Hellenic Astronomical Society
Ελληνική Αστρονομική Εταιρεία

ΤΟ ΣΥΜΠΑΝ
ΔΙΚΟ ΣΟΥ ΝΑ ΤΟ ΑΝΑΚΑΛΥΨΕΙΣ
ΠΑΓΚΟΣΜΙΟ ΕΤΟΣ ΑΣΤΡΟΝΟΜΙΑΣ 2009

International Year of Astronomy 2009

9th Hellenic Astronomical Conference

University of Athens, Department of Physics Athens 20-24 September 2009

Scientific Organising Committee:

K. Tsinganos (chair)
V. Charmandaris
I. Daglis
H. Dara
I. Georgantopoulos
D. Hatzidimitriou
A. Mastichiadis
M. Metaxa
P. Patsis
M. Plionis
J.H. Seiradakis
N. Stergioulas
L. Vlahos
E.M. Xilouris

Local Organising Committee:

P. Niarchos (chair)
H. Dara
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A. Liakos
M. Zoulias

Session 1: Sun, Planets, and Interplanetary Medium
Session 2: Our Galaxy: Stars, Exoplanets and Interstellar Medium
Session 3: Extragalactic Astrophysics and Cosmology
Session 4: Dynamical Astronomy and Relativistic Astrophysics
Session 5: Astronomical Infrastructure
Session 6: History and Education in Astronomy

Special Sessions:

European Southern Observatory – Prospects of Greek membership to ESO

European Space Agency program PRODEX

Astronomy Education in High Schools

Plenary Speakers

Dr S. Cabrit, Observatoire de Paris, France
Dr. E. Emsellem, Observatoire de Lyon, France & ESO, Germany
Dr. S. Krimigis, Academy of Athens & Johns Hopkins University, USA
Prof. M. Rowan-Robinson, Imperial College, UK
Prof. J. Truemper, MPE, Germany

Organised by

Hellenic Astronomical Society

University of Athens
Department of Physics

Sponsored by:

University of Athens, Academy of Athens, National Observatory of Athens and Ministry of Education

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FOREWORD

Held regularly since 1993, The Hellenic Astronomical Conference, organized by the Hellenic Astronomical Society (Hel.A.S.), is the major scientific event of the Greek astronomical community. The Conference, which takes place every two years in a different part of Greece, typically brings together over 100 scientists with research interests in Astronomy, Astrophysics, and Space Physics. The 9th Conference of Hel.A.S. took place in Athens, between September 20 and 24, 2009.

PLENARY SPEAKERS

Sylvie Cabrit, Observatoire de Paris, France
Eric Emsellem, ESO, Germany
Stamatis Krimigis, Academy of Athens, Greece
Joachim Truemper, MPE/Garching, Germany
Michael Rowan-Robinson, Imperial College, UK

INVITED SESSION SPEAKERS

Vassilis Archontis, University of St Andrews, UK
Spyros Basilakos, Academy of Athens, Greece
Scott Bolton, Southwest Research Institute, USA
George Contopoulos, Academy of Athens, Greece
Ioannis Contopoulos, Academy of Athens, Greece
Manolis Georgoulis, Academy of Athens, Greece
Evanthia Hatziminaoglou, ESO, Germany
Stella Kafka, Caltech, USA
Stellios Kazantzidis, Ohio State University, USA
Kostas Kokkotas, University of Thessaloniki, Greece & University of Tubingen, Germany
Alexandros Nindos, University of Ioannina, Greece
Dimitra Rigopoulou, Oxford University, UK
Magda Stavinsky, Romanian Academy, Romania
Theodosios Tassios, National Technical Univesity of Athens, Greece

SCIENTIFIC ORGANIZING COMMITTEE

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Panos Patsis, Academy of Athens, Greece
Manolis Plionis, National Observatory of Athens, Greeve
John Seiradakis, University of Thessaloniki, Greece
Nikos Stergioulas, University of Thessaloniki, Greece
Loukas Vlahos, University of Thessaloniki, Greece
Emmanuel Xilouris, National Observatory of Athens, Greece

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Despina Hatzidimitriou, University of Athens, Greece
Alexios Liakos, University of Athens, Greece
Manolis Zoulias, Academy of Athens, Greece

CONFERENCE PROGRAM

version: 8 September 2009

Sunday 20 September 2009		
To		**Event**
18:00		**Conference Registration**
19:00	S. Krimigis	Public outreach talk (in greek): "Λαμπροί Δακτύλιοι, Τεράστιες Λίμνες, και Πίδακες Πάγου: Η διαστημική αποστολή Cassini-Huygens αποκαλύπτει τα Μυστικά του Κρόνου"
20:00	The String Quartet of the City of Athens will perform for the participants of the conference at the building of the Academy of Athens.	
20:30		**Welcome Reception**

Monday 21 September 2009			
From	**To**	**Speaker**	**Topic**
09:00	09:25		**Conference Registration**
09:25	09:30		Welcome
09:30	10:15	**J. Truemper**	**Current Problems in Neutron Star Physics**
Main: Session 3 "Extragalactic Astrophysics and Cosmology"			
10:15	10:30	M. Georganopoulos	How much light was produced since the Universe was born? Finally, a way to measure it.
10:30	10:45	V. Pavlidou	Deciphering the Gamma-ray Background: the Search for Dark Matter in the GeV Band
10:45	11:00	N. Vlachakis	Magnetically driven astrophysical relativistic jets and their stability
11:00	11:15	L. Vlahos	Supernova Remnants as particle accelerators: Shocks or strong turbulence in spherical flows?
11:15	11:30	M. Stamatikos	Multi-Messenger GRB Astrophysics
11:30	12:00		**Coffee Break + Conference Registration**
12:00	12:15	A. Georgakakis	Infrared Excess Sources at z~2: Are they really Compton Thick QSOs?
12:15	12:30	E. Angelakis	Blazar astrophysics via multi-wavelength monitoring in the Fermi-GST era
12:30	12:45	M. Rovilos	The Lockman Hole multi-wavelength survey
12:45	13:00	I. Papadakis	The long term X-ray spectral variability of AGN
13:00	13:15	N. Fanidakis	AGN in hierarchical galaxy formation models
13:15	13:30	K. Boutsia	Selecting AGN through variability in SN datasets
13:30	13:45	E. Christopoulou	Optical microvariability observations of BL Lac objects
13:45	14:00	I. Nestoras	Cm to Sub-mm monitoring of gamma-ray blazars in the Fermi-GST era: First detailed results of the F-GAMMA project
14:00	15:30		**Lunch break**
15:30	16:30		**Poster Viewing Session**
Parallel 2: Session 3 "Extragalactic Astrophysics and Cosmology"			
16:30	17:00	S. Basilakos	The physical properties of the cosmic acceleration
17:00	17:15	P. Tzanavaris	Multiwavelength Investigations of Hickson Compact Groups of Galaxies: Evolution of Star Formation with UV, IR and X-ray diagnostics.
17:15	17:30	N. Nikoloudakis	Extreme Multiplex Spectrograph, XMS/NG1dF, and future cosmological measurements

17:30	17:45	G. Magdis	The Spitzer View of Lyman Break Galaxies

From	To	Speaker	Topic
17:45	18:15	D. Rigopoulou	Lifting the Cosmic Veil: the evolution of galaxies and the role of infrared spectroscopy from space
18:15	18:30	K. Tassis	Star formation in galaxies from molecular cloud to kpc scales
Parallel 1: Session 5 "Astronomical Infrastructures"			
16:30	17:00	E. Hatziminaoglou	Science with the Virtual Observatory
17:00	17:15	P. Boumis	ARISTARCHOS / RISE2: A wide-field fast imager for exoplanet transit timing
17:15	17:30	D. Emmanoulopoulos	The Cherenkov Telescope Array
17:30	17:45	A. Polatidis	The Low Frequency Array (LOFAR), a new radio telescope
17:45	18:00	T. Tzioumis	Next generation radio telescopes: SKA, Pathfinders and e-VLBI
Parallel 2: Session 3 "Extragalactic Astrophysics and Cosmology"			
18:00	18:15	A. Karampelas	Towards an optimized library of synthetic galaxy spectra for the GAIA mission
18:15	18:30	I. Leonidaki	New X-ray and optical SNRs in six nearby galaxies

Tuesday 22 September 2009

From	To	Speaker	Topic
09:00	09:30		Coffee from the cafeteria of Univ. of Athens
09:30	10:15	**S. Krimigis**	**The Dynamic Magnetosphere of Saturn as revealed by the Cassini Orbiter: 2004-2009**
Main: Session 1 "Sun, Planets, and Interplanetary Medium"			
10:15	10:30	N. Sergis	Structure, variation and pressure balance in the Saturnian plasma sheet: Combined plasma, energetic particle and magnetic field measurements from Cassini
10:30	11:00	S. Bolton	The Search for the Origin of the Solar System
11:00	11:30	V. Archontis	The magnetic coupling between the interior of the Sun and the outer solar atmosphere
11:30	12:00		**Coffee Break + Conference Registration**
12:00	12:30	A. Nindos	Multi-wavelength Observations of Solar Eruptions
12:30	13:00	M. Georgoulis	On the Nature of Solar Magnetic Eruptions
13:00	13:15	C. Gontikakis	Study of a Solar Active Region Jet
13:15	13:30	A. Anastasiadis	Particle acceleration process through reconnecting current sheets
13:30	13:45	N. Paschalidis	The Hot Plasma Composition Analyzer for the Magnetospheric Multiscale Mission
13:45	14:00	G. Anagnostopoulos	Temporal Evolution of Energetic Electron Precipitation as a Promisin tool for Earthquake prediction research: Analysis of Demeter Observations
14:00	16:00		**Lunch break**
16:00	16:45	**E. Emsellem**	**From SAURON to ATLAS3D: towards a paradigm shift for early-type galaxies?**
16:45	17:30		**Session on the ESO Prospects for Greece**
17:30	19:00		**General Assembly of Hel.A.S.**

Wednesday 23 September 2009			
From	**To**	**Speaker**	**Topic**
09:00	09:30		Coffee from the cafeteria of Univ. of Athens
9:30	10:15	**S. Cabrit**	**Modeling the origin of Jets from young stars**
Main: Session 2 "Our Galaxy: Stars, Exoplanets, and Interstellar Medium"			
10:15	10:45	Y. Tsamis	Integral field spectroscopy of protoplanetary disks in Orion with VLT FLAMES
10:45	11:00	T. Matsakos	Time variability in two-component protostellar jets, a numerical study
11:00	11:15	O. Dionatos	Spitzer spectral line mapping of the HH211 outflow
11:15	11:30	D. Stamatellos	The formation of low-mass stars and brown dwarfs
11:30	12:00		**Coffee Break**
12:00	12:15	D. Polychroni	A multi-wavelength study of the W3 Giant Molecular Cloud
12:15	12:45	N. Kylafis	Jets from Compact X-Ray Sources
12:45	13:00	S. Kafka	Magnetic activity on CV secondaries: Nature or Nurture?
13:00	13:30	I. Contopoulos	The 3D structure of the Pulsar Magnetosphere
13:30	13:45	A. Manousakis	Pulsed thermal emission from the accreting pulsar XMMU J054134.7-682550
13:45	14:00	A. Bonanos	The Nature and Origin of Hypervelocity Stars
14:00	16:00		**Lunch break**
Parallel 1: Session 1 "Sun, Planets, and Interplanetary Medium"			
16:00	16:15	A. Vourlidas	Heliospheric Imaging with STEREO: The Crucial Link Between In-situ and Imaging Observations of the Sun and the Heliosphere
16:15	16:30	S. Patsourakos	STEREO Observations Determine the Nature of EUV Waves
16:30	16:45	G. Balasis	Investigating magnetospheric dynamics using various complexity measures
16:45	17:00	A. Papaioannou	Establishing and Using the real-time Neutron Monitor Database (NMDB)
17:00	17:15	M. Gkini	Electron Density and Temperature in the Inner Magnetosphere of Saturn from Quasi Thermal Noise Spectroscopy: Cassini/RPWS
17:15	17:30	E. Zesta	The South American Meridional B-field Array (SAMBA) and opportunities for inter-hemispheric studies
Parallel 2: Session 3 "Dynamical Astronomy and Relativistic Astrophysics"			
16:00	16:30	G. Contopoulos	Stickiness
16:30	17:00	K. Kokkotas	Neutron Star Dynamics & Gravitational Waves
17:00	17:30	S. Kazantzidis	Coevolution of Galaxies & Supermassive Black Holes: A Key to Fundamental Physics and Galaxy Formation
17:30	17:45		**Coffee Break**
Parallel 1: Session 3 "Extragalactic Astrophysics and Cosmology"			
17:45	18:00	S. Kitsionas	Algorithmic comparisons of decaying, isothermal, compressible turbulence
18:00	18:15	S. Tsantilas	Inversed Semi-Detached Binaries: A new type of binary systems?
18:15	18:30	A. Sezer	Suzaku Analysis of Galactic Supernova Remnants G27.4+0.0 and G12.0-0.1
18:30	18:45	S. Akras	Modelling the Bar component in dusty spiral galaxies
18:45	19:00	M. Belcheva	Modelling the distribution of various objects in the Magellanic Clouds for Gaia

From	To	Speaker	Topic
Parallel 2: Session 3 "Dynamical Astronomy and Relativistic Astrophysics"			
17:45	18:15	Ch. Efthymiopoulos	Chaotic dynamics in galaxies
18:15	18:30	T. Kalvouridis	The Copenhagen case when the small body is a gyrostat
18:30	18:45	E. Vagenas	Area spectrum of rotating black holes and the new interpretation of QNMs
18:45	19:00	K. Lazaridis	High precision millisecond pulsar timing with the EPTA
21:00	24:00		**Conference Reception**

Thursday 24 September 2009

From	To	Speaker	Topic
09:00	09:30		Coffee from the cafeteria of Univ. of Athens
09:30	10:45		**Session on PRODEX and ESA**
Main: Session 6 "History and Education in Astronomy"			
10:45	11:15	T. Tassios	Ancient Greek Technology
11:15	11:25	J. Seiradakis	A new model of the Antikythera Mechanism
11:25	11:35	V. Manimanis	Ancient astronomical monuments of Athens
11:35	11:45	N. Solomos	Vicentios Damodos: The Man and the Telescope
11:45	11:55	N. Kallery-Vlahos	Astronomical Concepts and Events Awareness for Young Children
11:55	12:05	M. Metaxa	Astronomy Education: a challenge for contemporary Education
12:05	12:15	A. Papalambrou	"DarkSky.gr" - A Greek Campaign for Light Pollution Awareness
12:15	12:45	M. Stavischi	Astronomy and Culture
12:45	13:15		**Coffee Break**
13:15	14:00	**M. Rowan-Robinson**	The next decade of infrared and submillimetre astronomy: from Herschel and Planck to Alma, JWST and E-ELT
14:00			**End of Science Session**
14:00	16:00		**Lunch Break**
16:00	21:30		Session on Secondary Education

POSTER PRESENTATIONS

The following 107 posters will be displayed throughout the duration on the conference.

#	Presenter	Title
Session 1: "Sun, Planets, and Interplanetary Medium"		
1	G. Anagnostopoulos	A common acceleration process downstream of (quasi-perpendicular) CIR reverse shocks, planetary bow shocks and the termination shock
2	C. Bouratzis	The January 17, 2005 complex radio event (CME- CME interaction)
3	C. Bouratzis	Metric radio bursts and fine structures observed on 20 January, 2005
4	I. Daglis	Combining ground-based and space magnetic measurements for investigating the Earth's magnetosphere
5	K. Dialynas	Energetic Neutral Atom (ENA) Production from ions trapped in Saturn's Magnetosphere
6	M. Dimitropoulou	Simulating flaring events via an intelligent Cellular Automata mechanism
7	M. Georgiou	Storm-time ULF waves observed at low latitudes and their implication in radiation belt electron flux variability
8	M. Gerontidou	Fluctuations of CMEs characteristics during the declining phase of the last solar cycle
9	E. Giannaropoulou	Analysis of geomagnetic disturbances and cosmic ray intensity variations in relation to medical data from Rome
10	C. Gontikakis	Heating Distribution along an Active Region using a Simple Electrodynamic Model.
11	D. Grassi	Jupiter's hot spots: assessment of the retrieval capabilities of future IR spectro-imagers
12	P. Karagkiozidis	Mathematic type for the finding of relative distances of orbits of planets and satellites
13	A. Katsiyannis	SWAP: An EUV imager for solar monitoring on-board of PROBA2 micro-satellite
14	I. Kontogiannis	Comparative analysis of oscillations of a solar quiet region from multi-wavelength observations
15	O. Malandraki	CIR-Accelated Energetic Particles During 2008: Multi-point Observations by STEREO and ACE
16	O. Malandraki	Tracing Magnetic Connectivity and Solar Injection by means of Energetic Particles in the Inner Heliosphere
17	M. alandraki	Solar Energetic Particle Observations and Propagation in the 3-D Heliosphere in december 2006
18	F. Metallinou	Study of storm-time ring current built-up through ion acceleration Simulations
19	A. Papaioannou	Mapping of the cosmic ray events related to the solar activity for the period 2003-2005
20	A. Papaioannou	Anomalous Forbush effects associated with remote western and eastern sources
21	C. Plainaki	Space weathering on near-Earth objects
22	I. Sandberg	Unfolding SREM data with a SVD regularization method
23	M. Taylor	Identification of nonlinear space weather models of the Van Allen radiation belts using Volterra networks
24	M. Taylor	Towards a unified source-propagation model of cosmic rays
25	K. Tziotziou	Study of Ha Spicule Profiles with Line Inversion Techniques
26	K. Tziotziou	Solar origin of solar particle events detected by the Standard Radiation Environment Monitor of ESA
27	L. Vlahos	Why the magnetic flux and the impulsive energy released in solar active regions follow a universal power law distribution?
28	A. Voulgaris	Instrumentation, observational techniques and first results from the total solar eclipse of July 22, 2009 in China
Session 2: "Our Galaxy: Stars, Exoplanets and Interstellar Medium"		
1	S. Akras	Photo-ionization modeling of new PNe discovered in the Galactic bulge region
2	I. Alikakos	New optical candidate supernova remnants in Sagittarius.
3	J. Antoniadis	ThReT: A new survey for Extrasolar planetary transits at Mt. Holomon, Greece
4	A. Antoniou	Similarity between DACs/SACs phenomena in hot emission stars and quasars absorption lines
5	A. Antoniou	Studding the origin of SACs and DACs in the spectra of hot emission stars
6	I. Arka	Wave interaction and nonlinear compton scattering in relativistic shocks
7	P. Boumis	Long trails of optical emission behind PNe and LBVs

#	Presenter	Title
8	M. Bozkurt	XMM-Newton Analysis of Galactic Supernova Remnant G156.2+5.7
9	M. Contadakis	Transient high frequency optical oscillations of the red dwarf AD Leonis
10	S. Kitsionas	Forming free-floating brown dwarves as a by-product of multiple star formation
11	S. Kleidis	Discovery and observations of the new binary GSC 2805:0766
12	A. Liakos	The contact system V566 Ophiuchi revisited
13	A. Liakos	Preliminary results for the triple system AV CMi
14	F. Lykou	Dusty Disks Around Evolved Stars
15	A. Manousakis	X-ray wind tomography of IGR J17252-3616
16	N. Nanouris	Probing evolutionary trends in close binaries from observed period changes
17	N. Nanouris	Photometric monitoring of GSC 2696-2622 variability
18	Ch. Papadimitriou	Monitoring of the Cataclysmic Variable TW Tri
19	M. Petridis	A Study on Interstellar Communication: The Prerequisite for Interstellar Expansion
20	S. Pyrzas	Post Common Envelope Binaries from the SDSS
21	S. Tsantilas	VSAA: A program for time-frequency analysis in time-series.
22	S. Tsantilas	Light curve analysis of the ES UMa binary
23	P. Tzeferacos	On the Generation of Entropy in Jet-Launching Discs

Session 3: "Extragalactic Astrophysics and Cosmology"

1	E. Aktekin	Suzaku Analysis of A1800
2	A. Akylas	An updated look at the XRB synthesis models
3	A. Antoniou	DACs and SACs in the spectra of the quasars PG 0946+301 and PG 1254+047
4	V. Antoniou	Small Magellanic Cloud: Star-formation history and X-ray binary populations
5	I. Bellas-Velidis	UGC - Unresolved Galaxy Classifier for ESA's Gaia Mission
6	M. Bozkurt	Structural Analysis of Abell 3560 Clusters of Galaxies
7	S. Dimitrakoudis	Effects of hadronic reactions on the temporal evolution of the nonthermal emission of active galactic nuclei
8	S. Dimitrakoudis	Proton acceleration and radiation in astrophysical shocks
9	I. Georgantopoulos	Heavily Obscured AGN in X-ray Surveys
10	N. Gizani	Observations of Radio relics and Haloes in Xray selected Cluster sample. The physical nature of the intra-cluster cosmic rays.
11	E. Hatziminaoglou	Dusty AGN with Spitzer and Herschel
12	M. Hudaverdi	X-ray Picture of Super Clusters of Galaxies
13	E. Kapakos	The SMC RR-Lyrae variables and their metal abundances
14	A. Karampelas	Star complexes and stellar populations in NGC 6822
15	M. Karouzos	A multi-wavelength analysis of a statistically complete sample
16	E. Koulouridis	The Activity of The Neighbours of AGN galaxies.
17	L. Koutoulidis	X-ray Active Galactic Nucleus Angular Clustering and the Dependence of Luminosity and Redshift
18	D. Koutsokosta	Energy Estimation of Ultra High Energy Cosmic Hadrons by Lateral Distribution Functions of Extensive Air Showers
19	S. Lianou	Early-type dwarf galaxies in the M81 group
20	E. Livanou	Typical galaxy synthetic spectra for Gaia at high and low resolution
21	M. Malekjani	Spherical collapse with Modified Newtonian Dynamics
22	M. Mastichiadis	Hadronic Gamma Ray Burst Models
23	L. Moustakas	Mapping dark matter properties with strong gravitational lensing
24	G. Nikolov	Density profiles of star clusters in the Magellanic clouds
25	M. Petropoulou	On the synchrotron and SSC emission of GRB afterglows -- Some analytical results
26	A. Pouri	Cosmology from Gamma Ray Bursts
27	M. Stamatikos	Swift-BAT and Fermi-GBM GRB Inter-Calibration Results
28	E. Xilouris	Molecular gas properties in Luminous Infrared Galaxies: steping up the CO J-ladder towards the star forming phase
29	O. Zacharopoulou	Modification of blazar spectrum due to internal and intergalactic absorption

#	Presenter	Title
Session 4: "Dynamical Astronomy and Relativistic Astrophysics"		
1	E. Chaliasos	The Rotating and Accelerating Universe
2	M. Harsoula	Orbital structure in barred-spiral galaxies
3	C. Kalapotharakos	Orbital distributions in elliptical galaxies via appropriate SCF basis sets
4	M. Katsanikas	The orbital behavior at the neighborhood of Periodic orbits with high order Multiplicity in 3D Galactic Potentials
5	V. Kryvdyk	Astrophysical observations of collapsing stars.
6	P. Patsis	What nature thinks about "chaotic" spirals - The stellar flow in three barred-spiral systems
7	E. Tsigaridi	Response models of barred-spiral galaxies
Session 5: "Astronomical Infrastructures"		
1	P. Boumis	ARISTARCHOS Instrumentation: Meaburn Measuring Filter Spectrometer (MMFS)
2	E. Christopoulou	The new telescope at the University of Patras. Current and future prospects.
3	I. Daglis	ESA's BepiColombo mission to Mercury and the Greek contribution to the Planetary Ion Camera (PICAM)
4	T. Economou	The New Optical Telescope on Mountain Orliakas in Northwestern Macedonia
5	K. Gazeas	Applications of the stellar spectrograph of the University of Athens Observatory
6	N. Gizani	Get to know HELYCON – The alternative cosmic ray telescope.
7	C. Goudis	ARISTARCHOS telescope: The final phase
8	Y. Papamastorakis	The Current State of Skinakas Observatory
9	N. Solomos	Electrooptics of an experimental quantum-optical photometer
10	N. Solomos	Distributed Telescope Networks in the Era of Network-Centric Astronomy
11	N. Solomos	Aspects of the Optomechanical Design of the new 1.4m TCC Reflector
12	K. Tsinganos	A New Formation Flying Solar Coronagraph
13	S. Kleidis	H.A.A. & Z.P.O.: Informal Astronomical Education in Greece
Session 6: "History and Education in Astronomy"		
1	V. Manimanis	The eternal role of Astronomy in history and civilization
2	V. Manimanis	Science, theology and new civilization
3	V. Manimanis	Invisible world and modern physics: Modern science and theology
4	V. Manimanis	Non-prevailable political calendrical systems in the European history
5	V. Manimanis	The large built water clock of Amphiaraeion
6	A. Matthaiou	Astronomical Activities for students-Motivating students interest in Physical Science through Astronomy
7	Th. Pierratos	Teaching Astronomy in upper secondary schools using educational material that has been developed by the ESA and the ESO

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ABSTRACTS – ORAL CONTRIBUTIONS

Monday 21 September 2009

Current Problems in Neutron Star Physics

Truemper Joachim (Max-Planck-Institute for Extraterrestrial Physics)

After summarizing briefly the proven properties of neutron stars we shall review some recent developments in neutron star physics. How large is their gravitational field strength? What do we know about the equation of state of matter at extremely large densities which determines the radius of a neutron star of given mass? Answers to these questions come from recent observations of the thermal (photospheric) emission of isolated neutron stars. Another topic we will discuss concerns the nature of soft gamma ray repeaters (SGR's) and anomalous X-ray pulsars (AXP's). Are these objects magnetars having superstrong magnetic dipole fields ($\sim 10^{15}$ G) or are they neutron stars accreting matter from a fallback disk produced in the course of the supernova explosion?

How much light was produced since the Universe was born? Finally, a way to measure it.

Georganopoulos Markos (UMBC-NASA/GSFC)

The extragalactic background light (EBL) that permeates the Universe in the optical-IR is essentially an integral of the light produced from the time the first stars were formed in our Universe until now. As such, it is a quantity that is very closely connected to the galaxy/large scale structure formation in our Universe. Unfortunately, measuring the EBL has been proven very difficult, for very simple reasons that I will discuss in the first part of my talk. Luckily, we found a parameter-free way to break the deadlock of measuring the EBL with Fermi, NASA's new Gamma-ray satellite, observations of the lobes of the nearby radio galaxy Fornax A. This will be the second part of my talk. Fermi measurements are underway.

Deciphering the Gamma-ray Background: the Search for Dark Matter in the GeV Band

Pavlidou Vasiliki (Caltech)

The recently launched Fermi Gamma-ray Space Telescope promises a decade of excitement and discovery in the GeV Band. While Fermi represents a dramatic improvement in instrumental capabilities for point source observations in GeV gammas compared to its predecessors, much of GeV science will still be encoded in the unresolved, diffuse background, due to restrictions in point source sensitivity and angular resolution inherent in GeV energies. A most prominent example is that of dark matter, which, in popular supersymmetric models, is predicted to annihilate in Galactic substructure and produce diffuse gamma-ray emission of remarkably constant intensity across the sky. Although the unambiguous discovery of such a signal would be one of the most exciting discoveries for gamma-ray astrononmy, it is difficult to disentangle this emission from the extragalactic gamma-ray background due to astrophysical sources such as active and starforming galaxies. I will discuss a novel and most promising technique for identifying a dark matter signature in the diffuse gamma-ray emission, combining spectral and anisotropy information. I will show show that if Galactic dark matter contributes only a modest fraction of the measured emission in an energy range accessible to the Fermi Gamma-ray Space Telescope, it should be possible to confidently identify gamma rays from Galactic dark matter substructure and use them to measure the properties of the dark matter particle.

Magnetically driven astrophysical relativistic jets and their stability

Vlahakis Nektarios (University of Athens)

Analytical and numerical studies of relativistic magnetohydrodynamic jets give a simple and clear connection between the flow-shape, the bulk Lorentz factor, the structure of the magnetic field, and the pressure of the jet environment. The first results on the linear stability of these jets with respect to helical perturbations will be presented.

Supernova Remnants as particle accelerators: Shocks or strong turbulence in spherical flows?

Vlahos Loukas (University of Thessaloniki)

The "standard model" for particle acceleration in supernova remnants is diffusive acceleration in spherical shocks. The main idea is that waves developed in the vicinity of the spherical shock scatter the particles across the shock many times till they acquire enough energy to escape upstream. This mechanism probably dominates the acceleration during supernova explosions in the initial phases but at the latter phases a new and much more efficient accelerator sets in. The strongly turbulent spherical flow develops a network of filamentary nonlinear structures and a network of well studied small scale accelerators (e.g. thousands of traveling magnetic discontinuities (shocks) with variable Mach numbers and current sheets of different size). We will show that this new accelerator is much more efficient; particles reach to Ultra High Energies and retain all the spectral characteristics of the diffusive shock acceleration.

Multi-Messenger GRB Astrophysics

Stamatikos Michael (The Ohio State University / CCAPP)

Gamma-ray Bursts (GRBs) are relativistic cosmological beacons of transient high energy radiation whose afterglows span the electromagnetic spectrum. Theoretical expectations of correlated neutrino emission position GRBs at an astrophysical nexus for a metamorphosis in our understanding of the Cosmos. This new dawn in the era of experimental (particle) astrophysics and cosmology is afforded by current facilities enabling the novel astronomy of high energy neutrinos, in concert with unprecedented electromagnetic coverage. In that regard, GRBs represent a compelling scientific theme that may facilitate fundamental breakthroughs in the context of Swift, Fermi and IceCube. Scientific synergy will be achieved by leveraging the combined sensitivity of contemporaneous ground-based and satellite observatories, thus optimizing their collective discovery potential. Hence, the advent of GRB multi-messenger astronomy may cement an explicit connection to fundamental physics, via nascent cosmic windows, throughout the next decade.

Infrared Excess Sources at z~2: Are they really Compton Thick QSOs?

Georgakakis Antonis (National Observatory of Athens)

We explore recent claims for the detection of a large population of powerful (Lx>1e44) Compton Thick ($N_H>10^{24}$) QSOs at z~2 among "infrared excess" sources with 24-micron over R-band flux ratio f_24/f_R>1000 (e.g. Fiore et al. 2008; Daddi et a. 2007). The multiwavelength data in the AEGIS and the Chandra Deep Field North (CDF-N) surveys are used to select sources with secure spectroscopic redshifts at z~1 and with Spectral Energy Distributions, which if redshifted to z~2, would have *observed* f_24/f_R>1000 (i.e. would have been selected as "infrared-excess" sources at z~2). The advantage of our approach is that the selected sources are relatively bright at all wavelengths, inlcuding X-rays, allowing detailed study of their nature. It is found that a large fraction (e.g. ~80% in the CDF-N) of the sources in the sample are detected at X-rays,

suggesting a high fraction of AGN among the "infared excess" population. Analysis of the X-ray spectra however, suggests only moderate obscuration ($N\sim10^{22}$-10^{23}), well below the Compton Thick limit ($N_H\sim10^{24}$). Moreover, modeling of the Spectral Energy Distribution of the selected sources shows that the mid-infrared is dominated by star-formaton, with only a small contribution from AGN reprocessed radiation. We conclude that one should be cautious about recent suggestions for the detection of a large population of Compton Thick (N_H>1e24) QSOs at z~2. The data in those studies are also consistent with moderately obscured (N_H~1e22-1e23) AGN.

Blazar astrophysics via multi-wavelength monitoring in the Fermi-GST era

Angelakis Emmanouil (Max-Planck-Institut fuer Radioastronomie)

The analysis of the SED variability at frequencies from radio to TeV is a powerful tool in the investigation of the dynamics, the physics and the structure evolution occurring at the most exotic flavor of active galaxies, the blazars. In particular, the presence of Fermi-GST is providing a unique opportunity for such studies delivering gamma-ray data of unprecedented quality. Here we introduce a monitoring program that runs at the Effelsberg 100-m telescope since January 2007, pivoting a broad multi-frequency collaboration of facilities that cover the band from radio to infrared. At Effelsberg ~60 selected blazars are observed monthly between 2.64 to 43 GHz. The evolution of their spectra is studied and compared to their behavior in gamma-rays.

The Lockman Hole multi-wavelength survey

Rovilos Manolis (MPE)

The Lockman Hole is a region in the sky with minimal galactic absorption, which makes it ideal for deep surveys. We have imaged the Lockman Hole using the Large Binocular Telescope in an area which combines the deepest XMM exposure in the X-rays (800 ks - $2x10^{-16}$ erg/s/cm^2/s) with deep radio coverage with the VLA (4.6 uJy). We have reached a magnitude limit of ~28 mag(5sigma, AB) in the U, B and V bands, revealing more then 85000 sources. Combining this survey with deep r-i-z images taken with the Subaru telescope and NIR images taken with Spitzer, we have a complete wavelength coverage from radio wavelenghts to the X-rays, ideal for studying a variety of different classes of extragalactic objects, such as AGN, star-forming galaxes and clusters of galaxies.

The long term X-ray spectral variability of AGN

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We present the results from the spectral analysis of more than 7,500 RXTE spectra of 10 nearby, X-ray bright AGN, which have been observed by RXTE regularly the last 10 years. We modeled the data in a uniform way using simple phenomenological models (a power-law with the addition of Gaussian line and/or edge to model the iron Kalpha emission/absorption features, if needed) to consistently parametrize the shape of the observed X-ray continuum of the sources in the sample. We found that the average spectral slope does not correlate with source luminosity or black hole mass, while it correlates positively with the average accretion rate. We have also determined the (positive) "spectral slope - flux" relation for each object, over a flux range larger than before. We found that this correlation is similar in all objects, except for NGC 5548 which displays limited spectral variations for its flux variability. We discuss this global "spectral slope - flux'' trend in the light of current models for spectral variability. We consider (i) intrinsic variability, expected e.g. from Comptonization processes, (ii) variability caused by absorption of X-rays by a single absorber whose ionization parameter varies proportionally to the continuum flux variations, (iii) variability resulting from the superposition of a constant reflection component and an intrinsic power-law which is variable in flux but constant in shape, and, (iv) variability resulting from the superposition of a constant reflection component and an intrinsic power-law which is variable both in flux and

shape. Our final conclusion is that scenario (iv) provides the best fit to the data of all objects, except for NGC~5548.

AGN in hierarchical galaxy formation models

Fanidakis Nikos (ICC Durham)
Frenk Carlos (ICC Durham), Baugh Carlton (ICC Durham), Bower Richard (ICC Durham), Done Chris (ICC Durham), Cole Shaun (ICC Durham)

We present a new theoretical model of the evolution of the mass and spin of supermassive black holes (BHs). The calculation is embedded in the GALFORM semi-analytical model which follows the formation and evolution of galaxies in a cold dark matter universe. The BH and galaxy formation models are fully coupled: the semi-analytic model computes the rate at which hot and cold gas are added to the BH, while the emission from the BH regulates the gas cooling rate. We track the evolution of BH spin following BH-BH mergers and the accretion of gas from a disk. We find that the overall distribution of spins is bimodal when the accretion of gas onto BHs occurs via an accretion disk which is limited in size by its self-gravity. We find that the BHs hosted by bright ellipticals are massive ($M>10^8$Msun) and rapidly spinning. With our predictions for the mass, spin and mass accretion rates of the BH, and by assuming the Blandford-Znajek mechanism for jet production, we can predict the optical and radio emission from AGN. The model reproduces remarkably well the radio loudness of AGN, suggesting that the jet properties of an active galaxy are a natural consequence of the accretion rate and spin characterising its central black hole. This is the first confirmation that AGN-feedback galaxy formation models reproduce the observed properties of AGN.

Selecting AGN through variability in SN datasets

Boutsia Konstantina (INAF-OAR)

Variability is a main property of active galactic nuclei (AGN) and it was adopted as a selection criterion using multi epoch surveys conducted for the detection of supernovae (SNe). We have used two SN datasets. First we selected the AXAF field of the STRESS project, centered in the Chandra Deep Field South where, besides the deep X-ray surveys also various optical catalogs exist. Our method yielded 132 variable AGN candidates. We then extended our method including the dataset of the ESSENCE project that has been active for 6 years, producing high quality light curves in the R and I bands. We obtained a sample of ~5000 variable sources, down to R~22, in the whole 8 deg^2 ESSENCE field. Among them, we selected as the most probable AGN candidates those with a non-flat structure function and this has yielded a subsample of 500 high priority AGN candidates. In November 2007 we conducted a pilot spectroscopic run in order to confirm the nature of our candidates, which proved very successful. We will present the variability selection technique along with the optical spectra of the AGN we have detected and we will discuss their properties.

Optical microvariability observations of BL Lac objects

Christopoulou Eleftheria (Physics Department, University of Patras)
Xilouris Emmanuel (Institute of Astronomy and Astrophysics National Observatory Of Athens), Boumis Panayotis (Institute of Astronomy and Astrophysics National Observatory Of Athens), Iosif Papadakis (Physics Dept. University of Crete), Dapergolas Anastasios (Institute of Astronomy and Astrophysics National Observatory Of Athens))

We present the results from a multiband optical photometric monitoring programme of 4 BL Lac objects carried out in 2001. The observations resulted in almost evenly sampled light curves 6-9 h long in the U, B, V and I bands. Our main aim is to determine the basic variability characteristics of the sources (inter-day and intra-night variations, variability amplitude) and investigate their dependence on wavelength.

Cm to Sub-mm monitoring of gamma-ray blazars in the Fermi-GST era: First detailed results of the F-GAMMA project.

Nestoras Ioannis (Max-Planck-Institut fuer Radioastronomie)

The blazars, being the most dramatic manifestations of of the activity sustained by a supermassive black hole in galactic nuclei, show several exotic characteristics such as intense variability (both in total and polarised power) at almost al energy bands, highly super-luminal apparent motions, high brightness temperatures. Most of these characteristics are attributed to very small angles between the line-of-sight and the jet axis. Despite the years of research key questions remain unclear as of what is the emission mechanisms powering these systems. Monitoring programs are the ultimate tool to provide the necessary observational constraints and thus, to shed light in what is the radiation processes and energy production acting at the base of radio jets. The Fermi-GST (previously GLAST) is a space mission studying the cosmos in the gamma-ray energy band. Large Area Telescope (LAT) on-board Fermi-GST has area, angular resolution and field-of-view superior to that of its predecessors between 20 MeV and 300 GeV. Scanning the whole sky every a few hours gives a unprecedented opportunity for variability studies at those energies. However, only when combined with other energy bands the outcome of studies is maximized provided the broad-band character of the blazar emission. The Fermi-GST AGN Multi-frequency Monitoring Alliance known as F-GAMMA project is a program for the monthly monitoring of the spectra of ~60 Fermi-GST blazars from cm to sub-mm bands as well as optical and IR. The Effelsberg 100m telescope is pivoting the program together with the 30m IRAM telescope as well as the APEX 12m antenna covering roughly from 2 GHz up to 350 GHz with precision of a few percent. Here we present first results including light curves, spectra and variability properties, including a first comparison with their gamma-ray properties as observed recently by Fermi-GST.

The physical properties of the cosmic acceleration

Basilakos Spyros (Academy of Athens)

The detailed analysis of the available high quality cosmological data (SNIa, CMB, etc) leads to the conclusion that we live in a flat and accelerating universe. In order to investigate the cosmic history of the observed universe, we have to introduce a general cosmological model, which contains cold dark matter to explain the large scale structure clustering, and an extra component with negative pressure, the ''dark energy'', to explain the observed accelerated cosmic expansion. The nature of the dark energy is one of the most fundamental and difficult problems in physics and cosmology. In this talk, I will present several views regarding the nature of the dark energy which is thought to be responsible for the current acceleration.

Multiwavelength Investigations of Hickson Compact Groups of Galaxies: Evolution of Star Formation with UV, IR and X-ray diagnostics.

Tzanavaris Panayiotis (NASA/GSFC - JHU)
Hornschemeier Ann (NASA/GSFC), Gallagher Sarah (UWO), Johnson Kelsey (U. Virginia), Gronwall Caryl (Penn State), Charlton Jane (Penn State)

Nearby (<100 Mpc) compact groups of galaxies represent a special high-density environment, which, thanks to their relative proximity, can be studied in detail. The similarity of compact groups to dense environments at high redshift makes them an ideal laboratory for gaining insight on galaxy evolution and transformation in the distant Universe, where merging and interactions are prevalent. We have selected a diverse sample of 12 Hickson Compact Groups (HCGs), and performed observations in the X-ray (Chandra), the UV (Swift/UVOT), the optical (CTIO imaging/spectroscopy), and the IR (2MASS, Spitzer IRAC and MIPS). Until recently, large HCG samples were relatively unexplored in the UV, IR and X-ray wavelength regions. We aim to fully characterize star formation in galaxies of different morphological types and groups of different evolutionary stages. I will present Swift/UVOT 3-color UV data, which we combine with Spitzer and 2MASS IR data, to obtain, for the first time, dust maps

and specific star-formation rate (SSFR) estimates for HCGs. I will discuss the interpretation of the 'gap' in mid-IR and SSFR space and how it relates to the proposed evolutionary schemes for compact groups. The X-ray regime also provides valuable information on the evolutionary stage of HCGs. I will present our results on 5 HCGs from our sample and discuss the relative importance of the diffuse emission and X-ray binary contribution, as a function of stellar mass. I will conclude with future prospects, relating to the results of our ongoing, comprehensive imaging and spectroscopy campaign to discover new members of these HCGs.

Extreme Multiplex Spectrograph, XMS/NG1dF, and future cosmological measurements

Nikoloudakis Nikolaos (Durham University, ICC)

XMS/MG1dF is designed for the prime focus of classical 4-m wide field telescopes (AAT-NG1dF and Calar Alto-XMS) and can hand the minimum of 4000 MOS slit over a 1° field. This supreme multiplex ability means that 25000-30000 galaxy redshifts can be measured in a single night, giving the chance to have large redshift surveys out to z ~ 0.7. Because of the accomplishment to measure 4000 galaxy redshifts per hour for i < 21.5 absorption-lines and i < 22.5 emission-lines, XMS/NG1dF could provide almost $6x10^6$ galaxy redshifts in a 200 night survey. Such a survey could cover 1000-2000 deg^2 of sky offering the opportunity to have better investigations of the clustering of galaxies in a wide range scales like as 0.1-1000 h^{-1} Mpc. Due to the multiplex ability of this instrument, different science cases can be explored. Our interesting is focused in the field of observational Cosmology and specifically at measurements of the Gravitational Growth Rate through redshift space-distortions and the Baryon Acoustic Oscillations. These specific measurements are the main cosmological goals for XMS/NG1dF, so their future abilities will be discussed and compared with present/future galaxy redshift surveys.

The Spitzer View of Lyman Break Galaxies

Magdis Georgios (CEA/Saclay)

Using a combination of deep MID-IR observations obtained by IRAC, MIPS and IRS on board Spitzer we investigate the MID-IR properties of Lyman Break Galaxies (LBGs) at z~3, establish a better understanding of their nature and attempt a complete characterisation of the population. With deep mid-infrared and optical observations of ~1000 LBGs covered by IRAC/MIPS and from the ground respectively, we extend the spectral energy distributions (SEDs) of the LBGs to mid-infrared. Spitzer data reveal for the first time that the mid-infrared properties of the population are inhomogeneous ranging from those with marginal IRAC detections to those with bright rest-frame near-infrared colors and those detected at 24μm MIPS band revealing the newly discovered population of the Infrared Luminous Lyman Break Galaxies (ILLBGs). To investigate this diversity, we examine the photometric properties of the population and we use stellar population synthesis models to probe the stellar content of these galaxies. We find that a fraction of LBGs have very red colors and large estimated stellar masses $M>5x10^{10}$Mo. We discuss the link between these LBGs and submm-luminous galaxies and we report the detection of rest frame 6.2 and 7.7 μm emission features arising from Polycyclic Aromatic Hydrocarbons (PAH) in the Spitzer/IRS spectrum of an infrared-luminous Lyman break galaxy at z=3.01. Finally, we extent the M-SFR relation to z~3 and predict Herschel contibution to our understanding of the early universe.

Lifting the Cosmic Veil : the evolution of galaxies and the role of infrared spectroscopy from space

Rigopoulou Dimitra (University of Oxford)

In order to understand galaxy evolution detailed observations of the correlation between stellar mass and central black holes growth are needed. Since both of these events occur behind huge amounts of dust spectroscopy at longer wavelengths is necessary. In the coming years a number of facilities operating long-wards of visible/near-infrared will are/will become available. I will discuss our current understanding of the interstellar medium in young galaxies and the role of feedback in regulating star -formation and how mid/far-infrared spectroscopy provides the necessary tools for probing through the obscuring material. I will then outline the scientific synergies provided by the availability of HERSCHEL, ALMA and the JWST and ESA's future plans including SPICA.

Star formation in galaxies from molecular cloud to kpc scales

Tassis Konstantinos (JPL Caltech)

We investigate, using cosmological simulations of galaxy formation, the physics behind established scalings between galactic-scale observables (such as the star formation rate, gas density, and metallicity) in star-forming galaxies. To this effect, we follow the formation of molecular hydrogen in the ISM in a self-consistent way, including the effects of nonequilibrium chemistry and cooling, as well as radiative transfer. We develop subgrid star-formation models tied to molecular hydrogen. We find that, under such implementations of star formation, the observed scalings of the star formation rate with molecular and atomic hydrogen in galactic scales arise naturally.

Towards an optimized library of synthetic galaxy spectra for the Gaia mission

Karampelas Antonios (University of Athens)
Kontizas Evangelos (National Observatory of Athens / IAA), Kontizas Mary (University of Athens), Livanou Evdokia (University of Athens), Rocca-Volmerange Brigitte (Institut d' Astrophysique de Paris), Bellas-Velidis Ioannis (National Observatory of Athens / IAA)

ESA’s cornerstone Gaia Mission is going to observe millions of unresolved galaxies during the next few years. The Athens Group is in charge of providing a library of synthetic galaxy spectra and the appropriate software (UGC – Unresolved Galaxy Classifier) that will classify the observed galaxies and extract astrophysical parameters for Gaia. The optimization of our existing library, which was created with the Pegase2 code of galaxy evolution synthesis, is in progress: We present the results of our analysis, including 1) the comparison with observed SDSS galaxy spectra, 2) the investigation of the star formation parameters used to create the synthetic spectra and 3) the detection of outliers. We will also discuss our future plans in the development of the existing codes of galaxy evolution synthesis and the creation of more realistic libraries of synthetic galaxy spectra.

New X-ray and optical SNRs in six nearby galaxies

Leonidaki Ioanna (National Observatory of Athens / IAA)
Zezas Andreas (University of Crete-Department of Physics, Harvard Smithsonian Center for Astrophysics), Boumis Panayotis (National Observatory of Athens-IAA)

We present the results from a study of the SNR population in six nearby galaxies (NGC 2403, NGC 3077, NGC 4214, NGC 4449, NGC 4395 and NGC 3077) based on Chandra archival data. We have detected a sample of 244 discrete X-ray sources with fluxes down to 10^{-17} erg/sec. A total number of 40 X-ray detected SNRs are identified, 30 of which are new, based on their X-ray colors and spectroscopy. We discuss the SNR properties (luminosity, temperature, density)

of the X-ray detected SNRs in order to obtain information on their interaction with their environment. We also compare the luminosity distributions of X-ray SNRs in different types of galaxies with the number of our X-ray detected SNRs and we indicate differences between the SNR populations in spiral and irregular galaxies. Finally, on the basis of a multiwavelength study of SNRs, we obtained deep images in the [S II] and Halpha emission lines and we initially classified a large number of optical candidate SNRs based on their [S II] /Halpha ratio. Follow-up spectro-photometric observations of the candidate SNRs have also been obtained and their spectral signatures suggest that the detected emission originates from shock-heated gas.

Science with the Virtual Observatory

Hatziminaoglou Evanthia (ESO - Garching)

The virtual observatory (VO) is a collection of interoperating data archives and software tools which utilize the internet to form a scientific research environment in which astronomical research programs can be conducted. It is opening up new ways of exploiting the huge amount of data provided by the ever-growing number of ground-based and space facilities, as well as by computer simulations. This presentation summarises a variety of scientific results spanning various fields of astronomy, obtained thanks to the VO, while highlighting it's various capabilities.

ARISTARCHOS / RISE2: A wide-field fast imager for exoplanet transit timing

Boumis Panayotis (National Observatory of Athens / IAA)
Xilouris Emmanouel (National Observatory of Athens / IAA), Katsiyannis Athanassios (National Observatory of Athens / IAA), Goudis Christos (National Observatory of Athens / IAA)

The detection of exoplanets is currently of great topical interest in astronomy. The Rapid Imager for Surveys of Exoplanets 2 (RISE2) camera will be built for exoplanet studies and in particular for detection of transit timing variations (TTV) induced by the presence of a third body in the system. It will be identical to RISE which has been running successfully on the 2m Liverpool Telescope since 2008 but modified for the 2.3m ARISTARCHOS telescope. For TTV work the RISE/LT combination is regularly producing timings with accuracy <10 seconds making it the best suited instrument for this work. Furthermore, RISE2/AT has the added benefit of being located at a significantly different longitude to the LT/RISE on La Palma, hence extending the transit coverage.

The Cherenkov Telescope Array

Emmanoulopoulos Dimitrios (University of Southampton)

In recent years the field of ground-based gamma-ray astronomy has experienced a major breakthrough with the impressive astrophysical results obtained mainly by the current generation ground-based Cherenkov facilities like CANGAROO, H.E.S.S., MAGIC, MILAGRO and VERITAS. A clear physics potential of this field has been demonstrated, which is restricted not only to pure astrophysical observations, but also allows significant contributions to the field of particle physics and cosmology. The Cherenkov Telescope Array (CTA) is going to be the next generation ground-based Cherenkov observatory which will provide the deepest ever insight into the non-thermal high-energy universe. It is planned to have an order of magnitude better sensitivity in the current very high energy (VHE) domain between 100Gev to 10 TeV and an extension of the accessible energy range well below 100 GeV (~10 GeV) and to above 100 TeV. I am going to present the current status of this VHE experiment with respect its astrophysical prospects and the advantages of joining such an observatory.

The Low Frequency Array (LOFAR), a new radio telescope.

Polatidis Antonios (ASTRON)

The LOw Frequency ARray (LOFAR) is a multi-purpose sensor array. Its main application is astronomy at low frequencies (30-240 MHz) but also has geophysical and agricultural application. Its heart is a new, innovative, fully digital radio telescope, currently under construction in The Netherlands and other European countries. It is realised as a phased aperture array without any moving parts. Digital beam forming allows the telescope to point to any part of the sky within a second. Transient buffering makes retrospective imaging of explosive short-term events possible. Its superb sensitivity, high angular resolution, large field of view and flexible spectroscopic capabilities will represent a dramatic improvement over previous facilities at these wavelengths. The design of LOFAR has been driven by six fundamental astrophysical applications: (i) The Epoch of Reionisation, (ii) Extragalactic Surveys and their exploitation to study the formation and evolution of clusters, galaxies and black holes, (iii) Transient Sources and their association with high energy objects such as gamma ray bursts or pulsars, (iv) Cosmic Ray showers and their exploitation to study the origin of ultra-high energy cosmic rays (v) Magnetic Fields in the universe and (vi) Solar science, Space weather and planetary science. I will present the characteristics of the array, an update of the status and the commissioning progress and will discuss early results and the "Announcement of Opportunity" to participate in the early observations.

Next generation radio telescopes: SKA, Pathfinders and e-VLBI

Tzioumis Tasso (CSIRO ATNF)

The premier next-generation radio astronomy facility, the Square Kilometre Array (SKA), will provide huge increases in sensitivity and field of view. It will attempt to answer some of the fundamental questions, from Cosmology to the Cradle of life. To prepare for the SKA, "Pathfinder" projects and studies are already under way around the world. The two candidate SKA sites in Australia and South Africa are already constructing pathfinder telescopes at about 1% of the SKA area. New and innovative technological developments such as phased-array feeds are also actively pursued. Details and progress of the Australian SKA Pathfinder (ASKAP) will be given. The SKA will also include baselines to at least 3000 km to achieve milliarcsecond resolution, using Very Long Baseline Interferometry (VLBI) techniques. Hence, the international VLBI community is actively developing "real-time" VLBI or e-VLBI, and this has already produced new scientific capabilities. Developments and progress in e-VLBI will be reviewed.

Tuesday 22 September 2009

The Dynamic Magnetosphere of Saturn as revealed by the Cassini Orbiter:2004-2009

Krimigis Stamatios (Academy of Athens & Johns Hopkins University)

The NASA-ESA Cassini-Huygens mission has been in orbit around Saturn since July 1, 2004 and has provided detailed observations of the Saturnian system through the present. The instrument complement includes, in addition to optical remote sensing at several wavelengths, a comprehensive set of particles and fields sensors. A principal characteristic of the Saturn system has been copious production of neutral gas from the rings and satellites that permeates the entire magnetosphere. Thus, Saturn represents a case study of interaction between gas and plasmas, probably unique in our solar system. The magnetospheres of the outer planets are primarily driven by planetary rotation more than the solar wind and include internal plasma sources from various moons and rings, in addition to those from the planetary ionospheres and the solar wind. Io's volcanic source at Jupiter is a prime example, but now Enceladus at Saturn has joined the fray, while Titan is a surprisingly minor player despite its thick nitrogen atmosphere and its continued bombardment by energetic particles. Particles are readily accelerated to high (> Mev) energies, but are also lost through charge exchange interactions with the gas. Mass loading of plasma leads to interchange instability in the inner magnetospheres of Saturn, while ionospheric slippage, among other processes, seems to contribute to a variable rotation period in the spin-aligned dipole field, manifested in auroral kilometric radiation (SKR), components of the magnetic field itself, and the plasma periodicities measured at several energies. Through use of the ENA (energetic neutral atom) technique, it is now possible to observe bulk motion of the plasma and its connection to planetary auroral processes. Such imaging at Saturn by Cassini has revealed the location of a region of post-midnight acceleration events that seem to corotate with the planet and coincide with auroral brightening and SKR. The apparent variability in the planetary-magnetospheric rotation period, ranging from 10.6 to 10.8 hours, continues to defy detailed interpretation. These and other observed dynamic phenomena will be described and discussed in the context of current models.

Structure, variation and pressure balance in the Saturnian plasma sheet: Combined plasma, energetic particle and magnetic field measurements from Cassini.

Sergis Nick (Office for Space Research, Academy of Athens)

Combined plasma, energetic particle and magnetic field measurements, obtained by the Cassini Plasma Spectrometer (CAPS), Magnetospheric Imaging Instrument (MIMI) sensors and the magnetometer (MAG) respectively, are used to reveal the Saturnian plasma sheet through nearly vertical passes of Cassini during its high-latitude orbits. Trajectories with such geometry favour the clear detection of plasma sheet boundaries, both in magnetic field and particle data. As the in-situ Cassini measurements offer complete energy coverage (eV to MeV) of the cold plasma and the energetic particle population, the computation of total plasma pressure and density is made possible. In this presentation the extent and temporal variability of the plasma sheet will be examined. We will present scale heights for the plasma and energetic particles, calculated using different model profiles and compared with the scale height of the current sheet. Selected cases and a statistical approach based on a large number of passes will also be shown. Initial results indicate that the dayside energetic plasma sheet is wide in latitude (+/- 45 deg), the lower-energy plasma sheet is thinner, and both sheets extend out to the dayside magnetopause. The plasma sheet pressure is observed to fall with radial distance, while the night side plasma sheet appears to be much thinner in both plasma and energetic particles, with a larger scale height for energetic ions (2 Rs) compared to the cold-warm plasma (1 Rs). Plasma beta is kept close to or above 1 inside the plasma sheet region, outside 8 Rs.

The Search for the Origin of Solar System

Bolton Scott (SwRI)

Previous and current planetary missions have been focused on answering the fundamental question of how the planets in our solar system formed. Astrophysics, Planetary and Heliophysics mission have all made important contributions to the understanding of the Universe and how our solar system formed. With the basic measurements of Jupiter provided by the Galileo Probe, many theories were shown to be fundamentally inconsistent, and key measurements to unravel the mystery were identified. A review of the results from these and other missions will be presented. An outline of the upcoming Juno mission to Jupiter will also be provided.

The magnetic coupling between the interior and the outer solar atmosphere.

Archontis Vasilis (University of St Andrews)

One of the most important processes, responsible for many dynamical phenomena observed in the Sun, is the emergence of magnetic flux from the solar interior in active regions and the modification of the coronal magnetic field in response to the emergence. In fact, magnetic flux emergence might be responsible for the appearance of small-scale events (e.g., compact flares, plasmoids, active-region-associated X-ray brightenings) and large-scale events (e.g., X-class flares and CMEs). However, it is clear that the question of how exactly the magnetic fields rise through the convection zone of the Sun and emerge through the photosphere and chromosphere into the corona has still not been solved. Studying the process of flux emergence is an important step towards the understanding of the dynamic coupling between the solar interior and the outer solar atmosphere. In this talk, we review the recent progress and discuss what further developments are required, to understand better this magnetic coupling in the Sun.

Multi-wavelength Observations of Solar Eruptions

Nindos Alexander (University of Ioannina)

Flares and coronal mass ejections (CMEs) are the most violent solar eruptive phenomena. A solar flare is a sudden flash of electromagnetic radiation in the solar atmosphere, and a CME is a large-scale expulsion of solar plasma into interplanetary space. In order to understand the physical processes involved and obtain a complete picture of a solar eruption, multi-wavelength coverage with good spectral, spatial, and temporal resolution is required. In this talk, I will assess how new multi-wavelength observations have changed our understanding of the basic physics of flares and CMEs and I will highlight that both phenomena appear to have their origin in restructuring of the coronal magnetic field.

On the Nature of Solar Magnetic Eruptions

Georgoulis Manolis (RCAAM / Academy of Athens)

The puzzle of solar magnetic eruptions remains essentially unsolved ever since the first solar flare observation by Lord Carrington. Point taken, our understanding of solar eruptions has been revolutionized in recent decades with the addition of two critical elements: an observational one, being coronal mass ejections (CMEs), and a theoretical one, being the concepts of magnetic energy and helicity. To the benefit of understanding, we attempt a connection between the phenomenology and the physics of eruptive solar active regions, as reflected on their magnetic energy and helicity budgets. We find that non-neutralized electric currents are a rare commodity in the solar atmosphere: they only flow in eruptive active regions. Non-neutralized electric currents give rise to strong Lorentz forces that, in turn, may give rise to the strong magnetic shear observed in eruptive active regions. The shear will

enhance both the free magnetic energy and the magnetic helicity of the subject regions although this enhancement may be small compared to the existing budgets of energy and helicity. What shear and its consequences can do, however, is trigger the eruptions, thus dissipating free energy and possibly injecting helicity in the heliosphere via CMEs. Ongoing work will have to reveal the nature of this trigger, hence achieving our ultimate objective to understand solar eruptions.

Study of a Solar Active Region Jet

Gontikakis Costis (Academy of Athens)
Archontis Vasilis (Univ. of St Andrews, UK), Tsinganos Kanaris (University of Athens)

We compare the results of a 3D MHD numerical simulation of magnetic flux emergence and its subsequent reconnection with preexisting magnetic flux for an active region jet originating from the east side of NOAA 8531 on May 15 1999. In the numerical simulation, the full compressible and resistive MHD equations are solved, including viscus and Ohmic heating, and the jet is shown to be the result of magnetic reconnection of emergent magnetic flux with a preexistent active region magnetic field. To compare with observations we used a series of TRACE 171A filtergrams, simultaneous observations from SUMER in Ne VIII 770A. and C IV 1548A. as well as MDI magnetograms. The magnetic flux emergence is the cause of the jet as is confirmed by the presence of new magnetic flux during the jet onset in MDI magnetograms. The jet is present in temperatures between 100 000 K, in C IV 1548A and 10^6~K in 171 filtergrams. The full jet velocity has been computed using TRACE 171 proper motions and Ne VIII 770A., Doppler shifts, indicating upflows of ~120 km/s. The jet upward velocities in C IV 1548A are smaller, of the order of 10 - 20 km/s. The MHD numerical simulation is in agreement with several measurements of the jet morphology, plasma velocity and temperature.

Particle acceleration process through reconnecting current sheets

Anastasiadis Anastasios (National Observatory of Athens / ISARS)
Gontikakis Costis (Academy of Athens), Efthymiopoulos Christos (Academy of Athens)

Charged particles (electrons and protons) acceleration inside solar reconnecting current sheets is investigated using numerical and analytical methods. The kinetic energy gain of particles traveling through a single Harris type reconnecting current sheet follows a simple analytical law. Particles interacting consecutively with a number of reconnecting current sheets have a limited kinetic energy gain as it is found through numerical experiments and explained with analytical theory. Finally, the computation of X-ray spectra by a `thick target' model is given for the produced kinetic energy distributions.

The Hot Plasma Composition Analyzer for the Magnetospheric Multiscale Mission

Young, D.T.[1], Pollock, C.J.[1], Burch, J. L.[1], de Los Santos, A.[1], Miller, G. P.[1], Fuselier, S. A.[2], Hertzberg, E.[2], Trattner, K.[2], Paschalidis, N.[3], Donald, E.[3], Jacques, A.[3]

1) Space Science and Engineering Division, Southwest Research Institute, 2) Lockheed Martin Advanced Technology Center, 3) Space Department, The Johns Hopkins University / Applied Physics Laboratory

This talk presents an overview of the hot plasma composition analyzer (HPCA) investigation for the NASA Magnetospheric Multiscale Mission. The HPCA is based on a toroidal top-hat energy-angle analyzer coupled to a time-of-flight mass analyzer based on the carbon foil technique. Using analytical methods we optimized the HPCA for transmission, dynamic range and mass resolution sufficient to measure and resolve all relevant major ion species (H+, He++, He+ and O+) found in the solar wind and Earth's magnetosphere. The design takes

into consideration optimum matching of energy-angle and time-of-flight analyzers. Dynamic range issues are addressed in a novel way using a radio-frequency waveform applied to the energy analyzer. We have obtained improved ion mass resolution compared to earlier instruments of this type by spatially resolving scattered ions and neutrals exiting the carbon foil of the time-of-flight (TOF) analyzer and using that information to correct the TOF spectrum. Development of the HPCA is led by the Southwest Research Institute.

Temporal Evolution of Energetic Electron Precipitation as a Promisin tool for Earthquake prediction research: Analysis of Demeter Observations

Anagnostopoulos George (University of Thrace)

In this study we present spatial and temporal correlation results of energetic (70 – 2500 keV) electron bursts (EBs) detected by the DEMETER spacecraft (~700 km alt.) before some great (M>7) Earthquakes (EQs) at middle latitudes. These EBs were found to show a characteristic flux-time profile, time duration and energy spectrum and are associated with VLF activity. The main finding of this study is a characteristic pattern of the temporal distribution of the daily number of EBs that shows an increasing at the first phase (which starts ~2-4 weeks before the EQ), and a decreasing in the second phase, that reaches a local minimum around the occurrence time of the EQ; the minimum lasted ~1 day around the time of the EQs examined. This temporal evolution pattern allows the determination of a first signal a long time before a possible intense seismic event and a sort time signal of the coming EQ. The statistical analysis of EBs of this type confirms a strong correlation between the number of EBs observed near the EQ epicenter (+/- 25o) and all over the globe, suggesting a useful tool even for distant EQs from the detection point as well. Various constraints of the EBs which are probably related with intense EQs are also discussed.

From SAURON to ATLAS3D: towards a paradigm shift for early-type galaxies?

Emsellem Eric (ESO, Garching)

Early-type galaxies are among the most powerful probes at low redshift of the hierarchical mass assembly of galaxies. Indeed, these galaxies are those that probably had the most violent history even at moderate redshifts, with the highest frequency of galaxy mergers that shaped their morphology and kinematics. A number of baryonic substructures in early type galaxies are thus fossil records of their formation history. These range from decoupled central cores to larger-scale structures in the outer regions. The SAURON survey has then provided strong hints that our view on nearby early-type galaxies was simplistic. Integral-field spectroscopy of a representative sample of targets revealed a wealth of dynamical structures, linked with complex formation and evolution processes. It was found that early-type galaxies came in two broad flavors, the so-called slow- and fast-rotators, the former tending on average to be more massive and having kinematically decoupled cores and/or velocity twists, the latter exhibiting regular kinematics. Extensive dynamical modeling confirmed and extended that result to detail the orbital make-up of these two families. The ATLAS3D project now combines a unique dataset probing a complete sample of nearby early-type galaxies, including multi-band photometry, integral-field spectroscopy, radio and sub-millimeter observations but also state-of-the-art numerical simulations and modeling. In this context, I will review the past results as well as the recent output from ATLAS3D, which may ultimately trigger a paradigm shift for early-type galaxies.

Wednesday 23 September 2009

Modelling the origin of jets from young stars

Cabrit Sylvie (Observatoire de Paris)

Jets are found in a wide range of accreting young stars, from brown dwarfs to intermediate mass stars. They may play a crucial role in solving the angular momentum problem of star formation. However, their exact launch region and launch mechanism remain enigmatic. I will review the main observational constraints gleaned recently in young low-mass stars on the jet origin, including jet widths, kinematics along and across the jet, possible rotation signatures, ejection/accretion ratio, and molecular counterparts. These will be confronted with the predictions of various jet models, in particular for MHD winds ejected from the disk surface. New perspectives opened by the ALMA interferometer will be discussed.

Integral field spectroscopy of protoplanetary disks in Orion with VLT FLAMES

Tsamis Yiannis (IAA-CSIC Granada)

We shall present new results from our deep optical spectral mapping of M42 proplyds secured with the VLT FLAMES Argus integral field unit combined with UV and optical spectroscopy from the HST Faint Object Spectrograph. Proplyds are partially ionized low-mass star forming clouds immersed in the strong radiation field of the Trapezium cluster. They represent a unique nearby environment for the study of low mass embedded young stellar objects in a region dominated by higher mass main sequence stars. Our investigation allows us to determine the chemical composition of their photoionized surfaces, and to derive plasma temperatures and densities, in fields of view that encompass the whole YSO and its immediate M42 surroundings with 300 spectra per position. The high spatial resolution of 0.3 arcsec per pixel can help us to study the small-scale mixing (milli-parsec scales) of the proplyd photoevaporated outflows with the local ISM.

Time variability in two-component protostellar jets, a numerical study

Matsakos Titos (University of Athens)

Recent advances in theory, simulations and observations of young stellar object jets point towards the two-component outflow scenario. In particular, a disk wind component, necessary to explain the observed high mass loss rates, surrounds and collimates a stellar wind component, which is probably associated with the observed stellar spin down. In this context, we set as initial conditions a combination of two analytical outflow solutions, properly derived to describe the launching and propagation properties of each region. We perform numerical simulations for several sets of the temporal and spatial parameters, studying the dynamics and stability of the system as well as other evolutionary features. We find that the knot-like large scale structure produced due to the enforced time variability has significant similarities with observed jet variability.

Spitzer spectral line mapping of the HH211 outflow

Dionatos Odysseas (UoA / INAF-OAR)

Protostellar jets are believed to play an important role in removing angular momentum from the circumstellar disk, allowing accretion onto the central engine. Class 0 jets are often detected only at mm wavelengths, with molecular tracers such as CO and SiO. However, it is not clear if such jets are intrinsically molecular or if they represent only the cold external layer of an embedded atomic jet. We have used the low resolution Spitzer IRS modules (spectral range between 5.2 and 38 micron) to construct spectral line maps of the HH211-mm outflow. We have detected and mapped the S(0) - S(7) pure rotational lines of molecular

hydrogen as well as fine-structure lines of [FeII], [SiII] and [SI]. The detection of atomic and ionic lines very close to the driving source indicate the presence of an embedded atomic jet at low excitation conditions. The mid-IR molecular and atomic lines are interpreted by means of emission line diagnostics and an extensive shock model grid which includes chemical reactions, in order to derive the excitation conditions of the shocked gas. The physical properties of the warm gas are compared against the other molecular jet tracers (CO, SiO), and confronted with the results of a similar study towards the L1448-C outflow.

The formation of low-mass stars and brown dwarfs

Stamatellos Dimitris (Cardiff University)
Whitworth Anthony (Cardiff University)

Stars form with masses from a few Mjupiter to a few hundreds of Msun, with the most typical star having mass of about 1 Msun. I will review the main formation mechanisms of low-mass objects (low-mass hydrogen burning stars, brown dwarfs and planetary-mass objects), namely the gravo-turbulent fragmentation theory, the embryo-ejection scenario, and the disc fragmentation model. I will focus on the mechanism of fragmentation of discs around Sun-like stars, present the predictions of this model, and compare these predictions with the observed properties of low-mass stars and brown dwarfs. In particular, I will show that the model of disc fragmentation can explain the binary properties of low-mass stars and brown dwarfs, the brown dwarf desert, and the existence of free-floating planetary-mass objects. I will also discuss predictions of the model that can be tested by future observations.

A multi-wavelength study of the W3 Giant Molecular Cloud

Polychroni Danae (Astrophysics Research Institute LJMU)
Moore Toby (Astrophysics Research Institute LJMU), Allsopp James (Astrophysics Research Institute LJMU)

We present the latest results from our multi-wavelength study of the W3 Giant molecular cloud, mapped in the IR with the Spitzer Space Telescope and in the sub-mm with HARP-B and SCUBA on the JCMT. We make a comparative study of the star formation across the triggered and spontaneous regions clearly defined in the cloud. We have, for the first time, constructed a temperature map of the star forming regions in W3 GMC that shows a clear temperature gradient across the cloud, indicative of a age sequence. We have also identified the SCUBA cores across the cloud with an IR counterpart and measured the ratio of starless cores to cores with an IR counterpart in the different star forming regions of the cloud. We find no significant difference between the triggered and spontaneous regions of W3. Using the photometry classification of these objects we find, again, an age sequence across the different star forming regions of W3 GMC and we describe the sequence of the triggered star formation in the cloud. We also fit models to the identified objects' SEDs and measure the luminosity function of the spontaneous and triggered regions in the cloud. We find that while very luminous objects exist only in the triggered regions of W3, the two regions have the same underlying luminosity distribution.

Jets from Compact X-ray Sources

Kylafis Nikos (University of Crete)

Jets have been observed from both neutron stars and black holes in binary X-ray sources. The neutron star jets are typically about 30 times weaker than the black-hole ones. Thus, the second have been studied more extensively. Contrary to common belief, jets from compact X-ray sources are not simply "fireworks" that emit radio waves. I will demonstrate that they play a central role in the observed phenomena in both neutron-star and black-hole systems. In particular, for black-hole jets, a simple jet model can explain the very stringent correlations that have been found between the power-law X-ray spectrum and a) the time lag between hard and soft X-rays and b) the characteristic frequencies observed in the power spectra. Up to now, no other model has even attempted to explain these correlations. I will present the weaknesses of the model and the improvements that need to be done to it.

Magnetic activity on CV secondaries: Nature or Nurture?

Kafka Stella (Caltech/DTM)

Chromspheric Activity on the mass-losing secondary star in cataclysmic variables (CVs) is commonly invoked to explain sustained mass transfer caused by system angular momentum loss via a magnetized stellar wind. Such activity may also be responsible for the CV period gap, and for the widely differing mass transfer rates among CVs at the same orbital period. We present a spectroscopic monitoring campaign of magnetic CVs at times of reduced accretion, where unusual components in the H-alpha line reveal magnetically confined gas motions in large, long-lived loop prominence-like structures on the donor star. We discuss possible mechanisms leading to those structures which will lead to a new paradigm on magnetic activity in CVs.

The 3D structure of the Pulsar Magnetosphere

Contopoulos Ioannis (Academy of Athens)
Kalapotharakos Constantinos (Academy of Athens)

We present the three-dimensional structure of the pulsar magnetosphere obtained through time-dependent numerical simulations of a magnetic dipole that is set in rotation. Our Eulerian finite difference time domain numerical solver of force-free electrodynamics implements the technique of non-reflecting and absorbing outer boundaries. This allows us to follow the evolution of the magnetosphere for several stellar rotations, and thus obtain a steady corotating pattern, in agreement with previous numerical solutions. We propose a simple physical picture where coherent radio emission is produced along the separatrix between closed and open field lines, along the light cylinder and beyond.

Pulsed thermal emission from the accreting pulsar XMMU J054134.7-682550

Manousakis Antonis (ISDC Data Center for Astrophysics)
Walter Roland (ISDC), Audard Marc (ISDC), Lanz Thierry (University of Maryland)

Soft X-ray excesses have been detected in several Be/X-ray binaries and interpreted as the signature of hard X-ray reprocessing in the inner accretion disk. The system XMMU J054134.7-682550, located in the LMC, featured a giant Type II outburst in August 2007. The geometry of this system can be understood by studying the response of the soft excess emission to the hard X-ray pulses. We have analyzed series of simultaneous observations obtained with XMM-Newton/EPIC-MOS and RXTE/PCA in order to derive spectral and temporal characteristics of the system, before, during and after the giant outburst. Spectral fits were performed and a timing analysis has been carried out. Spectral variability, spin period evolution and energy dependent pulse shapes are analysed. The outburst ({L}_X= 3x 1038 erg/s? {L}_EDD) spectrum could be modeled successfully using a cutoff powerlaw, a cold disk emission, a hot blackbody, and a cyclotron absorption line. The magnetic field and magnetospheric radius could be constrained. The thickness of the inner accretion disk is broadened to a width of 75 km. The hot blackbody component features sinusoidal modulations indicating that the bulk of the hard X-ray emission is emitted preferentially along the magnetic equator. The spin period of the pulsar decreased very significantly during the outburst. This is consistent with a variety of neutron star equations of state and indicates a very high accretion rate.

The Nature and Origin of Hypervelocity Stars

Bonanos Alceste (STScI & NOA/IAA)

Hypervelocity stars (HVSs) are a newly discovered class of objects, with velocities that are high enough to be escaping their host galaxies. The early B-type hypervelocity star HE 0437-5439 was serendipitously discovered in 2005. Its young age and distance render a Galactic origin of this star problematic, with a merged blue straggler scenario or an origin in the Large

Magellanic Cloud being the only possible explanations. We measured half-solar metallicity from high resolution spectroscopy, establishing the origin of HE 0437-5439 in the LMC. This result implies the existence of a massive black hole somewhere in this galaxy. We have further obtained high resolution spectroscopy of other HVSs to measure their projected rotational velocities and test the Hills scenario, which predicts an origin in a binary system around the supermassive black hole in the Galactic Center. We find several HVSs to be fast rotators, in contrast to the prediction of Hansen.

Heliospheric Imaging with STEREO: The Crucial Link Between In-situ and Imaging Observations of the Sun and the Heliosphere

Vourlidas Angelos (Naval Research Lab)

The launch and operation of heliospheric imagers in the Coriolis and STEREO missions has ushered a new area of research in heliophysics: heliospheric imaging. This new capability allows for the first time a direct link between remote imaging observations of the Sun and the inner corona to in-situ, single point observations at Earth and other planets. In this talk, I will demonstrate how heliospheric imaging is leading to breakthroughs in understanding the evolution of coronal mass ejections and corotating interaction regions and is improving Space Weather forecasting techniques.

STEREO Observations Determine the Nature of EUV Waves

Patsourakos Spiros (University of Ioannina)
Vourlidas Angelos (NRL)

The nature of CME-associated low corona propagating disturbances, 'EUV waves', has been controversial since their discovery by EIT on SOHO. These waves, a type of solar tsunamis, travel at speeds of several hundred km/s and can cover most of the Sun's surface in a matter of an hour The low cadence, single viewpoint EUV images and the lack of simultaneous inner corona white light observations has hindered the resolution of the debate on whether they were true waves or just projections of the expanding CME. The operation of the twin EUV Imagers and inner corona coronagraphs aboard STEREO has improved the situation dramatically. Since early 2009, the STEREO Ahead (STA) and Behind (STB) spacecraft are observing the Sun in quadrature having an 90 degree angular separation. An EUV wave and CME erupted from active region 11012, on February 13, when the region was exactly at the limb for STA and hence at disk center for STB. The STEREO observations capture the development of a CME and its accompanying EUV wave not only with high cadence but also in quadrature. The resulting unprecentented dataset allowed us to separate the CME structures from the EUV wave signatures and to determine without doubt the true nature of the wave; it is a fast-mode MHD wave after all!

Investigating magnetospheric dynamics using various complexity measures

Balasis Georgios (National Observatory of Athens / ISARS)
Daglis Ioannis A. (National Observatory of Athens), Papadimitriou Constantinos (University of Athens), Kalimeri Maria (University of Athens), Anastasiadis Anastasios (National Observatory of Athens), Eftaxias Konstantinos (University of Athens)

The complex system of the Earth's magnetosphere corresponds to an open spatially extended nonequilibrium (input - output) dynamical system. The non-extensive Tsallis entropy has been recently introduced (Balasis et al., 2008) as an appropriate information measure to investigate dynamical complexity in the magnetosphere. The method has been employed for analyzing Dst time series and gave promissing results, detecting the complexity dissimilarity among different physiological and pathological magnetospheric states (i.e., pre-storm activity and intense magnetic storms, respectively). This paper explores the applicability and effectiveness of a variety of computable entropy measures (e.g. Block entropy, Kolmogorov entropy, T-

complexity and Approximate entropy) to the investigation of dynamical complexity in the magnetosphere. We show that as the magnetic storm approaches there is clear evidence of significant lower complexity in the magnetosphere. The observed higher degree of organization of the system agrees with that inferred previously (Balasis et al., 2006), from an independent linear fractal spectral analysis based on wavelet transforms. This convergence between nonlinear and linear analyses provides a more reliable detection of the transition from the quiet-time to the storm-time magnetosphere, thus showing evidence that the occurrence of an intense magnetic storm is imminent. More precisely, we claim that our results suggest an important principle: significant complexity decrease and accession of persistency in Dst time series can be confirmed as the magnetic storm approaches, which can be used as diagnostic tools for the magnetospheric injury (global instability). Overall, Approximate entropy and Tsallis entropy yield superior results for detecting dynamical complexity changes in the magnetosphere in comparison to the other entropy measures presented herein. Ultimately, the analysis tools developed in the course of this study for the treatment of Dst index can provide convenience for space weather applications.

Establishing and Using the real-time Neutron Monitor Database (NMDB)

Papaioannou Athanasios (University of Athens)
Mavromichalaki Helen (University of Athens), Gerontidou Maria (University of Athens), Mariatos George (University of Athens), Papailiou Maria (University of Athens), Plainaki Christina (University of Athens), Sarlanis Christos (University of Athens), Souvatzoglou George (University of Athens)

The worldwide network of standardized neutron monitors is, after 50 years, still the state-of-the-art instrumentation to measure variations of the primary cosmic rays. These measurements are an ideal complement to space based cosmic ray measurements. Unlike data from satellite experiments neutron monitor data has never been available in high resolution from many stations in real-time. The data is often only available from the individual stations website, in varying formats, and not in real-time. To overcome this deficit, the European Commission is supporting the Neutron Monitor database (NMDB) (www.nmdb.eu) as an e-Infrastructures project in the Seventh Framework Programme in the Capacities section. The prospective goal of the network is to make the receiving of all data (either with 1 min resolution or with 1 hour resolution) in real time from all servers around Europe possible. This system has been designed with the capability to support a large number of stations and therefore the upgrade of the system is rather flexible. It is important to outline that the designed collection system has the ability to provide reliable data, based on the issue that all participating stations have been standardized at a common recording format. At this point, the database has been fulfilled together with user tools and applications. The first and most important application was the establishment of an Alert signal when dangerous solar particle events (SPEs) are heading to the Earth, resulting into a Ground Level Enhancement (GLE) registered by NMs. As a sequence, the mapping of all GLE features in near real-time mode which provides an over all picture of this phenomenon and is being used as an input for the calculation of the ionization of the atmosphere, was made possible. The latter calculations are useful for radiation dose calculations within the atmosphere at several altitudes and will reveal the absorbed doses during flights. Athens Cosmic Ray Group was responsible for the upgrade and standardization of all participating stations as well as, for the design and implementation of a novel affordable registration system. Moreover, the software of GLE Alert and the Neutron Monitor Basic Anisotropic Ground Level Enhancement (NM-BANGLE) one, originating from the Athens Group, was customized into NMDB necessities. In this work, a description of the project, its goals and achievements together with its usefulness for potential users, studying the Sun and Interplanetary Medium is presented.

Electron Density and Temperature in the Inner Magnetosphere of Saturn from Quasi Therman Noise Spectroscopy:Cassini/RPWS

Gkini Magda Evgenia (Observatoire de Paris)
Moncuquet Michel (Observatoire de Paris/LESIA), Meyer-Vernet Nicole (Observatoire de Paris/LESIA)

On July 2004, the Cassini spacecraft performed its Saturn orbit insertion (SOI). Since then and for 6 years Cassini will orbit the planet more than 134 times with various periapsis (so called perikrones) and inclinations. This work is interested in the closest approaches of Saturn by Cassini, i.e. the trajectory part located around the perikrones, typically between 3.5Rs and 9Rs. Around each of these perikrones, the radio-HF receiver of RPWS observed a peak at the upper-hybrid frequency and weakly banded emissions having well-defined minima at the gyroharmonics. We have studied these spectra by using the technique of Quasi-Thermal Noise spectroscopy (QTN) in magnetized plasmas and we deduced the electron density, the core and the halo temperatures in the inner magnetosphere of Saturn. We present the results for 20 perikrones, which took place during the period 02/2005-02/2008. We show the dependence of those parameters on the distance from the planet and on the inclination related to the ring plane. From the latter we will be able to have a clear view of the large scale structure of the plasma torus in this region of Saturn's magnetosphere (embedded in the dusty ring E), which is badly known, especially because it is very cold (typically a few eV for the core electrons) and thus hardly accessible to particle analyzers.

The South American Meridional B-field Array (SAMBA) and opportunities for inter-hemispheric studies

Zesta Eftyhia (AFRL)
Boudouridis Athanasios (UCLA), Moldwin Mark (UCLA), Weygand James (UCLA), Chi Peter (UCLA), Daglis Ioannis (NOA / ISARS), Georgiou Marina (NOA / ISARS)

The Antarctic continent, the only landmass in the southern polar region, offers the unique opportunity for observations that geomagnetically range from polar latitudes to well into the inner magnetosphere, thus enabling conjugate observations in a wide range of geomagnetic latitudes. The SAMBA (South American Meridional B-field Array) chain is a meridional chain of 12 magnetometers, 11 of them at L=1.1 to L=2.5 along the coast of Chile and in the Antarctica peninsula, and one auroral station along the same meridian. SAMBA is ideal for low and mid-latitude studies of geophysical events and ULF waves. It is conjugate to the northern hemisphere MEASURE and McMAC chains, offering unique opportunities for inter-hemispheric studies. We use 5 of the SAMBA stations and a number of conjugate stations from the Northern hemisphere to determine the field line resonance (FLR) frequency of closely spaced flux tubes in the inner magnetosphere. Standard inversion techniques are used to derive the equatorial mass density of these flux tubes from the FLRs. From our conjugate pairs we find, surprisingly, that the derived mass density of closely spaced flux tubes, from L=1.6 to L=2.5, drops at a rate that cannot be predicted by any of the existing models or agree with past observations. We also study asymmetries in the power of Pc3 waves. We find that during northern summer solstice the waves are significantly stronger at the northern conjugate point, while during northern winter solstice the wave power is comparable over both conjugate points. Finally, using the SAMBA auroral station, WSD, along with all available southern auroral stations we calculate a southern AE index and its direct conjugate northern AE index and compare both with the standard AE index. We explore under what conditions the north-south asymmetries in the AE calculation are due to the significant gap of auroral stations in the Southern hemisphere and under what conditions the asymmetries have a geophysical source.

Algorithmic comparisons of decaying, isothermal, compressible turbulence

Kitsionas Spyridon (HAEF - Psychico College)

Simulations of astrophysical turbulence have reached a level of sophistication that quantitative results are now starting to emerge. Contradicting results have been reported, however, in the literature with respect to the performance of the numerical techniques employed for its study and their relevance to the physical systems modelled. We aim at characterising the performance of a number of hydrodynamics codes on the modelling of turbulence decay. This is the first such large-scale comparison ever conducted. We have driven compressible, supersonic, isothermal turbulence with GADGET and then let it decay in the absence of gravity, using a number of grid (ENZO, FLASH, TVD, ZEUS) and SPH codes (GADGET, VINE, PHANTOM). We have analysed the results of our numerical experiments using a variety of statistical measures ranging from energy spectrum functions (power spectra), to velocity structure functions, to probability distribution functions. In the low numerical resolution employed here the performance of the various codes is comparable. In more detail, our analysis indicates that the numerical techniques used can be sorted from least to most dissipative as follows: ENZO-FLASH; TVD; ZEUS-SPH codes. Use of the Morris & Monaghan viscosity implementation for SPH results in less dissipation. We have shown that the density- weighted power spectrum is a more robust statistical measure for the study of compressible turbulence. Here we have adopted the (\rho/\rho_0)^{1/2} velocity weights which provide physical reference to kinetic energy.

Inversed Semi-Detached Binaries: A new type of binary systems?

Tsantilas Sotirios (University of Athens)
Livaniou-Rovithis Helen (University of Athens)

The inclusion of the radiation pressure effect in the classical Roche model can lead to a number of different geometrical configurations. It has been also shown that this is a possible situation in a binary system that contains at least one component of early spectral type where the effect is stronger. Here, we focus to the case of the outer contact configuration at the Langragian point L2. This corresponds to a new type of binaries, which we call Inversed Semi-Detached (ISD) binaries, in contrast to the classical S-D systems with contact at L1. Furthermore, we present the implications of the action of radiation pressure to the system from geometrical, dynamical and evolutional point of view. We also present and analyze a sample of possible candidates for this new type of binary systems.

Suzaku Analysis of Galactic Supernova Remnants G27.4+0.0 and G12.0-0.1

Sezer Aytap (TUBITAK Space Technologies Research Institute)

In this work, we present Suzaku analysis results of SNRs G27.4+0.0 and G12.0-0.1. X-ray morphologies of both SNR are studied by imaging analysis. In order to address metal abundance distributions we applied true-color imaging. Spectral imaging is used for defining important parameters like galactic hydrogen column density (NH), electron temperature (kTe), ionization timescale (net), and metal abundances of individual elements.

Modelling the Bar component in dusty spiral galaxies

Akras Stavros (National Observatory of Athens / IAA)

We investigate the effect of a stellar bar component in the shape of the galaxy by using a 3D radiative transfer model of spiral galaxies. The basic characteristics of a stellar bar component such as the central X-shape feature and the boxy/peanut shape of the bulge are well described by our model. With this tool we perform diagnostic studies of how the shape of the galaxy changes with various geometrical parameters such as inclination and position

angle. Finally, we apply our model to typical spiral galaxies (like our own Galaxy) and derive the best set of the parameters that describe the stellar bar.

Modelling the distribution of various objects in the Magellanic Clouds for Gaia

Belcheva Maya (University of Athens)

Gaia is an ESA mission expected to chart a three-dimensional map of our Milky Way galaxy, in the process revealing the composition, formation and evolution of the Galaxy. Gaia will resolve in stars nearby galaxies. The main goal of our project is to obtain the spatial distribution of different stellar components in these galaxies. The Magellanic Clouds, being the nearest neighbours of our Galaxy, are the most important targets with a large number of observed stars. In order to obtain their spatial distribution already existing catalogues are used, which are homogeneous, have a good coverage of the galaxies, and are deep enough. Such are "The Magellanic Clouds Photometric Survey", 2MASS, "SuperCosmos Sky Survey", etc. The spatial distribution of different Magellanic Clouds' populations is studied using isopleth maps and radial densty profiles. Preliminary results are now available. Exponential disk and King profiles seem to fit the spatial distribution of the various stellar populations very well. The distribution of the older populations follows the King law. The younger population, on the other hand, behaves like an exponential disk.

Stickiness

Contopoulos George (Academy of Athens)

Stickiness is a temporary confinement of orbits in a particular region of the phase space before they diffuse in a larger region. In a system of 2 degrees of freedom there are two main types of stickiness (a) stickiness around an island of stability, which is surrounded by cantori with small holes, and (b) stickiness close to the unstable asymptotic curves of unstable periodic orbits, that extend to large distances in the chaotic sea. We consider various factors that affect the time scale of stickiness around an island of stability. The size of an island varies in characteristic ways as the perturbation increases. Then we find the stickiness times along the asymptotic curves. An important application of stickiness is in the outer spiral arms of strong barred galaxies. These spiral arms consist mainly of chaotic orbits. Such orbits may escape to large distances, or to infinity, but because of stickiness they support the spiral arms for very long times.

Neutron Star Dynamics & Gravitational Waves

Kokkotas Kostas (University of Thessaloniki/Tuebingen)

We will present a review of the recent developments in the dynamics of compact objects in relation to the emission of gravitational waves. Especially, we will discuss rotational instabilities of compact objects as well as the dynamics of strongly magnetized neutron stars (magnetars).

Coevolution of Galaxies & Supermassive Black Holes: A Key to Fundamental Physics and Galaxy Formation

Kazantzidis Stelios (The Ohio State University)

In recent years, compelling dynamical evidence has indicated that supermassive black holes (SMBHs) are ubiquitous in galactic nuclei. According to the currently favored cold dark matter cosmological model, structures in the Universe grow through a complex process of continuous mergers and accretion of smaller systems. Thus, the hierarchical buildup of SMBHs by massive seed black holes present at the center of protogalaxies and the formation of SMBH binaries appear as natural consequences in any hierarchical cosmogony. Upcoming gravitational wave

detection experiments such as the Laser Interferometer Space Antenna will be able to detect emission from coalescing SMBH binaries essentially to the edge of the observable Universe and provide a test of General Relativity as well as constraints on galaxy formation theories. The available observational data also reveal the existence of a remarkably tight correlation between the mass of the SMBH and the stellar velocity dispersion of the host galaxy spheroid, suggesting a fundamental connection between the growth of SMBHs and the assembly of galaxies. Numerical simulations constitute the most powerful tool for elucidating these issues. In this talk, I will investigate the coevolution of SMBHs and their host galaxies using high-resolution supercomputer simulations of galaxy mergers. Utilizing these results I will emphasize the importance of SMBHs in advancing our understanding of fundamental physics and the processes of galaxy formation and evolution.

Chaotic dynamics in galaxies

Efthymiopoulos Christos (RCAAM / Academy of Athens)

The implications of chaotic dynamics for the structure and evolution of galaxies will be reviewed, focusing on two characteristic examples: i) elliptical galaxies with steep central density profiles (or central black holes), and ii) spiral structure in barred galaxies.

The Copenhagen case when the small body is a gyrostat

Kalvouridis Tilemahos (National Technical University of Athens)

Problems with gyrostats have been studied in the past, particularly during the last decades. These problems are extremely interesting, since most of the artificial satellites and spacecrafts have mobile parts such as rotating antennas, photovoltaic panels or mechanical articulated arms, etc. and can therefore be presumed as gyrostatic bodies. On the other hand, a special case of the old and famous restricted three-body problem is the Copenhagen configuration where the two dominant masses are equal. This case lately gains a new scientific interest after the discovery of many exo-solar planetary systems the majority of which consists of two members. The recent estimations about the masses of the partners in such system show, that, in many cases, can roughly be considered equal. Here we consider a small gyrostat S moving in the Newtonian field of two big spherical and homogeneous bodies P1 and P2 of equal masses m that rotate about their center of mass with constant angular velocity ?. The much smaller body S of mass m0, does not affect the motion of the primaries and has a gyrostatic structure. As we know, a gyrostat consists of two parts: a rigid part called the platform or carrier and n other parts, the rotors, which are connected to the platform. Each rotor is spinning independently about an axis fixed on the platform and its motion does not modify the mass distribution of the gyrostat. The platform may rotate about an inertial reference frame, so that a gyrostat is generally characterized by n+1 angular velocities, n of which, are the angular velocities of the spinning rotors relative to the platform. Sometimes, in the relevant literature, a gyrostat is also referred to as a 'dual-spin' body. Hereunder we shall examine gyrostats with only one rotor. In this presentation, the gyrostat's equations of motion are derived and classes of its stationary solutions as well as, their stability are studied.

Area spectrum of rotating black holes and the new interpretation of QNMs

Vagenas Elias (RCAAM, Academy of Athens)

Motivated by the recent work on a new physical interpretation of quasinormal modes by Maggiore, we utilize this new proposal to the interesting case of Kerr black hole. In particular, by modifying Hod's idea, the resulting black hole horizon area is quantized and the resulting area quantum is in full agreement with Bekenstein's result. Furthermore, in an attempt to show that the area spectrum is equally spaced, we follow Kunstatter's method. We propose a new interpretation as a result of Maggiore's idea, for the frequency that appears in the adiabatic invariant of a black hole.

High presicion millisecond pulsar timing with the EPTA

Lazaridis Kosmas (Max-Planck-Institut für Radioastronomie)

The European Pulsar Timing Array (EPTA) network is collaboration between the five largest radio telescopes in Europe aiming to study the astrophysics of millisecond pulsars and to detect cosmological gravitational waves in the nano-Hertz regime. The advantages and techniques of handling the multi-telescope data sets of a number of sources will be presented. In addition, the results of the EPTA timing analysis of the pulsar-white dwarf binary PSR J1012+5307 will be reported. Specifically, the measurements for the first time for this system, of the parallax, the variation of the projected semi-major axis and of the orbital period. Finally, the derived stringent, theory independent limits on alternative theories of gravity, with the use of this ideal laboratory for strong-field gravity tests, will be presented.

Thursday 24 September 2009

Ancient Greek Technology

Tassios Theodosios (National Technical Univ. of Athens)

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A new model of the Antikythera Mechanism

Seiradakis John (University of Thessaloniki)
Efstathiou Kyriakos (Aristotle University, Thessaloniki), Zacharopoulou Theodora (Aristotle University, Thessaloniki), Anastasiou Magdalene (Aristotle University, Thessaloniki)

A new accurate model of the Antikythera Mechanism has been built at the Aristotle University of Thessaloniki. The model complies with the current published knowledge of the Mechanism and is based on precise measurements of the fragments of the ancient astronomical device. We believe that it is the most accurate model that has been built until now, incorporating features that have not been included up to now in previous models. Not only has the gearing system of the ancient device been reproduced, the new model bears all the hitherto known inscriptions in their original size and style. Modern automation techniques were used whenever possible, so that future copies of the new model could be replicated using standard manufacturing processes. Furthermore the model can be easily evolved as new knowledge about the Mechanism is accumulated. During the design and fabrication stages, the subtleties of the original device were studied in detail, revealing the precision of the construction and the advanced technological capabilities of ancient Greeks.

Ancient astronomical monuments of Athens

Manimanis Vassilios & Theodossiou Efstratios (University of Athens)

In this work, four ancient monuments of astronomical significance found in Athens and still kept in the same city in good condition are presented. The first one is the conical sundial on the southern slope of the Acropolis, over the Dionysus Theater. The second one is the Tower of the Winds and its vertical sundials. This Tower, still standing in the Roman Forum (Agora) of Athens, is a small octagonal marble tower built circa 50 B.C. by Andronicus Kyrrhestos. On the upper part of its sides there are carved lines, which indicated the hours of the day using the shadow of iron rods. Moreover, inside the tower there was a water clock to show the time when there was no sunlight. Today, along with the lines of the 8 sundials, the tower hosts remains of the water clock and its reservoir. The third monument-instrument is the ancient clepsydra of ?thens, one of the findings from the Ancient Agora (Forum) of Athens, a unique water clock dated from 400 B.C., which is displayed at the Museum of the Ancient Roman Agora. Finally, the fourth monument is the carved ancient athenian calendar over the main entrance of the small Byzantine temple of the 8th Century, St. Eleftherios, located to the south of the temple of the Annunciation of Virgin Mary, the modern Cathedral of the city of Athens.

Vicentios Damodos: The Man and the Telescope.

Solomos Nikolaos (Hellenic Naval Academy / R.F.K "EUDOXOS")

An account of the advent of the new 0.51m telescope "Vikendios Damodos" recently installed in the Ainos Astronomy Base of the National Observatory of Education "EUDOXOS" in Kefalinia, will be presented from the historical and educational point of view.

Astronomical Concepts and Events Awareness for Young Children

Kallery-Vlahos Maria (University of Thessaloniki)

In the present study we test the effectiveness of a teaching intervention aiming at acquainting children aged 4-6 with the concept of the sphericity of the earth and the causes of the phenomenon of day and night. The treatment comprised three units of activities that were developed collaboratively by a researcher and early-years' teachers employing action research processes. In the present study student knowledge is considered context-specific. The selected approach to learning can be characterized as socially constructed. In the activities, children were presented with appropriate information along with conceptual tools, such as a globe and an instructional video. The activities were implemented in a sample of 104 children of the above age group. Children's learning outcomes were assessed two weeks after the activities. Assessment tasks comprised children's construction and handling of concrete 3-D material models, children's use of pictures and of the globe and children's verbal explanations. Results revealed awareness of the concepts and events that the activities dealt with in high percentages of children, children's storage of new knowledge in the long-term memory and easy retrieval from it, and children's enthusiasm for the subject. The outcomes suggest that the approach adopted in the present study is fruitful and promising for helping very young children develop their understanding of fundamental astronomical concepts and events considered difficult for their age and for raising their motivation for astronomy. The approach used in the present study could also find application in other areas of science.

Astronomy Education: a challenge for contemporary Education

Metaxa Margarita (Filekpaideutiki Etaireia)

At the heart of the educational crisis lies the problem of unmotivated students. Astronomy is a scientific field that correlates: local and global, science and philosophy, culture with history and myth, natural environment and artificial environment. It´s obvious that through Astronomy Education we can approach the world as a network of messages, multiplicity, time, and ecology. Additionally to the above, the mystery of the night sky enjoys significant penetration into the young students, and the general public. These facts indicate that Astronomy Education is an ideal part of Contemporary Education and can certainly contribute to the development of the future citizens´ knowledge, sensitivity, imagination and understanding of their relationship with the physical, and human environment. In this paper we will discuss examples/best practices on how Astronomy Education can encourage future-oriented thinking and equip all people, women and men, to be fully participating members of their own communities and also citizens of the world i.e. how it can reinforce the Contemporary Education.

darksky.gr – A Greek Campaign for Light Pollution Awareness

Papalambrou Andreas (University of Patras / Orion Patras)
Antonopoulos Panagiotis (University of Patras / Orion Patras), Zafiropoulos Basil (University of Patras / Orion Patras)

In April 2009 the web site under the title darksky.gr went online. This site is an attempt to communicate the problem of light pollution to the public. Light pollution is treated not as an isolated problem but as part of a more general and complex issue which affects the environment, energy resources and human health. Darksky.gr aims to become a meeting point and unite the efforts of Greek amateur astronomy clubs and other organizations interested in the issue such as scientific societies, environmental organizations, technical chambers, mass media and private companies involved in electricity and lighting. Its creation has been suggested by the Astronomical Society of Patras "Orion" and approved in the annual meeting of Greek amateur astronomy clubs that took place in Alexandroupoli in November 2008. We believe that amateur astronomy clubs represent a very active cell in the field of scientific knowledge communication to the public and that they can play an important role in

raising awareness of the problem in cooperation with active organizations in related fields. The goal is to launch a wide cooperation between interested parties targeting to prevent the increasing light pollution. In this presentation, the goals and methods of the campaign are analyzed and an attempt to assess the very first results is made.

Astronomy and Culture

Stavinschi Magda (Astronomical Institute of the Romanian Academy)

Astronomy is, by definition, the sum of the material and spiritual values created by mankind and of the institutions necessary to communicate these values. Consequently, astronomy belongs to the culture of each society and its scientific progress does nothing but underline its role in culture. It is interesting that there is even a European society which bears this name "Astronomy for Culture" (SEAC). Its main goal is "the study of calendric and astronomical aspects of culture". Owning ancient evidence of astronomical knowledge, dating from the dawn of the first millennium, Romania is interested in this topic. But Astronomy has a much deeper role in culture and civilization. There are many aspects that deserve to be discussed. Examples? The progress of astronomy in a certain society, in connection with its evolution; the place held by the astronomy in literature and, generally, in art; the role of the SF in the epoch of super-mediatization; astronomy and belief; astronomy and astrology in the modern society, and so forth. These are problems that can be of interest for everyone, but the most important one could be her educational role, in the formation of the culture of the new generation, in the education of the population for the protection of our planet, in the ensuring of a high level of spiritual development of the society in the present epoch.

The next decade of infrared and submillimetre astronomy: from Herschel and Planck to Alma, JWST and E-ELT

Rowan-Robinson Michael (Imperial College)

The successful launch of Herschel and Planck heralds an exciting decade of infrared and submillimetre astronomy. I hope to be able to show some early results from Herschel and will outline the science we hope to do with Herschel and Planck submillimetre surveys. By 2012 ALMA should be delivering fabulous submillimetre sensitivity and resolution. JWST is planned to launch in 2014 with unprecedented performance at 1-27 microns. And ESO hopes to have the 40-m E-ELT operating by 2018, again operating out to 20 microns. I outline the exciting science we hope to achieve with these and other planned projects.

ABSTRACTS – POSTER CONTRIBUTIONS

Session 1: Sun, Planets, and Interplanetary Medium

A common acceleration process downstream of (quasi-perpendicular) CIR reverse shocks, planetary bow shocks and the termination shock

Anagnostopoulos George (University of Thrace)

The exploration of our solar system allowed the observation of a common characteristic at quasi-perpendicular shocks of different nature and spatial scales. We remind that, in the case of CIRs, the spacecraft often detect more intense acceleration effects at the reverse shocks than the forward shocks. In general, the observations suggest that energetic particles can be accelerated and temporally "trapped" downstream from a shock, in a magnetic configuration opposite to that of the magnetic mirror. Beside the CIR Reverse shocks, this phenomenon has been confirmed in the downstream region of the planetary bow shocks (i.e. Earth's and Jupiter's bow shocks) and the Termination shock. The observations can be well explained in terms of the Shock Drift Acceleration theory for particles approaching the shock from downstream. In this case, energetic particles can "feel" the shock as a barrier and can "temporarily" trapped behind it. This feature is enhanced for high plasma speed and ~900 ??? values. The acceleration process discussed here may have important applications to the supernova shocks.

The January 17, 2005 complex radio event (CME- CME interaction)

Bouratzis Costas (University of Athens)

A complex radio event was observed on January 17, 2005 with the radio-spectrograph ARTEMIS-IV; it was associated with an X3.8 SXR flare and two fast Halo CMEs (CME1 & CME2 henceforward) in close succession. We present ARTEMIS--IV dynamic spectra of this event combined with data from WIND WAVES; these observations provide a complete view of the radio emission induced by shock waves and electron beams from the low corona to about 1 A.U. These are supplemented by recordings, from the Nancay Radioheliograph (NRH), GOES, EIT and LASCO for the study of the associated flare and CME activity.

Metric radio bursts and fine structures observed on 20 January, 2005

Bouratzis Costas (University of Athens)

A complex radio event was observed on January 20, 2005 with the radio-spectrograph ARTEMIS-IV, operating at Thermopylae,Greece; it was associated with an X7.1$/$2B flare (in active region 720) and a very fast CME. We present dynamic spectra of this event; the high time resolution (1/100 s) of the data in the 450–270 MHz range, makes possible the detection and analysis of the fine structure which this major radio event exhibits. The fine structure was found to match, almost, the comprehensive Ondrejov Catalogue which it refers to the spectral range 0.8–2 GHz, yet seems to produce similar fine structure with the metric range.

Combining ground-based and space magnetic measurements for investigating the Earth's magnetosphere

Daglis Ioannis (National Observatory of Athens / ISARS)
Balasis Georgios (National Observatory of Athens), Kapiris Panayiotis (National Observatory of Athens), Anastasiadis Anastasios (National Observatory of Athens), Georgiou Marina (National Observatory of Athens)

The National Observatory of Athens (NOA) currently operates ENIGMA (HellENIc GeoMagnetic Array), an array of 4 ground-based magnetometer stations in the area of south-eastern Europe (central and southern Greece). The current stations are latitudinally equi-spaced between 30° and 33° corrected geomagnetic latitude. In the near future another station will be installed in Macedonia or Thrace, and there are plans for the installation of an additional station in Crete by the end of 2009. One of the primary research objectives assigned to ENIGMA is the study of geomagnetic field line resonances (FLRs). The latter is a well-established phenomenon taking place in the Earth's magnetosphere. It can be pictured as the formation of standing magnetohydrodynamic waves on magnetic field lines with fixed ends at the conjugate ionospheres. An interesting option in this field of research would be to compare ultra-low-frequency (ULF) wave observations in space made by ESA's Cluster mission and on the ground acquired by these mid-to-low-latitude ground-based observation sites of the Earth's magnetic field. Cluster has a high inclination orbit; insofar studies at high latitudes are more justified for direct interactions along the magnetic field lines. So, for a Cluster-ENIGMA study one has to expect some indirect, somehow related reactions with propagations perpendicular to the B-field. The Cluster-ENIGMA study can serve as a pilot-study for the upcoming Swarm mission of ESA. The Swarm constellation of spacecraft will allow, for the first time, the unique determination of the near-Earth field aligned currents, which connect various regions of the magnetosphere with the ionosphere and can be regarded as a complement to the Cluster mission.

Energetic Neutral Atom (ENA) Production from ions trapped in Saturn's Magnetosphere

Dialynas Konstantinos (Academy of Athens)
Brandt Pontus (Applied Physics Laboratory, Johns Hopkins University, Laurel, MD, USA), Krimigis Stamatios (Office for Space Research and Applications, Academy of Athens, Athens, Greece), Mitchell Donald (Johns Hopkins University Applied Physics Laboratory, Laurel, Maryland, USA.), Sergis Nick (Office for Space Research and Applications, Academy of Athens, Athens, Greece)

Energetic Neutral Atoms (ENAs) result from charge exchange collisions between fast ions trapped in planetary magnetic fields and residual neutral gases resident in the magnetosphere. ENAs thus escape and can be detected and imaged by the INCA (Ion and Neutral CAmera) camera on board Cassini to produce a picture of the population in the entire magnetosphere. Using all available INCA images in the time period 183/2004 to 200/2008 and selecting those times during which the INCA imager was looking at Saturn's magnetosphere from approximately the same vantage position, we were able to produce average images of the neutral gas cloud that correspond to 4.6 Saturn rotations. In the present study, we demonstrate a technique to retrieve the global neutral gas distribution in Saturn's magnetosphere using these average ENA images. The neutral gas distribution at Saturn is retrieved by simulating INCA images using ion distributions of combined CHEMS, LEMMS and INCA in-situ ion measurements that cover several passes from SOI (183/2004) to day 100/2007, at various local times over the dipole L range 5<L<20 Rs. A parameterized neutral gas distribution is then changed until agreement between the simulated and average INCA image is obtained. Our preliminary results on the neutral cloud density distribution and composition up to ~10 Rs are consistent with the neutral gas model by Jurac and Richardson [2005], while the calculated total O content is in agreement with the Esposito et al., [2005] results. The OH vertical distribution was found to be more extended than previously thought [e.g. Richardson, 1998].

Simulating flaring events via an intelligent Cellular Automata mechanism

Dimitropoulou Michaila (University of Athens)
Vlahos Loukas (University of Thessaloniki), Isliker Heinz (University of Thessaloniki), Georgoulis Manolis (Academy of Athens)

We simulate flaring events through a Cellular Automaton (CA) model, in which, for the first time, we use observed vector magnetograms as initial conditions. After non-linear force free extrapolation of the magnetic field from the vector magnetograms, we identify magnetic discontinuities, using two alternative criteria: (1) the average magnetic field gradient, or (2) the normalized magnetic field curl (i.e. the current). Magnetic discontinuities are identified at the grid-sites where the magnetic field gradient or curl exceeds a specified threshold. We then relax the magnetic discontinuities according to the rules of Lu and Hamilton (1991 or 1993),i.e. we redistribute the magnetic field locally so that the discontinuities disappear. In order to simulate the flaring events, we consider several alternative scenarios with regard to: (1) The threshold above which magnetic discontinuities are identified (applying low, high, and height-dependent threshold values); (2) The driving process that occasionally causes new discontinuities (at randomly chosen grid sites, magnetic field increments are added that are perpendicular (or may-be also parallel) to the existing magnetic field). An observational test for the soundness of the model is the comparison of the model's photospheric magnetic field after a flare with the actual magnetic snapshots captured in the photospheric magnetograms in later stages of the event. We also address the question whether the coronal active region magnetic fields can indeed be considered to be in the state of self-organized criticality (SOC).

Storm-time ULF waves observed at low latitudes and their implication in radiation belt electron flux variability

Georgiou Marina (National Observatory of Athens / University of Athens)
Daglis Ioannis (National Observatory of Athens / ISARS), Balasis Georgios (National Observatory of Athens / ISARS), Zesta Eftyhia (Air Force Research Laboratory), Yumoto Kiyohumi (Kuyshu University), Tsinganos Kanaris (University of Athens)

Relativistic electron fluxes in the outer radiation belt can vary over multiple orders of magnitude as a result of competing acceleration, transport and loss processes. By using ground measurements from the 210MM and SAMBA magnetometer arrays, along with measurements from the magnetometers on-board GOES satellites, we have studied the development of ultra-low frequency (ULF) waves that have been associated with changes in the flux level of radiation belt electrons. Pc5 waves with frequencies in the range of a few mHz driven by varying solar wind conditions provide an essential link for energy transfer from the interplanetary space to the inner magnetosphere. Sources of such externally-generated Pc5 waves are located at the magnetopause and thus their amplitude decreases rapidly with decreasing L shell. During the most intense geomagnetic storms (minimum Dst index < -100nTesla) of the declining phase of solar cycle 23, however, there is evidence of enhanced fluctuations of the geomagnetic field in the Pc5 frequency range at L shells as low as 1.23. We observed periodic fluctuations of the geomagnetic field at discrete frequencies, which often matched the 1.7mHz, 1.9mHz, 2.7mHz and 3.6mHz that have been attributed to global magnetospheric cavity and waveguide modes, as well as significant power at higher frequencies. These observations of enhanced ULF wave activity have been used to discriminate between geomagnetic storms that were accompanied by an increase or decrease in the fluxes of relativistic electrons in the radiation belts. Our findings are discussed in terms of the influence of ULF wave growth on radiation belt electron flux variability.

Fluctuations of CMEs characteristics during the declining phase of the last solar cycle

Gerontidou Maria (University of Athens)
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The relation between coronal mass ejections, solar flares and solar proton enhancements is statistically studied. The main properties of 13857 coronal mass ejections observed by the Solar and Heliospheric Observatory (SOHO) mission's Large Angle and Spectrometric Coronagraph (LASCO) from January 1996 until December 2008 are analyzed. Moreover, the extended database of solar proton enhancements with proton flux >0.1pfu at energy>10MeV measured at the Earth's orbit as well as the solar flare flux measurements provided by the Geostationary Operational Environmental Satellite (GOES) during this time period is also used. A comparison of these databases gives new results concerning the sources of solar energetic particles as well as the long term behavior of coronal mass ejections, which have fundamental implication for the evolution of the magnetic flux of the Sun. Coronal mass ejections data were corrected taking into account the gaps of SOHO during the last solar cycle and were separated according to their linear speed, their width and their kinetic energy. A first result is that the corrected number of detected coronal mass ejections seems to present fluctuations from the expected behavior of that of sunspot number during the declining phase of this solar cycle. Additionally, a correlative analysis of all above properties of coronal mass ejections and all registered solar proton enhancements is also performed.

Analysis of geomagnetic disturbances and cosmic ray intensity variations in relation to medical data from Rome

Giannaropoulou Elisavet (University of Athens)

Over the last few years many studies have been conducted concerning the possible influence of geomagnetic and solar activity and cosmic ray activity on human physiological state and in particular on human cardio – health state. As it is shown the human organism is sensitive to environmental changes and reacts to them through a series of variations of its physiological parameters such as heart rate, arterial systolic and diastolic blood pressure, etc. In this paper daily mean values of heart rate and atrial and ventricular systoles, as they were registered for a group of 2.028 volunteers (1.039 females and 989 males with average age 59,8±0,4 years) during medical examinations at the Polyclinico Tor Vergata, Rome, Italy are analyzed in relation to daily cosmic ray intensity variations, as measured by the Neutron Monitor of the University of Athens (http://cosray.phys.uoa.gr) and daily variations of the geomagnetic indices Dst, Ap and Kp. The data refer to the time period from 24th April until 12th May 2004, a period of low geomagnetic and cosmic ray activity. The results from this study show that geomagnetic activity changes and cosmic ray intensity variations may regulate the human homeostasis. Moreover the group of volunteers is divided to subcategories, according to gender, medical history and medication, in order to examine the influence of each of the above parameters separately. As it is proven each group reacts in a different way to environmental changes.

Heating Distribution along an Active Region using a Simple Electrodynamic Model.

Gontikakis Costis (Academy of Athens)
Contopoulos John (Academy of Athens), Dara Helen C. (Academy of Athens),
Georgoulis Manolis K. (Academy of Athens)

The heating along hundreds of coronal loops of a non flaring active region is computed using a simple electrodynamic model. The random plasma displacements caused by the photospheric motions generate electric fields and, as a consequence, electric potential differences at the footpoints of loops. These potential differences generate electric currents which are the cause of Ohmic heating. We computed the potential magnetic field extrapolation using the MDI magnetogram of the NOAA 9366 active region observed on March 6, 2001 and used the closed magnetic field lines to model the coronal loops. For each loop we compute the heating function and obtain the hydrostatic distribution of temperature and pressure. We find that the coronal heating is stronger near the footpoints of the loops and asymmetric along them. We obtain scaling laws that relate the mean volumetric heating with the loop length, and the heating flux through the loop footpoints with the magnetic field strength at the footpoints. We simulated the emission of the hydrostatic loops in the 171 and 284 Angstroms spectral bands and compared the resulting images with EIT observations. Our results are in qualitative agreement with observations. We conclude that our model can be used as a simple working tool for the study of active regions.

Jupiter's hot spots: assessment of the retrieval capabilities of future IR spectro-imagers

Grassi Davide (IFSI-INAF)

JIRAM instrument for Juno mission will return the first high-spatial resolution IR spectro-image data of Jupiter atmosphere two decades after the historical NIMS-Galileo observations. A formal retrieval scheme based on the Bayesian formalism is presented, providing a quantitative assessment of retrieval errors and vertical resolution for derived profiles of water vapour and ammonia mixing ratios. Attention is paid to the peculiar conditions of 5 um hot-spots, atmosphere clear areas that provide a mean to probe atmospheric depths usually precluded to remote sensing investigations because of Jupiter thick cloud decks. An IR spectro-imager has also been included in the core payload of the EJSM mission orbiters. This instrument will provide complimentary results to JIRAM-Juno due to the different s/c orbits and improved spectral resolution.

Mathematic type for the finding of relative distances of orbits of planets and satellites

Karagkiozidis Polychronis (Secondary School Education Advisor)

For five satellites of Jupiter, we have: Take the geometrical series 21 42 84 168, in which each term is double the previous one. With the addition of 0 as the first term, we have the series 0 21 42 84 168. Adding 22 to each term produces a third series: 22 43 64 106 190. If we multiply these terms by 10,000, we arrive at the distances in kilometers of Jupiter's four Galilean moons and the small satellite Thebe from the planet's centre. 220,000 430,000 640,000 1,060,000 1,900,000 Thebe Io Europa Ganymede Callisto The above appear to be an adaptation of the well-known Titius-Bode law to these satellites. This is achieved by identifying the suitable small satellite whose position defines the two constants of the formula that will be given below. The general formula giving the distances of planets and satellites, is the following: D=?2^n +? For a planet's satellite system, ? corresponds to the (orbit of the) first satellite's distance from the planet's centre, and ? to the distance between the second satellite and the first, while n is the number of the satellite in the series, beginning with 0. Similarly for the solar system, ? corresponds to the distance of the first planet, Mercury, from the Sun, and ? to the distance between the second and first planets orbits (Venus ? Mercury), while n is the number of the planet in the series, beginning with 0. For

the 5 satellites of Uranus we have : ?=86,000 km (Puck) and ?=46,000 km (Puck ? Miranda distance), which give: D=46,000.2^n+86,000 Satellite n D (km) True distance (km) Deviation % Miranda 0 132,000 129,780 -1.71 Ariel 1 178,000 191,240 6.92 Umbriel 2 270,000 265,970 -1.52 Titania 3 454,000 435,840 4.17 For the solar system we have: ?=0.4 AU (Mercury's distance from the Sun) and ?=0.3 AU (Mercury ? Venus distance's orbit), which give: D=0.3x2^n+0.4 At first glance this formula appears to fit the Solar System less well than the classic Titius-Bode law, as it does not include Mercury. The Sun ? Mercury distance is, however, included in the formula as the constant ?.

SWAP: An EUV imager for solar monitoring on-board of PROBA2 micro-satellite

Katsiyannis Athanassios (National Observatory of Athens / IAA)

Project for On-board Autonomy 2 (PROBA2) is an ESA technology demonstration micro-satellite to be launched on 2nd November 2009. The prime instrument on board of Proba2 is SWAP (Sun Watcher using Active Pixel System detector and Image Processing), a full disk solar imager with a narrow bandpass filter centred at 17.5 nm (Fe IX - XI) and a fast cadence of ~1min. The telescope is based on an off-axis Ritchey Chretien design while an extreme ultraviolet (EUV) enhanced APS CMOS will be used as a detector. As the prime goal of the SWAP is solar monitoring and advance warning of Coronal Mass Ejections (CME), on-board intelligence will be implemented. Image recognition software using experimental algorithms will be used to detect CMEs during the first phase of eruption so the event can be tracked by the spacecraft without human intervention. On-board automated prioritazation of the created images allows the best possible use of the telemetry data channel, allowing a high level of on board autonomy.

Comparative analysis of oscillations of a solar quiet region from multi-wavelength observations

Kontogiannis Ioannis (Univ. of Athens - National Obs. of Athens)
Tsiropoula Georgia (National Observatory of Athens), Tziotziou Kostas (National Observatory of Athens)

We analyze the temporal behavior of a solar quiet region using a set of multi-wavelength observations obtained during a coordinated campaign. The observations were acquired by the ground-based Dutch Open Telescope (DOT), the Michelson Doppler Imager (MDI) on-board SoHO, the UV filters of the Transition Region and Coronal Explorer (TRACE) and the Solar Optical Telescope (SOT) and Extreme UV imaging spectrograph (EIS) on-board the Hinode satellite. A large range of height in the solar atmosphere, from the deep photosphere to the corona was covered by these instruments. We investigate the oscillation properties of the intensities and velocities in distinct regions of the quiet Sun, i.e. internetwork, bright points defining the network boundaries (NB) and dark mottles forming a well-defined rosette as observed by the different instruments and in the different heights. The variations of the intensities and velocities are studied with wavelet, coherence and phase difference analyses. The aim of our work is to find similarities and/or differences in the oscillatory phenomena observed in the different examined regions, propagation characteristics of waves, as well as a comprehensive information on the interaction of the oscillations and the magnetic field.

CIR-Accelated Energetic Particles During 2008: Multi-point Observations by STEREO and ACE

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During 2008 the angular separation between the twin STEREO spacecraft grew from 44 to 88 degrees. During this period solar activity remained very low, providing an excellent opportunity for multi-spacecraft studies of CIRs, using combined observations from STEREO, and near Earth-spacecraft. In-situ energetic particle and plasma data from the SEPT, LET and PLASTIC instruments onboard STEREO along with observations from ACE SWEPAM and EPAM have been mapped back to the Sun. The use of this technique allowed us to directly compare the in-situ data from different spacecraft and correlate them with the parent coronal holes. We found telltale discrepancies in the structures observed by the three spacecraft. Heliographic latitudinal separation between the spacecraft cannot always account for the observed discrepancies. The observations suggest that temporal evolution of the parent coronal holes as well as the interaction between CIRs and transient solar wind structures in the interplanetary medium can also play an important role.

Tracing Magnetic Connectivity and Solar Injection by means of Energetic Particles in the Inner Heliosphere

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We demonstrate how fine-time resolution measurements of near-relativistic electron intensities (>20 keV) and their angular distributions provided by the Energetic Particle Detector (EPD) onboard Solar Orbiter and the Energetic Particle Instrument (EPI) onboard Solar Probe+ can be utilized as diagnostic tracers of the large-scale structure and near-Sun connectivity of the Interplanetary Magnetic Field embedded within Interplanetary Coronal Mass Ejections in the inner heliosphere. Furthermore, for Solar Probe+ that will trace the origin of the fast and slow solar wind the in situ measurement of such parameters as the electron and energetic particle bi-directional streaming will be important to correlate the flow speed with closed/open magnetic field topologies. We also discuss how our understanding of the transport of Solar Energetic Particles (SEPs) through the inner heliosphere will increase in the context of the new observations. Propagation effects are expected to have a much smaller influence on particle profiles closer to the Sun which will enable a more accurate estimation of the onset times of SEP events and the separation of different energetic particle injections. The combination with EUV and hard X-ray imaging and spectrography at gamma-ray, HXR, and decametric-hectometric radio wavelengths aboard Solar Orbiter and with ground based radio measurements, will allow us to trace the particle signatures back to their coronal sources and shed light on the whole chain of processes affecting SEP acceleration and transport from the low corona to interplanetary space.

Solar Energetic Particle Observations and Propagation in the 3-D Heliosphere in december 2006

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Ulysses is the first spacecraft to fly over the poles of the Sun. Although the Sun was again close to its activity minimum during the recently completed third polar orbit of Ulysses, solar activity has been more prevalent during the declining phase of solar cycle 23 than was the case in the declining phase of the 22nd solar cycle, when the first polar passes occurred (1994-1995). In December 2006, an unexpected rise of solar activity occurred. Active Region 10930 produced a series of major solar flares with the strongest one (X9.0) recorded on December 5, after it rotated into view on the east limb of the Sun. In this work, we present in detail energetic particle observations obtained by various instruments onboard Ulysses, located at > 70 degrees south heliographic latitude during this period and discuss their implications for particle propagation to solar polar regions. The observed events are also compared with high latitudes measurements obtained previously by Ulysses close to solar maximum. Furthermore, comparisons with data acquired by the STEREO and ACE spacecraft near the ecliptic plane are discussed.

Study of storm-time ring current built-up through ion acceleration Simulations

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We address the acceleration and transport of ions to the inner magnetosphere during geospace magnetic storms through a test particle simulation approach. Protons and oxygen ions with energies of the order of few keV, as typically observed in the plasma sheet, are launched from the near-Earth magnetotail under the influence of the large-scale convection electric field. The resulting ring current build-up is compared to the case of additional acceleration through impulsive induced electric fields, which are typically observed at substorm expansion onset. Ion trajectories are nonlinear with strong dependences on initial and boundary conditions, such that they become stochastic and irreversible in the presence of the slightest field fluctuations. The results of our simulations partially confirm observational features of magnetic storms. The energization of oxygen ions is more pronounced than the energization of protons, as observed by many spacecraft. However, the dominance of oxygen ions is very limited in time, while spacecraft observations suggest that oxygen dominance is pronounced throughout storm maximum. The observed fast loss of energetic oxygen ions after storm maximum is reproduced by the simulations, but appears quicker than expected. We

discuss the benefits and the shortcomings of our approach and suggest improvements to be implemented in the future.

Mapping of the cosmic ray events related to the solar activity for the period 2003-2005

Papaioannou Athanasios (University of Athens)
Makrantoni Panagiota (National & Kapodistrian University of Athens), Mavromichalaki Helen (National & Kapodistrian University of Athens)

The relationship between cosmic ray intensity decreases and solar events is still an open field of space research. In this work a complete study of solar events occurred from January 2003 to December 2005, is considered. This three-years time period characterized by an unexpected activity of the Sun was divided into 27-day intervals starting from Bartels Rotation 2313 (06.01.2003) to 2353 (21.12.2005), generating diagrams of the cosmic ray intensity data recorded at the Athens Neutron Monitor Station. This station is working at an altitude of 260m and cut-off rigidity 8.53GV provided to the Internet high-resolution data in real-time. A mapping of all available solar and interplanetary events, such as solar flares with importance M and X, coronal mass ejections (Halo and Partial) was done. As we are going down from the solar maximum to the declining phase of the 23rd solar cycle, a statistical overview of the corresponding relationship among these phenomena, the significant percentage of the connection of Halo CMEs and solar flares and the respective connection to Forbush decreases on yearly and monthly basis are discussed. The close association, as well as a probable quantitative analysis, between solar events is being denoted. The role of extreme solar events occurred in October / November 2003 and January 2005 are also discussed. Obtained results may be useful for predictions of transient solar events and space weather forecasting.

Anomalous Forbush effects associated with remote western and eastern sources

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Solar wind disturbances near Earth, as a rule, dominate the magnitude, shape and other properties of Forbush effects (FE). At specific cases though, an inconsistency in the relation between the characteristics of the interplanetary disturbance and Forbush effect is observed, when a large decrease of cosmic ray intensity may correspond to a small disturbance of the near Earth solar wind. Most often such cases occur when the source of disturbance is a large release of solar substation in the eastern part of the solar disk. The study of the Forbuch effect on 16-17 July 2005 has shown that an anomaly in the relation of the interplanetary magnetic field (IMF) intensity and the FE magnitude may not be caused by eastern but by far western sources. We analyzed the events from the database of IZMIRAN, which contains several thousands interplanetary disturbances and Forbush effects in order to search for anomalous Forbush decreases associated with both remote western and eastern sources. Analysis of such events testifies that Cosmic Ray (CR) variations are able to provide information on sufficiently remote heliospheric phenomena and thus, play a significant role to the understanding of space environment.

Space weathering on near-Earth objects

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In many planetary environments of the solar system, direct plasma precipitation on a surface can result in neutral particle release via the process of ion-sputtering (IS) (for instance, Mercury, Moon and Europa). In particular, solar wind sputtering is one of the most important agents for the surface erosion of a near-Earth object (NEO), acting together with other surface release processes, such as photon stimulated desorption (PSD), thermal desorption (TD) and micrometeoroid impact vaporization (MIV). The energy distribution of the IS-released neutrals peaks at a few eVs and extends up to hundreds of eVs. Since all other release processes produce particles of lower energies, the presence of neutral atoms in the energy range above 10 eV and below a few keVs (sputtered high-energy atoms (SHEA)) identifies the IS process. SHEA easily escape from the NEO, due to NEO's extremely weak gravity. Detection and analysis of SHEA will give important information on surface-loss processes as well as on surface elemental composition. The investigation of the active release processes, as a function of the external conditions and the NEO surface properties, is crucial for obtaining a clear view of the body's present loss rate as well as for getting clues on its evolution, which depends significantly on space weather. In this work, we analyze the processes that take place on the surface of these small airless bodies, as a result of their exposure to the space environment. We propose a new space weathering model (space weathering on NEO-SPAWN) and we present an instrument concept of a neutral-particle analyzer, specifically designed for the measurement of neutral density and the detection of SHEA from a NEO.

Unfolding SREM data with a SVD regularization method

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The Standard Radiation Environment Monitor (SREM) belongs to a second generation of instruments in a program established by the European Research and Technology Centre of the European Space Agency (ESA) to provide minimum intrusive particle radiation detectors on ESA spacecrafts for space weather applications. Early particle radiation warning is important for space missions and quite critical for future efforts of manned planetary exploration. SREM units monitor the particle radiation environment providing suitable functions related to space weather hazards for the host spacecraft and its payload. SREM detects high-energy electrons and protons and bins the measurements in overlapping energy bins. In order to estimate the particle fluxes associated with solar particle events, a method was developed based on the Singular Value Decomposition technique which unfolds the flux spectra from the measurements. This method does not require any assumption for the spectral form of the particle fluxes and includes proper schemes treating issues related to the characteristic properties of the detector, in particular the small number of channels, contamination effects, overlapping energy bands and the strong correlation between count-rates in SREM channels. A benchmarking of our method is performed by considering various spectral forms for the fluxes. Using real data, the particle fluxes measured by the SREM/INTEGRAL during a large solar particle event on January 20, 2005 were derived. It is shown that application of this approach to SREM data can successfully unfold even non-monotonic distributions, e.g. populations of protons localized in high energy ranges of the flux spectra.

Identification of nonlinear space weather models of the Van Allen radiation belts using Volterra networks

Taylor Michael (ISARS-NOA)

We present a holistic approach to the modelling of phenomena observed in the form of time series. Dimensional analysis is initially used to provide knowledge discovery in the form of dimensionless groups that help to constrain physical models. Then, using a correspondence principle based on the equivalance and unity of nonlinear input-output models, state-space representations, phase-space dynamics, and neural networks, we show how equations can be extracted from time series data and used to resolve the degeneracy inherent in the functional relation between dimensionless groups. A general taxonomy of input-output models based on the nonlinear autoregressive integrated moving-average with exogenous inputs NARIMAX(p,q,r) process is developed specifically for this purpose.

Towards a unified source-propagation model of cosmic rays

Taylor Michael (ISARS-NOA)

The recent fit of the cosmic ray spectrum using non-extensive statistical mechanics (Tsallis et al 2003: Phys. Lett. A 310, 372) provides what may be the strongest evidence for a source-propagation system deviating significantly from Boltzmann statistics. It is well known that the spectrum is multifractal with cosmic ray fluxes as a function of energy revealing a knee slightly below 1E+16 eV and an ankle close to 1E+19 eV. The knee then appears as a crossover between two fractal-like thermal regimes caused by process occurring at energies ten million times lower in the region of the quark-hadron transition (?1GeV). Towards the GDZ limit a further mechanism comes into play and surprisingly it also presents as a modulation akin to that in our own local solar-neighbourhood. We propose that this is due to modulation at the source and is likely to be due to processes in the shell of the originating supernova. We report that the entire spectrum, spanning cosmic rays of local solar origin and those emanating from galactic and extra-galactic sources can be explained using a new diagnostic - the gradient of the log-log plot. This diagnostic reveals Boltmann statistics at both the source and in the solar-terrestrial neighbourhood, with two clearly separated fractal scales in between. We interpret this as modulation at the source followed by Fermi acceleration facilitated by galactic and extra-galactic magnetic fields with a final modulation in the solar-terrestrial neighbourhood. We conclude that the gradient of multifractal curves appears to be an excellent detector of fractality.

Study of Ha Spicule Profiles with Line Inversion Techniques

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High resolution optical spectra of chromospheric spicules obtained in the Hα line are studied together with slit-jaw filtergrams. The spectra were recorded along a vertical slit parallel to the solar limb with the HSFA2 (Horizontal-Sonnen-Forschungs-Anlage) Solar Spectrograph at Ondrejov Observatory on August 19, 2007 and show Hα line profiles taken in spicules - due to the limb curvature - at different heights from the solar limb. A multi-cloud model that considers two or more spicules along the line-of-sight (LOS), together with a statistical approach that takes into account a large set of initial conditions for solving the radiative transfer equation, is used for the fitting of the observed profiles and the derivation of several parameters such as the LOS velocity, the source function, the optical thickness and the Doppler width that describe the respective spicules. The height-dependence of the shape of

the observed profiles, as well as their dependence on the values of the derived parameters are studied in detail. The derived results are compared with the statistical theoretical results of a multi-cloud model where the aforementioned physical parameters, as well as a random number of spicules along the LOS were taken into account, in order to define the dependence of several spicule profile characteristics on them. Specific steps of the used procedures, as well as crucial problems are discussed.

Solar origin of solar particle events detected by the Standard Radiation Environment Monitor of ESA

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Solar Particle Events (SPEs) of the 23rd Solar Cycle detected by the ESA Standard Radiation Environment Monitor (SREM) onboard the INTEGRAL satellite have been studied in order to find their connection to solar sources. X-ray, optical and radio data of solar flares that were observed by several space-based instruments during the aforementioned solar cycle have been selected. The data were reduced and thoroughly analyzed in order to establish the corresponding solar origin of the selected SPEs. The extensive scientific analysis has produced clear correlations with X class solar flares for the events of the October-November 2003, January 2005 and December 2006 periods while for the events that occurred during September 2005, correlations with X class flares are possible but not straightforward due to the complexity of the registered solar particle fluxes.

Why the magnetic flux and the impulsive energy released in solar active regions follow a universal power law distribution?

Vlahos Loukas (University of Thessaloniki)

Observations from Hinode satellite suggest that magnetic flux (Parnell et al, ApJ, 698, 75, 2009) and explosive dissipation of energy, from solar active regions, follow a power law distribution over several decades. The current MHD simulations are not capable to reproduce these results. We use a combination of tools, borrowed from complex systems dynamics, to form a theory for driven and dissipative Global Active Regions. Using these tools we are able to recover most of the well-known observational results. We will argue that the statistical properties, of the impulsive energy dissipation in solar active regions, are an integral part of the "flare theory" . Flares cannot be understood as isolated magnetic discontinuities. The new generation of theories for impulsive energy dissipation should combine MHD properties to trace the formation of magnetic discontinuities in "driven dissipative systems" and tools borrowed for complex systems analysis to trace the evolution of the discontinuities. The evolution of sharp (critical) discontinuities is an inherently kinetic problem and falls outside the domain of MHD theories. Therefore we should rely on mixed (e.g. MHD combined with Cellular automata models) methods of analysis (similar to the ones presented here) till very large scale kinetic codes are accessible to astrophysics.

Instrumentation, observational techniques and first results from the total solar eclipse of July 22, 2009 in China

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We undertook the following observations during the total solar eclipse of July 22, 2009 at Jiangnan Tianchi, Anji, China: (a) White light photography, (b) Monitoring ''on (emission) and off (continuum) band'' of the FeXIV 5302.8 Å spectral line with a narrow (0.9 Å) birefringent Lyot filter, (c) Observations of the flash spectrum using a slitless spectrograph with coelostat and (d) Simultaneous observations of the FeXIV (5302.8 Å) και FeX (6374 Å) coronal emission lines, using a high dispersion spectrograph, coelostat and progressively scanning the solar corona with the help of a linear plate.

In order to perform the above experiments, one of us (V.A.) constructed: (a) A Lyot filter, using birefringent quartz and calcite plates, tuned to the FeXIV 5302.8 Å spectral line, with FWHM of 0.9 Å, (b) A slitless spectrograph with reflecting grating 300 lines/mm, resolution (1.5 Å/pixel), (c) A 150mm coelostat, (d) A slit spectrograph, with reflecting grating 1200 lines/mm, resolution (0.37 Å/pixel) and (e) A linear plate driven by a digital stepper motor.

A preliminary analysis of the data, taken with the Lyot filter, shows that (a) The coronal FeXIV 5302.8 Å emission line was confined to two localized regions on the SE (heliographic latitude -42^o to -73^o E)and SW (heliographic latitude -16^o up -63^o W) solar limb, extending up to 0.16R_8 from the limb (b) Using the low and the high dispersion spectrograph data we found that the FeX emission was fairly strong and easily identified, above the average continuum background, whereas the FeXIV emission was hardly detected and (c) Comparing the 2006 (Sun: active) flash spectra with those of the 2008 and 2009 (quiet Sun) flash spectra, we observe a gradual decline of the strength of the FeXIV emission line (ionization temperature of 2 X 10^6 K), with a simultaneous increase of the FeX line (ionization temperature of 1.2 X 10^6 K). During the eclipses of 2008 and 2009 the strongest coronal emission line was FeX.We attribute the decline of temperature of the solar corona (not the Sun!) between 2006 and 2009 to the observed reduction of solar magnetic activity during the solar minimum of the 11-year solar cycle, which takes place about now (2008, 2009).

Session 2: Our Galaxy: Stars, Exoplanets, and Interstellar Medium

Photo-ionization modeling of new PNe discovered in the Galactic bulge region

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Using new low resolution spectra of Galactic Bulge Planetary Nebulae (PNe) to the photo-ionization model Cloudy, the physical parameters of the nebula as well as of the central star(CS) were determined. In particular, the model predicted the abundances of elements, electron temperature, electron density, mass of the nebula, temperature and luminosity of the central star etc. The main goal is to find any possible correlation among the physical parameters of the nebula and their CS by using statistical tools (i.e. Bayesian theory). Since PNe play an important role to the chemical enrichment history of the ISM as well as in the star-formation history and evolution of our Galaxy, these results will help us to understand more about the bulge dynamics.

New optical candidate supernova remnants in Sagittarius.

Alikakos Ioannis (National Observatory of Athens / IAA)

Deep optical CCD images of a large unknown area have been obtained in the light of Hα+[N II], [O III] and [S II]. The resulting mosaic covers an area of 1.4º x 1.0º where filamentary and diffuse emission was discovered, suggesting the existence of more than one supernova remnants (SNRs) in the area. Deep long slit spectra were also taken at eight different regions. Both the flux calibrated images and the spectra show that the emission of the filamentary structures originates from shock-heated gas, while photo-ionization mechanism is responsible for the diffuse emission. The optical emission is found to be well correlated with the radio at 1420 MHz and 4850 MHz, suggesting their association. The presence of the [O III] 5007 emission line in one of the candidate SNRs suggests shock velocities into the interstellar "clouds" of >100 Km/s, while the absence in the other indicates slower shock velocities. For all candidate remnants the [S II] λλ 6716/6731 ratio indicates electron densities below 270 cm^{-3}, while the Hα emission has been measured to be between 0.6 to 41 x 10^{-17} erg s-1 cm-2 arcsec-2. The detected optical emission could be part of a number of supernovae explosions and the possibility that it is within an OB association cannot be ruled out.

ThReT: A new survey for Extrasolar planetary transits at Mt. Holomon, Greece

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Seiradakis John (Aristotle University of Thessaloniki), Nitsos Athanasios (Aristotle University of Thessaloniki), Karamanavis Vasilis (Aristotle University of Thessaloniki), Mislis Dimitris (Hamburger Sternwarte)

We present the instrumentation, the target selection method, the data reduction pipeline and the preliminary results of the Thessaloniki Research for Transits project (ThReT). ThReT is a new project aiming to discover Hot Jupiter planets, orbiting Sun-like stars. In order to locate the promising spots for observations on the celestial sphere, we produced a sky-map of the Transit Detection Probability by employing data from the Tycho Catalog and applying several astrophysical and empirical relationships. For the data reduction we use the ThReT pipeline, developed by our team for this specific purpose. The photometric results from the first test field at Cassiopeia are also presented.

Similarity between DACs/SACs phenomena in hot emission stars and quasars absorption lines

Antoniou Antonios (University of Athens)

In this paper we indicate that DACs and SACs phenomena, can explain the spectral lines peculiarity in Hot Emission Stars and AGNs (Danezis 2006b, Danezis 2008). We also try to connect the physical properties of absorption regions around stars and quasars. Additionally, we propose a new idea to explain the very broad absorption lines that we can not explain as rotational or random velocities of the density layers that construct these lines. We propose that around a central density region that produces the main absorption lines (that may have the form of spiral streams and which have accepted values of rotational and random velocities) we can detect microturbulent movements, which produce narrow absorption components with different shifts. These narrow lines create a sequence of lines, on the left and on the right of the main components. The density of these lines and their widths, which are added, give us the sense of line broadening (SACs phenomenon). As a result, what we measure as very broad absorption line, is the composition of the narrow absorption lines that are created by micro-turbulent effects.

Studding the origin of SACs and DACs in the spectra of hot emission stars

Antoniou Antonios (University of Athens)

In the spectra of hot emission stars (Oe and Be stars) we observe the appearance of complex spectral line profiles, which are due to the existence of DACs and/or SACs phenomenon. In order to explain and reproduce theoretically these complex line profiles we use the GR model (Gauss-Rotation model). This model presupposes that the regions, where the spectral lines are created, consist of a number of independent and successive absorbing or emitting density regions of matter as the area that contains these spherical density regions is near the star and thus is limited. In this study we are testing a new approach of GR model, which supposes that the independent density regions are not successive. We use this new approach in order to study the density regions that produce the C IV, N V resonance lines of a number of Oe stars and the Fe II and Mg II resonance lines of a number of Be stars. Comparing the results of this method with the classical way of GR model that supposes successive regions we try to conclude to the best one in the case of hot emission stars.

Wave interaction and nonlinear Compton scattering in relativistic shocks

Arka Ioanna (Max Planck Institut for Nuclear Physics)

The radiation produced by the acceleration of particles in low frequency, high amplitude electromagnetic waves and its possible application in astrophysical environments have been investigated by various authors in the past. Using the paradigm of the pulsar striped wind, we investigate the phenomenon of electromagnetic wave reflection at a relativistic shock and the radiation produced by particles interacting with the waves. Possible application in other astrophysical environments are discussed.

Long trails of optical emission behind PNe and LBVs

Boumis Panayotis (National Observatory of Athens / IAA)
Meaburn John (Jodrell Bank Centre for Astrophysics, Univ. Manchester)

Deep wide field optical images of Planetary Nebulae (PNe) and Luminous Blue Variables stars (LBVs) have revealed long tails of emission which form as the stars plough through their local interstellar media (ISM) during periods of mass ejection.

XMM-Newton Analysis of Galactic Supernova Remnant G156.2+5.7

Bozkurt Mustafa (Bogazici University)

We report 24 ks XMM-Newton observations of G156.2+5.7. The X-ray morphology shows an elongation towards southern regions. A three-color image which was derived from 0.4-1.0 keV, 1.0-2.0 keV and 2.0-5.0 keV energy bands shows elevated abundances O and Ni, suggesting that G156.2+5.7 is an O-rich SNR. We discuss the spatial variations of the spectral parameters and the abundance ratios of individual elements of the ejecta.

The new telescope at the University of Patras. Current and future prospects.

Christopoulou Eleftheria & Papageorgiou Athanasios (Physics Department, University of Patras)

The installation of a 0.35 m Celestron Schmidt Cassegrain on the roof of the Astronomical Laboratory at the University of Patras on a robotic mount (SB Paramount ME) equipped with a ST-10XE/XME CCD camera and Bessel UBVRI filters, gave the possibility to initiate research projects in the field of photometry of variable, eclipsing and cataclysmic variable stars. The high quality of our telescope-camera system would allow to support multi wavelength observations of blazars in network systems like WEBT and contribute to ground based observations from large telescopes (AGN Monitoring with the Whipple 10m Telescope).

Transient high frequency optical oscillations of the red dwarf AD Leonis

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Thorough investigations on the red dwarfs EV Lac and YZ CMin indicate that transient high frequency oscillations occur during the flare event and during the quiet-star phase as well. The postulation that this is a general characteristic of the active red dwarf is a very important task. In the frame of his consideration we present in this paper the results of the analysis of the U-light curve for the flares of the red dwarf AD Leo, which were observed on February 2002, with the help of the 30-inch Cassegrain telescope of the Stephanion Observatory. The combined use of Fractal analysis, DFT-analysis and Wavelet analysis enable us to estimate the proper random noise and detect possible weak transient optical oscillations. In accordance to the results of the previous studies the results of the present study indicate that: (1) Transient high frequency oscillations occur during the flare event and during the quiet-star phase as well. (2) The Observed frequencies range between 0.0083Hz (period 2min) and 0.3 Hz (period 3s) not rigorously bounded. The phenomenon is most pronounced during the flare state. (3) During the flare state:(a) Oscillations with period 2 to 1.5min, 11s, 7.5s and 4s appear during the pre-flare state and persist during the whole flare state, (b) From the flare maximum phase on, a progressive increase of oscillations with periods 20s up to 4.0s is markedly indicated and (c) At the end of the flare only the oscillation of the pre-flare state do remain. This result is in favour of (or does not contradict) the suggested explanation, i.e. the evolution of a fast mode magneto-acoustic wave generated at the impulsive phase of the flare and travelling through the magnetic loop. This procedure may occur many times during the development of a large flare. Finally, the transient optical oscillation, which occurs during the quiet-star state, are not necessary connected with any flare and may be a general characteristic of the active stars atmospheres.

Forming free-floating brown dwarves as a by-product of multiple star formation

Kitsionas Spyridon (HAEF - Psychico College)
Zinnecker Hans (AIP, Germany)

The formation of free-floating brown-dwarf-mass objects is a common outcome in SPH simulations of dynamical star formation (Bate, Bonnell & Bromm 2002a,b, 2003; Kitsionas & Whitworth 2007). These objects get ejected from the protostellar discs they form in at early stages of their formation, i.e. at their first phases of accretion. Therefore, they end up with low masses outside the mass reservoir of their forming site. On average they are ejected at moderate speeds as a result of dynamical interactions (star-star, disc-disc, star-disc etc.) in their forming environment. We present new as well as previous (Kitsionas & Whitworth 2007) SPH simulations of cloud-cloud collisions in which brown dwarves get ejected in the course of interactions within filaments between their parental protostellar discs. Such interactions lead to the formation of (close) stellar binaries and the ejection of low-mass objects forming in the discs. It is important to understand the statistics (frequency, efficiency etc.) of such formation scenarios in order to be able to assess the number of free-floating brown dwarves in star formation sites and the field. Zinnecker (2001) calculates the feasibility of microlensing observations of free-floating brown dwarves towards the galactic centre based on the binary and disc fragmentation statistics. This poster sets some constraints on such statistics.

Discovery and observations of the new binary GSC 2805:0766

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2)

We present the discovery and photometric observations of the new W UMa variable GSC 2805:0766. It was found to vary during photometric observations in 2005 and observed during autumns of 2006 and 2007, in B, V, Ic and Clear filters. Ephemeris, phased light curves in V & Ic and O-C data are acquired and presented.

The contact system V566 Ophiuchi revisited

Liakos Alexios, Varrias Simos & Niarchos Panagiotis (University of Athens)

New BVRI photometric observations of the contact system V566 Oph have been obtained. The light curves are analyzed with the Wilson-Devinney code and new geometric and photometric elements are derived. A new O-C analysis of the system, based on our minima times and the most reliable ones found in the literature, is presented and apparent period changes are discussed with respect to possible Light-Time effect (LITE) in the system. Moreover, the results for the existence of a tertiary component around the eclipsing pair, derived from the period study, are compared with those for extra luminosity, derived from the light curve analysis.

Preliminary results for the triple system AV CMi

Liakos Alexios & Niarchos Panagiotis (University of Athens)

New CCD photometric observations in V, R and I filters of the detached eclipsing binary AV CMi have been obtained. The complete light curves are analyzed with the Wilson-Devinney code and new geometric and photometric elements are derived. Moreover, 2-year systematic observations of the system revealed the existence of a third body moving in an eccentric orbit around one of the components with an approximate period of 1 day. The first light elements for this tertiary component are given and its nature is discussed.

Dusty Disks Around Evolved Stars

Lykou Foteini (University of Manchester)

Mass-loss outflows are important in the late stages of stellar evolution. We have observed such outflows using high-angular resolution techniques, and we have found dusty discs and torii around the cores of evolved stars. The dusty structures may have been instrumental for the shaping of the gaseous ejecta of those objects into bipolar/multipolar nebulae. The sample consists of two different stages of late-type evolution objects, namely two planetary nebulae (Mz3 and M29) and a very-late-thermal-pulse object (V4334 Sgr), that allows us to compare and assess the contribution of those dusty structures in the shaping of the mass-loss throughout the final stages of stellar evolution. For each of the three cases, we have detected a disc/torus around the central ionising source in the mid-infrared with VLTI. The first two objects contain discs composed of silicate dust, while the latter contains a torus of carbonaceous material. Their intrinsic geometric and physical properties have been determined with the use of radiative transfer modelling.

X-ray wind tomography of IGR J17252-3616

Manousakis Antonis (ISDC Data Center for Astrophysics)
Walter Roland (ISDC)

IGR J17252-3616, a highly absorbed High Mass X-ray Binary (HMXB) with Hydrogen column density N¬H~(2-4) 1023 cm-2, has been observed with XMM-Newton for about one month. Observations were scheduled in order to cover the orbital-phase space as much as possible. IGR J17252-3616 shows a varying column density NH and Fe K? line when fit with simple phenomenological models. A refined orbital solution can be derived. Spectral timing analysis allows derivation of the wind properties of the massive star.

Probing evolutionary trends in close binaries from observed period changes

Nanouris Nikolaos (University of Athens)
Kalimeris Anastasios (Technological and Educational Institute of the Ionian Islands), Antonopoulou Evgenia (National and Kapodistrian University of Athens), Rovithis-Livaniou Helen (National and Kapodistrian University of Athens)

O-C diagrams analysis offers an opportunity to view the very late orbital evolution history (about 100 yrs) of nearly synchronized close binaries. The orbital period function P(E) becomes known in this way and hence it can be related with the most important physical mechanisms that modulate the orbital period of such binary systems through dJ/dt - dP/dt (angular momentum - orbital period relations). Given the dP/dE function and a variety of the implemented parameters, analytic parametric solutions can be sought in order to have estimations of the action of the most important of the physical mechanisms driving the observed orbital period variation trends. Preliminary analytic parametric solutions of such a generalized (non-conservative) dJ/dt - dP/dt equation involving mass loss, magnetic braking and tidal evolution are presented here for some detached synchronized pairs (mainly members of the RS CVn group) whose orbital period variations are known by O-C diagram analysis.

Photometric monitoring of GSC 2696-2622 variability

Nanouris Nikolaos & Antonopoulou Evgenia (University of Athens)

The present poster deals with the possible variability of GSC 2696-2622. Our work focuses on high resolution and precision photometric observations taken by two observatories. The results, supported by Fourier analyses, confirm that the star is a semi-periodic one with variable amplitude that varies in hourly timescales.

Monitoring of the Cataclysmic Variable TW Tri

Papadimitriou Christos (National Observatory of Athens / IAA)
Giannakis Omiros (Institute of Astronomy and Astrophysics (IAA/NOA)), Kolokotronis Vaggelis (Institute of Astronomy and Astrophysics (IAA/NOA))

We present white light CCD photometry and Fourier power spectrum analysis of the dwarf nova TW Trianguli (TW Tri). Data have been collected from eight different epochs between September 2006 and September 2008, using the 1.2 m Kryoneri telescope of the National Observatory of Athens in Greece. The aim is to explore in detail the photometric properties of the system and compare results with spectroscopic findings.

A Study on Interstellar Communication: The Prerequisite for Interstellar Expansion

Petridis Marios (Apple INC, University of Athens)

In this paper we explore the possibility of communication between two technologically advanced civilizations within our Milky Way's spiral, working under the supposition that at least two of them do exist. First, we provide a definition of what we consider as effective communication. Then, we calculate the possibility of two technologically advanced civilizations arising in specific distances within specific time intervals and calculate initial proximity conditions in relation to total number of technologically advanced civilizations within a Milky Way's spiral. Given that, we estimate whether proximity conditions are adequate by themselves for communication between technologically advanced civilizations and explain why they aren't. As a next step we search the prerequisites needed for expansion of a technologically advanced civilization upon habitable planets within the Milky Way's spiral and demonstrate why the property of expansion is critical for communication. We propose a model simulating realistically the expansion of a technologically advanced civilization within its spiral inside the Milky Way and use it to draw results thereof. Our proposed model of expansion is created thus, as to be able to draw directly upon the results of the recently launched Kepler Mission when these are produced, in order to provide us with a more accurate estimation of how difficult interstellar expansion really is. We further investigate the time needed for expansion to take place and the percentage of existing planets that it covers, if it occurs. Last we deduce the possibility of communication between two technologically advanced civilizations in relation to their initial proximity, their possibilities of displaying expansion, the duration of each such expansion and the percentage of planets that the expansion may cover. Using this result we are able to draw conclusions involving the issues of why humanity has not been contacted yet by another technologically advanced civilization (giving an effective answer to the so called "Fermi paradox") and what technology humanity would have to eventually develop in order to expand and communicate with other civilizations in the Milky Way Galaxy by its own initiative.

Post Common Envelope Binaries from the SDSS

Pyrzas Stylianos (ING / University of Warwick)

While the majority of (wide) binaries evolve as if they were single stars, a fraction of them is expected to undergo a common envelope phase (CEp), giving birth to close binaries. The classes of objects affected by the CEp include supernova Ia progenitors, low mass X-ray binaries, ultracompact binaries and progenitors of short gamma ray bursts. Thus, Post Common Envelope Binaries (PCEBs), i.e. binaries that have undergone a CEp during their evolution, play a key role in our understanding of close binary systems. Despite the clear importance, the current theoretical understanding of the CE phase and its products is rather poor and underconstrained by observations. In this talk, I will present an ongoing project, aiming to build a large, well-defined sample of PCEBs, identified in the Sloan Digital Sky Survey (SDSS), with observationally determined stellar parameters. I will refer to the current status of the project, focus on the methods and techniques used and present important first results.

VSAA: A program for time-frequency analysis in time-series.

Tsantilas Sotirios (University of Athens)
Livaniou-Rovithis Helen (University of Athens), Latkovic Olivera (Belgrade Astronomical Observatory), Cseki Attila (Belgrade Astronomical Observatory)

The VSAA code (Tsantilas & Livaniou 2007) has been developed to address the problem of tracing a single variable frequency through a given time-series. It is designed to perform accurate TFA analysis in cases of single variable frequencies. VSAA analyzes time-series of any type in the joined time-frequency domain, and thus provides an accurate description of the time variation. This makes the method ideal for tracing single variable periodicities and can be applied in many scientific fields like Physics, Medical Sciences, Economics, and Social Sciences. In Astronomy, it has been already applied to the orbital period variation of binaries, to the Blazhko effect of pulsating stars and to the sunspot activity. For this code, a Graphical User Interface (GUI) has been developed, making the use of the program easy, quick and practical. All the parameters of the analysis are easily accessible and the results are given in the form of both diagrams and tables. The program can be installed on any Windows OS platform and it is freely available through the www.phys.uoa.gr/VSAA website. In this site one can find the free installer and also informations, tutorials and news about the development of the program.

Light curve analysis of the ES UMa binary

Tsantilas Sotirios (University of Athens)
Kleidis Stelios (Helliniki Astronomiki Enosi), Livaniou-Rovithis Helen (University of Athens)

The variability of ES UMa (GSC 4383.0384) was found through visual observations carried out by J. Kyselý and K. Hornoch and confirmed by D. Hanžl in 1993. Since then, only a couple of light curves have been published in the literature. We present here a number of multi-night photometric observations of this system, carried out from 28/2/07 to 2/6/07 in B,V, R and Ic filters. From these observations, a light curve solution has been acquired with the use of the PHoEBe program (Prša & Zwitter 2005).

On the Generation of Entropy in Jet-Launching Discs

Tzeferacos Petros (University of Turin)
Ferrari Attilio (University of Turin, Italy), Mignone Andrea (University of Turin, Italy), Zanni Claudio (INAF-Osservatorio Astronomico of Turin, Italy), Bodo Gianluigi (INAF-Osservatorio Astronomico of Turin, Italy), Bodo Gianluigi (INAF-Osservatorio Astronomico of Turin, Italy), Massaglia Silvano (University of Turin, Italy)

A common approach for the interpretation of such astrophysical objects as active galactic nuclei (AGN) and young stellar objects (YSOs) are the MHD models of collimated outflows, driven by accretion discs in the proximity of a central attractor. In this study we present a series of time dependent axisymmetric numerical simulations (performed with the PLUTO code) of a jet-launching accretion disc, where both the outflow and the disc itself are treated consistently. In particular the issue of entropy generation due to anomalous transport coefficients is being addressed. The relevance of Ohmic and viscous heating is examined, in the context of its influence in the mass loading process. Since the ejection rates determine to a great extent the dynamics of the out-flowing plasma, thermal effects play too much of an important role to be ignored. We discuss in detail the characteristics of the numerical solutions and establish the relationship between heating and various important parameters of the ouflows (magnetic lever arm, ejection efficiencies, mass fluxes etc.) that can be then cross-checked with observations.

Session 3: Extragalactic Astrophysics and Cosmology

Suzaku Analysis of A1800

Aktekin Ebru (Akdeniz University of Antalya)

In this work we present the analysis results of Abell 1800 clusters of galaxies obtained from X-ray observation by Suzaku satellite. A1800 is a nearby (z=0.0755) cluster, locating at RA=13h49m41s, DEC=+28d04.1m. The intra cluster hot plasma properties are studied by XIS detector. Radial profile is studied in order to understand ICM morphology and dynamical history of the cluster. Based on the imaging and spectral analysis we try to understand structural evolution and merger history of A1800. In this work, X-ray analyasis of Suzaku sattellite data of a cluster of galaxies A1800 is presesented.

An updated look at the XRB synthesis models

Akylas Athanassios (National Observatory of Athens / IAA)

We examine XRB synthesis models under different assumptions in the input parameters. In particular, we use updated x-ray spectral models, based on Monte Carlo simulations, to include the effect of Compton Scattering in the spectra of Compton-thick sources.

DACs and SACs in the spectra of the quasars PG 0946+301 and PG 1254+047

Antoniou Antonios (University of Athens)

In this paper we investigate the physical properties of Broad Absorption Line Regions (BALRs) of the BALQSOs PG 0946+301 (Z=1.216) and PG 1254+047 (Z=1.024) by applying Danezis et al. model (GR model) on their spectra. Specifically, we study the C IV ?? 1548.187, 1550.772 ? and Si IV ?? 1393.755, 1402.77 ?, UV resonance lines. We found that their peculiar profiles are created by a number of Satellite Absorption Components (SACs). An exceptional phenomenon that we observed is that the C IV doublet of PG 0946+301 is one of the very few lines that present clearly Discrete Absorption Components (DACs), in the case of quasars. Finally, we calculate some kinematical parameters such as the apparent radial (Vrad) and rotational (Vrot) velocities of the regions where the studied lines are created, as well as the random velocities (Vrand) of the studied ions.

Small Magellanic Cloud: Star-formation history and X-ray binary populations

Antoniou Vallia (Harvard-Smithsonian CfA)
Zezas Andreas (University of Crete & Harvard-Smithsonian CfA), Hatzidimitriou Despina (University of Crete), Kalogera Vicky (Northwestern University)

Using Chandra, XMM-Newton and optical photometric catalogs we study the young X-ray binary (XRB) populations of the Small Magellanic Cloud. We find that the Be/X-ray binaries (Be-XRBs) are observed in regions with star-formation (SF) rate bursts ~25-60 Myr ago. The similarity of this age with the age of maximum occurrence of the Be phenomenon (~40 Myr) indicates that the presence of a circumstellar decretion disk plays a significant role in the number of observed XRBs in the 10-100 Myr age range. We also find that regions with strong but more recent SF (e.g. the Wing) are deficient in Be-XRBs. By correlating the number of observed Be-XRBs with the formation rate of their parent populations, we measure a Be-XRB production rate of ~1 system per 10^{-6} M_{sun}/yr. Finally, we use the strong localization of the Be-XRB systems in order to set limits on the kicks imparted on the neutron star during the supernova explosion.

UGC - Unresolved Galaxy Classifier for ESA's Gaia Mission

Bellas-Velidis Ioannis (National Observatory of Athens / IAA)
Kontizas Mary (University of Athens), Livanou Evdokia (University of Athens),
Tsalmantza Paraskevi (Max-Planck Institute fur Astronomie, Heidelberg)

Unresolved Galaxy Classifier, UGC, a software package for galaxy spectra classification and astrophysical parameters estimation is presented. UGC is developed, as part of the ground-based pipeline software of ESA's Gaia mission, in the frame of the Data Processing & Analysis Consortium (DPAC). It is provided to analyze low-dispersion spectra of unresolved galaxies that will be observed with Gaia BP/RP instrument. The classifier algorithm is based on Support Vector Machines (SVM), a supervised learning technique. The system is "trained" using galaxy spectra with a priori known galaxy type and its astrophysical parameter values. The so trained system can be applied to unknown spectra. A library of galaxy BP/RP spectra simulated with GAIA Object Generator is used for UGC learning purposes. The library is based on a set of synthetic galaxy spectra which we produced applying the Pegase software for galaxy spectra evolution. UGC software is implemented in Java in accordance with DPAC requirements. It consists of an offline SVM-learning module and of a pipeline's application module. The learning module provides functions for the development of SVM-models, their tuning, training and testing. These models can then be used repeatedly by the application module. It is applied to unlabelled galaxy spectra and estimates the galaxy type and the parameter values. The tests showed very good performance of UGC and its applicability for the pipeline. The software is already delivered and approved by Gaia DPAC. Development of next version is in progress.

Structural Analysis of Abell 3560 Clusters of Galaxies

Bozkurt Mustafa (Bogazici University)

In this work we study A3560 clusters at Shapley concentration. A3562 and A2558 are the closest neighbors (< 8 Mpc). Imaging analysis shows that ICM is symmetric and relaxed. It is elongated towards south-east to north-west direction which is the direction of A3558. This is interpreted as the evidence of higher probability of mergers as the cost of being a member of super cluster. Temperature and metal distributions are further analyzed to funderstand underlying physics in the vicinity of A3560.

Effects of hadronic reactions on the temporal evolution of the nonthermal emission of active galactic nuclei

Dimitrakoudis Stavros & Mastichiadis Apostolos (University of Athens)

We present the method and first results of a self-consistent model for the acceleration and losses of protons in compact sources, taking into account both Bethe-Heitler pair production and photomeson reactions in the coupling between the hadronic and leptonic components. The distributions of protons, photons, electrons, neutrons and neutrinos are calculated simultaneously from their respective non-linear, coupled kinetic equations, and their evolution in time is shown for a choice of initial parameters.

Proton acceleration and radiation in astrophysical shocks

Dimitrakoudis Stavros (University of Athens)
Meli Athina (Erlangen Center for Astroparticle Physics), Mastichiadis Apostolos
(University of Athens)

We study the primary proton spectra and the energy distribution of secondaries arising from non-relativistic and relativistic shock acceleration in the presence of ambient photon fields, as an application to Supernovae and Active Galactic Nuclei jet environments. For this purpose we have developed a two-fold numerical code, which simulates the diffusive shock acceleration mechanism in the test particle limit, and includes the energy losses of the protons from

processes such as photomeson and Bethe-Heitler pair production on black body radiation fields of various temperatures. We show that the primary proton spectrum, as well as the ones of the secondary particles, carries characteristic imprints of the ambient photon fields in their maximum energies and flux. These results can be of relevance to future extragalactic neutrino observations.

Heavily Obscured AGN in X-ray Surveys

Georgantopoulos Ioannis (National Observatory of Athens / IAA)

We present our recent results for the identification of heavily obscured AGN (Compton-thick sources) in the deepest X-ray observations available. These are sources which have column densities ($>10^{24}$ cm^{-2} or $A_V > 400$) and may form a large fraction of AGN. We identify candidate Compton-thick sources directly through X-ray spectroscopy and we examine their mid-IR (Spitzer) properties. We finally compare with IR methods which attempt identify candidate Compton-thick sources on the basis of their intense 24micron relative to optical flux.

Observations of Radio relics and Haloes in Xray selected Cluster sample. The physical nature of the intra-cluster cosmic rays.

Gizani Nectaria (Hellenic Open University)

We review observations of extended regions of radio emission, known as `relics' and `halos', in an X-ray selected cluster sample. X-ray observations together with Faraday rotation measurements of background and cluster radio sources, provide the main evidence of large-scale intra-cluster magnetic fields and of significant densities and acceleration mechanisms of relativistic electrons. Radio spectral observations are indicative of ageing of the emitting particles. We also investigate the correlation between cluster X-ray luminosity and radio power of halos. Most cool core clusters of galaxies possess active galactic nuclei (AGN) in their centres. These AGN produce bubbles of non-thermal radio-emitting particles. If these bubbles efficiently confine cosmic rays (CRs) then this could explain `radio relics and halos' seen away from cluster centres. Cosmic rays (CRs) preserve the information about their injection and transport processes, providing unique window of current and past structure formation processes. We report on the work in progress and future plans.

Dusty AGN with Spitzer and Herschel

Hatziminaoglou Evanthia (ESO - Garching)

The physical properties of in active galactic nuclei (AGN) can be derived from the comparison of their observed Spectral Energy Distributions (SEDs) and models describing the dust in the pc-to-kpc range from the nucleus. The aim of this work is to model the observed SEDs of large samples of type 1 and type 2 AGN and derive the hot (torus) and cold (starburst) dust properties. The results of the study, primarily based on Spitzer IRAC and MIPS photometry, favour the receding torus paradigm, i.e. the dependency of the dust geometry on the accretion luminosity. They are also in support the AGN Unified Scheme, according to which the diversity of the observed properties of AGN are the result of the different lines of sight with respect to the obscuring material surrounding the active nucleus. Herschel will soon provide a full sampling of the far-infrared and submm domain. This data will better constrain the starburst component of the models and will allow disentangling the AGN and starburst contributions.

X-ray Picture of Super Clusters of Galaxies

Hudaverdi Murat (TUBITAK Space Technologies Research Institute)

Clusters of galaxies are the largest entities of the universe. Galaxies gravitationally attract each other and form galaxy groups (~50) or galaxy clusters (>100). Nevertheless galaxy clusters are not the end of the formation. Clusters are further get together and form super

clusters. Recent simulations and observations showed that universe forms cosmic filaments and cosmic voids based on the hierarchical formation of structure. In this work we present analysis results of SCC100 and Shapley. There are many unknown and previously unstudied clusters of galaxies from the fields. Using the x-ray satellite observation we try to understand mutual interactions of these structures. Since they are the best representatives of the universe, we try to address large scale properties of the universe.

The SMC RR-Lyrae variables and their metal abundances

Kapakos Efstratios (University of Athens)
Hatzidimitriou Despina (University of Crete), Soszynski Igor (Warsaw University Observatory)

We present derivations of the metal abundances ([Fe/H]) of 472 RR-Lyrae variables of RRab type in the Small Magellanic Cloud, based on extended and merged/combined data provided by OGLE II and OGLE III projects. Fourier decomposition of the 11-year V-band light curves of the variables and Monte Carlo simulations have been used to derive Fourier parameters which are related to [Fe/H]. The distribution of the derived metal abundances is examined in relation to the star formation history and chemical evolution of the Small Magellanic Cloud. Moreover, we examine possible correlations between metal abundance and projected distance from the dynamical center of the SMC.

Star complexes and stellar populations in NGC 6822

Karampelas Antonios (University of Athens)
Kontizas Evangelos (National Observatory of Athens / IAA), Dapergolas Anastasios (National Observatory of Athens / IAA), Livanou Evdokia (University of Athens)

Star complexes (large scale star forming regions) seem to belong to a star formation hierarchy, in which stars form in hierarchically clustered systems from sub-parcec to kiloparcec scales. Their properties (size, age, stellar content) seem to be universal, revealing their importance in studies of star formation in galaxies and in galaxy evolution. We have traced and mapped the star complexes of the Local Group dwarf irregular galaxy NGC 6822 and compared with the star complexes of the Magellanic Clouds. Indications of hierarchical star formation, in terms of spatial distribution, time evolution and preferable sizes were found in NGC 6822 and the Magellanic Clouds. Moreover, the spatial distribution of stellar populations of various age in NGC 6822 has indicated traces of an interaction, dated before 350 Myr.

A multi-wavelength analysis of a statistically complete sample

Karouzos Marios (Max Planck for Radioastronomy)

In the context of structure evolution in the Universe, the role of active galactic nuclei (AGN) is not clear. The central (super)massive black hole, assumed in the centers of most galaxies, is tied to the evolution of the galaxy itself. Binary black hole (BBH) systems will play a key role in our understanding of galaxy evolution and AGN activity. So far, there are only a few systems identified as BBH (NGC 6240, 3C 75). We investigate the statistically complete Caltech-Jodrell Bank flat-spectrum (CJF) sample of radio loud AGN, in search of AGN in different stages of evolution, and in particular of BBH systems. In this talk, I will first briefly discuss the criteria which one can use in the search for BBH. I will present results of the statistical investigation of the properties (emission, morphologies, black hole masses, etc.) of this sample and will discuss the correlations found between them. I will also present different sources of the CJF sample as candidate tracers for different evolutionary phases. An outlook of the next steps in this project will also be given.

The Activity of The Neighbours of AGN galaxies.

Koulouridis Elias (National Observatory of Athens / IAA)

We present a study concerning the role of interactions as a possible triggering mechanism of the activity of AGN galaxies. We have already studied the near (<100 kpc) and the large scale environment (<1 Mpc) of Seyfert and Bright IRAS galaxies (BIRG) and the results led us to the conclusion that a close encounter appears capable of activating a sequence where a normal galaxy becomes first a Starburst then a Sy2 and finally a Sy1 galaxy. Since both galaxies of an interacting pair should be affected, we present a spectroscopic analysis of the neighbouring galaxies of our Seyfert and BIRG samples. We found that more than 70% of all neighbouring galaxies exhibit thermal/or non thermal activity and furthermore we discovered various trends regarding the type and strength of the neighbour's activity with respect to the activity of the central galaxy, the most important of which is that the neighbours of Sy2s are systematically more ionized, and their starburst is younger, than the neighbours of Sy1s. Our results strengthen the link between interactions and activity and provide more clues regarding an evolutionary sequence of activity.

X -RAY ACTIVE GALACTIC NUCLEUS ANGULAR CLUSTERING AND THE DEPENDENCE OF LUMINOSITY AND REDSHIFT

Koutoulidis Lazaros (University of Patras)

We present angular clustering of X-ray selected Active Galactic Nuclei(AGN) of the Chandra Deep Field North (CDF-N), South(CDF-S) and the AEGIS-X surveys. The 2Ms CDF-N and 2Ms CDF-S cover an area of 448 and 391 arcmin^2 respectively. The AEGIS-X survey comprises pointings at 8 separatepositions,each with nominal exposure 200ks, covering a total area of approximately 0.67deg^2 in a strip of length 2 degrees. Most XMM and Chandra clustering analyses provide results in contradiction that arose from the apparent differences in their respective clustering lengths. Specifically we compute the angular clustering not only for the whole sample, but also in different flux limited subsamples in order to investigate faint fluxes and so different luminosities. In addition, we split the sample in different redshift bins using spectroscopic distances which are available. This will allow us to examine if the clustering evolves with time or if the main parameter which affects the clustering is luminosity.

Energy Estimation of Ultra High Energy Cosmic Hadrons by Lateral Distribution Functions of Extensive Air Showers

Koutsokosta Dimitra (University of Athens)
Geranios Athanasios (University of Athens, Nuclear and Particle Physics Department), Mastichiadis Apostolos (Physics Department, Section of Astrophysics, Astronomy and Mechanics, University of Athens), Malandraki Olga (Institute for Astronomy and Astrophysics, National Observatory of Athens), Rosaki-Mavrouli Helen (Nuclear and Particle Physics Department, University of Athens), Maltezos Stavros (Physics Department, School of Applied Sciences, National Technical University of Athens)

The determination of energy of Ultra High Energy Cosmic Rays (E > 5x1019 eV) is one of the important issues concerning these particles. For this purpose, Monte Carlo simulations are used to create a large number of vertical and inclined extensive air showers in order to estimate the primary energy based on the lateral distribution function of recorded electrons and muons. This methodology could be applied to all cosmic ray experiments using a surface array of Cerenkov detectors, like, for example, the P. Auger Observatory.

Early-type dwarf galaxies in the M81 group

Lianou Sophia (ARI, University of Heidelberg)
Grebel Eva (ARI, University of Heidelberg), Koch Andreas (Department of Physics and Astronomy, University of Leicester)

The M81 group is a highly interacting one consisting of a few large galaxies and about 40 currently known dwarf galaxies of both early- and late-type, thus making it an important nearby laboratory to study environmental effects and the role of interactions in the formation and evolution of dwarf galaxies. We are using the resolved stellar populations of the early-type dwarf galaxies in this group to derive the photometric metallicity distribution functions and study the potential presence of population gradients.

Typical galaxy synthetic spectra for Gaia at high and low resolution

Livanou Evdokia (University of Athens)
Kontizas Mary (University of Athens), Rocca-Volmerange Brigitte (Institut d'Astrophysique de Paris), Tsalmantza Paraskevi (Max-Planck-Institut für Astronomie, Heidelberg), Bellas-Velidis Ioannis (National Observatory of Athens / IAA)

A library of synthetic spectra of galaxies has already been produced with PEGASE2. code in order to contribute to the data reduction of the Gaia space mission. The synthetic spectra allow us to correlate characteristic Spectroscopic and Photometric features of the observed galaxies with the values of the Astronomical Parameters that were used in order to produce the synthetic spectra. Consequently they can be used for training appropriate classification and regration software. So the Gaia observed spectra of galaxies, given as inputs to this software, allow us to derive the characteristic values of the real galaxies. However, the continuous progress of the Gaia preparation enables us to test more specific cases of spectra sets. Thus 407 more spectra which cover deferent geometry and redshift cases were produced in order to be included to the Gaia Simulation Group. Their task is preparing the Universe Model, a synthetic representation of the sky, as will be seen through Gaia. Moreover the scientific community working with radial velocities requires also high resolution synthetic spectra. These spectra are produced with PEGASE-HR, an improved version of PEGASE2 code which is using a high resolution stellar library, adjusted to the Gaia observed wavelength range.

Spherical collapse with Modified Newtonian Dynamics

Malekjani Mohamad (Bu-Ali-Sina University)

Modeling the structure formation in the universe, we extend the spherical-collapse model in the context of modified Newtonian dynamics (MOND) starting with the linear Newtonian structure formation followed by the MONDian evolution. In MOND, the formation of structures speeds up without a need for dark matter. Starting with the top-hat overdense distribution of the matter, the structures virialize with a power-law profile of the distribution of matter. We show that the virialization process takes place gradually from the center of the structure to the outer layers. In this scenario, the smaller structures enter the MONDian regime earlier and evolve faster, hence they are older than larger structures. We also show that the virialization of the structures occurs in the MONDian regime, in which the smaller structures have stronger gravitational acceleration than the larger ones. This feature of the dynamical behavior of the structures is in agreement with the fact that the smaller structures, as the globular clusters or galactic bulges, have been formed earlier and need less dark matter in cold dark matter scenario.

Hadronic Gamma Ray Burst Models

Mastichiadis Apostolos (University of Athens)
Kazanas Demosthenes (NASA/GSFC)

We examine the evolution of the Relativistic Blast Wave associated with Gamma Ray Bursts (GRBs) from its early acceleration phase to its later deceleration one. We assume that at each radius electrons and protons are injected with Lorentz factors equal to that of the flow with a rate that is proportional to the external density. We show, by solving the coupled kinetic equations for protons, electrons and photons, that this simple scheme can lead to photon flares which have many characteristics of a classic GRB. We will present examples puting emphasis in those cases where this picture leads naturally to a MeV - GeV evolution during the prompt phase.

Mapping dark matter properties with strong gravitational lensing

Moustakas Leonidas (JPL/Caltech)

Strong gravitational lensing on cosmological scales can be affected in several independent ways by the distribution of dark matter on many scales. Depending on the particulars of the cross-section properties of the as-yet unknown dark matter particle or particles, the matter power spectrum may have features that are detectable through the right set of strong lensing observations. I will present new results on how strong lensing may become an important probe of constraining the nature of dark matter.

Density profiles of star clusters in the Magellanic clouds

Nikolov Grigor (Sofia University & NKUA)

LMC and SMC provide the unique opportunity to study young and populous star clusters, some of them elliptical in shape, or members of a multiple system, which are almost absent in the Milky Way. We have selected a sample of young LMC clusters, some of them a multiple system candidates, to investigate them by means of number density profiles. This technique allows us to determine the radial distribution of the stars of different magnitude. Since the brighter stars have bigger masses than the faint stars, the profiles can be used to trace mass-segregation in the clusters. We have fitted a King-like model to determine the core radius and the concentration of the stars for each magnitude range. We have used data from the WFPC2 on the Hubble Space Telescope, which has spatial resolution good enough to resolve the crowded central regions of the clusters. For a PSF fitting photometry we have used the HSTphot package, especially developed for WFPC2 images reduction. Here we present and discuss the density profiles and the derived parameters for the selected cluster sample. Some of the clusters show indications of mass-segregation.

On the synchrotron and SSC emission of GRB afterglows -- Some analytical results

Petropoulou Maria & Mastichiadis Apostolos (University of Athens)

We present analytical and numerical results of the electron radiation spectrum during the GRB afterglow phase as produced by an external shockwave. For this we solve the electron kinetic equation assuming a power-law injection and cooling due to synchrotron radiation. We then use the derived solution at each radius and calculate the synchrotron and SSC photon spectra. We present analytic solutions of the above equations when this is possible. As a second step, in order to include processes which cannot easily be treated analytically, such as SSC losses and photon-photon absorption, we have used a numerical code which can solve the PDE for the electron and photon evolution simultaneously by including these processes. Finally, we discuss numerical results of the above equations in cases where cooling is dominated by SSC losses.

Cosmology from Gamma Ray Bursts

Pouri Athina (University of Athens)

Several interesting correlations among Gamma Ray Burst (GRB) observables with available redshifts have been recently identified.Proper evaluation and calibration of these correlations may facilitate the use of GRBs as standard candles constraining the expansion history of the universe up to redshifts of z>6. In this work, we attempt to place constraints on the main cosmological parameters of spatially flat cosmological models by using the recent GRB data.

Swift-BAT and Fermi-GBM GRB Inter-Calibration Results

Stamatikos Michael (The Ohio State University / CCAPP)

We report on recent inter-calibration studies featuring Swift's Burst Alert Telescope (BAT) and Fermi's Gamma-ray Burst Monitor (GBM) based upon correlated observations of GRBs, via their resultant joint spectral energy fit analysis. Swift's intrinsic multi-wavelength instrumentation and dynamical response complement Fermi's superior energy range. The addition of BAT's spectral response will (i) facilitate in-orbit GBM detector response calibration, (ii) augment Fermi's low energy sensitivity, (iii) enable ground-based follow-up efforts of Fermi GRBs, and (iv) help identify a subset of GRBs discovered via off-line GBM data analysis, for an annual estimate of ~30 GRBs. The synergy of BAT and GBM augments previous successful joint spectral fit efforts by enabling the study of peak photon energies (Epeak), while leveraging the over eleven energy decades afforded by Fermi's Large Area Telescope (LAT), in conjunction with Swift's X-Ray (XRT) and Ultraviolet-Optical (UVOT) Telescopes, for an unprecedented probe of broad-band spectral and temporal evolution, throughout their contemporaneous orbital tenure over the next decade.

Molecular gas properties in Luminous Infrared Galaxies: steping up the CO J-ladder towards the star forming phase

Xilouris Manolis (National Observatory of Athens / IAA)
Papadopoulos Padelis (University of Bonn, Argelander-Institut für Astronomie)

We report the results of our large molecular line survey of Luminous Infrared Galaxies (LIGs) conducted with the JCMT and the IRAM 30-m telescopes, aiming at a detailed picture of the molecular gas properties in vigorously star-forming systems in the local Universe. We find exceptionally bright CO J=4-3 lines sharply making the emergence of the star forming molecular gas phase in the global CO line luminosities of LIGs. For several of the most IR-luminous systems the high-excitation CO J=6-5 line is found to be very faint incompatible with the excitation state of the large amounts of warm and dense molecular gas fueling the extreme star formation in such galaxies. We find that large dust optical depths at submillimeter wavelengths are likely responsible for surpressing this line into a nearly blackbody dust emission.

Modification of blazar spectrum due to internal and intergalactic absorption

Zacharopoulou Olga (MPIK)

Blazars are known TeV emitters. The gamma rays they produce are attenuated by the Extragalactic Background Light (EBL) through gamma-gamma absorption producing electron-positron pairs. Using current models for the EBL we can deabsorbe the observed blazar spectrum. Following this, some of the deabsorbed spectra appear too hard. We introduce a model that can produce arbitrarily hard spectra. The key element in this procedure is internal absorption. We assume protons are accelerated to high energies by blobs in the relativistic outflow, subsequently emitting gamma rays via synchrotron radiation which are then absorbed

by the radiation fields present in their production region (internal absorption). The electron-positron pairs that are created produce additional synchrotron radiation but at lower energies, forming the X-ray bump in the spectral energy distribution (SED). We will present the results of fitting the blazar's SED within the framework of this model.

Session 3: Dynamical Astronomy & Relativistic Astrophysics

The Rotating and Accelerating Universe

Chaliasos Evangelos (Freelance)

An attempt is made to explain the spiral structure of spiral galaxies through a possible rotation of the Universe. To this end, we write down a possible form of the metric, and we calculate the necessary quantities (Rik, Tik, …) in order to form the Einstein equations. We find the two Einstein equations pertaining to the Robertson-Walker metric and no rotation at all in this way, if we assume p+e different from 0. There are introduced then two suitable rotational motions in the universe, and we try to generalize again the Robertson-Walker metric in this way. The result is again null, since it is found that the corresponding angular velocities must vanish, for not vanishing p+e. A third attempt is finally done, without restricting ourselves to generalize any existing cosmological model. We introduce again two suitable rotational motions, and we form the appropriate Einstein equations. After solving them, we find that the two rotations, corresponding to the usual rotations on a torus, dictate again the equation of state p+e=0. This solution is a steady state one, and it describes naturally the observationally discovered acceleration of the Universe (1998), without a cosmological constant and the ambiguous dark energy. For reference see: astro-ph/0601659.

Orbital structure in barred-spiral galaxies

Harsoula Mirella (RCAAM / Academy of Athens)
Kalapotharakos Constantinos (Center for Astronomy, Academy of Athens, Soranou Efesiou 4 GR 11527), Contopoulos George (Center for Astronomy, Academy of Athens, Soranou Efesiou 4, GR 11527)

Using frequency analysis we study the orbital structure of self-consistent N-body configurations simulating rotating barred-spiral galaxies. We find that chaotic orbits play a major role in supporting the outer envelope of the bar as well as the rings and spiral arms. The explanation is given by studying the different types of stickiness on the 2-D surfaces of section of the phase space of our experiments.

Orbital distributions in elliptical galaxies via appropriate SCF basis sets

Kalapotharakos Constantinos (RCAAM, Academy of Athens)

We address the question of an appropriate choice of basis functions for the self-consistent field (SCF) method of simulation of the N-body problem. Using the improved SCF code, we make a detailed orbital analysis for a wide range of systems representing smooth centre elliptical galaxies in equilibrium. We reveal the role of chaos and the significance of the various types of regular orbits in these systems.

The orbital behavior at the neighborhood of Periodic orbits with high order Multiplicity in 3D Galactic Potentials

Katsanikas Matthaios & Patsis Panos (Academy of Athens)

The purpose of this paper is the study of the structure of the Phase space in galactic potentials of three degrees of Freedom.A Basic problem we have to overcome is to visualize the 4D surface of section in a 3D Autonomous Hamiltonian system. The method used is the method of color and rotation (Patsis and Zachilas 1994). We apply this method to some cases of families of 7-periodic orbits (with multiplicity 7) in a 3D potential, which describes the potential of the Milky Way (Miyamoto and Nagai 1975). We describe the differences in the orbital behavior at the neighborhood of Stable and Simple Unstable Periodic Orbits.

Astrophysical observations of collapsing stars.

Kryvdyk Volodymyr (Taras Shevchenko National University of Kyiv)

There are the some problems for the astrophysical observations of collapsing stars. Above all now the theories can indicate only on the stars types that can collapse to SNe, but we can not point to the location SNe before their explosion. This fact is principal problem in the observation of presupernovae collapsing stars. We propose of the program for search of collapsing presupernovae using the non-thermal emission of the particles in the magnetospheres of collapsing stars. This emission generate when the star magnetosphere compress during collapse and its magnetic field increases considerable. The electric field thus produced involves acceleration of charged particles, which generate radiation when moving in the magnetic field. Thus the presupernovae can be the powerful sources of the non-thermal radiation when before a supernova flares, the star compress and emit bursts. These bursts can be observed by means of modern instruments (radio, X- and gamma- telescopes).

Response models of barred-spiral galaxies

Tsigaridi Eliana (RCfA, Academy of Athens & University of Athens),
Patsis Panos (RCfA, Academy of Athens)

We construct a series of response models to external barred-spiral perturbations that lead to a variety of morphologies depending on the pattern speed, the amplitude and the initial conditions of the models. Our goal is to associate observed morphologies to characteristic model parameters behind them. In our posters we present the first results of our study.

What nature thinks about "chaotic" spirals - The stellar flow in three barred-spiral systems

Patsis Panos (RCfA, Academy of Athens)

The orbital content in three barred-spiral galaxies (NGC~4314, NGC~3359, NGC~1300) points to the fact that spirals made out of stars in chaotic motion is just one of the possible scenaria for the dynamics of such objects. The best agreement between numerical models and observations in these three cases is obtained by three different dynamical mechanisms, which will be presented in this talk. We will discuss also several morphological features that could help in distinguishing between the various cases.

Session 5: Astronomical Infrastructures

ARISTARCHOS Instrumentation: Meaburn Measuring Filter Spectrometer (MMFS)

Boumis Panayotis (National Observatory of Athens / IAA)
Xilouris Emmanouel (National Observatory of Athens / IAA), Giannakis Omiros (National Observatory of Athens / IAA), Maroussis Athanassios (National Observatory of Athens / IAA), Katsiyannis Athanassios (National Observatory of Athens / IAA)

The Meaburn Measuring Filter Spectrometer (MMFS) is an optical system which has been designed and manufactured specifically to test the filter's performance (especially the interference ones) before they will be used for imaging or spectroscopy on the telescope. In particular, MMFS measures the filter's bandwidth and provides information on the filter's behavior. The result is the filter's transmission curve (lamda=f(theta); variation of peak transmission wavelength with incidence angle). This spectrometer was used successfully for many years at the University of Manchester's Astronomy Dept. Optical lab and in 2008 was moved to I.A.A.'s Optical lab in Penteli (Athens). Within 2009, MMFS restarted its operation after an optical and electronic upgrade to its system.

ESA's BepiColombo mission to Mercury and the Greek contribution to the Planetary Ion Camera (PICAM)

Daglis Ioannis (National Observatory of Athens / ISARS)
Panagopoulos Ioannis (NOA / ISARS), Torkar Klaus (IWF), Xydis Sotiris (NOA / ISARS), Anastasiadis Anastasios (NOA / ISARS), Orsini Stefano (INAF/IFSI)

BepiColombo is a cornerstone mission of the European Space Agency, in collaboration with the Japanese Space Agency JAXA, to planet Mercury. This planet is poorly known, because the only space-based information comes from three fly-bys performed by Mariner 10 in 1974 and two (up to now) fly-bys performed by MESSENGER – both US missions. The proximity of Mercury to the Sun makes in-situ observations very difficult and technologically demanding. However this proximity to the Sun makes Mercury a most interesting object for space physics. The Planetary Ion Camera (PICAM) for the payload of the Mercury Planetary Orbiter – one of the two spacecraft of the BepiColombo mission – is being provided by an international consortium lead by the Austrian Institut für Weltraumforschung (IWF). PICAM is one of four sensors in the SERENA particle consortium and constitutes an ion mass spectrometer operating as an all-sky camera for charged particles to study the chain of processes by which neutrals are ejected from the soil, eventually ionised and transported through the environment of Mercury. It will provide the mass composition, energy and angular distribution of low energy ions up to 3 keV in the environment of Mercury. The National Observatory of Athens has developed and provided the PICAM Detector Simulator Module (PDSM), which simulates the operation of the PICAM Detector Real Module and will be used by IWF for testing the FPGA Control Unit (FPGACU). The paper presents an overview of the mission, of PICAM and of PDSM.

The New Optical Telescope on Mountain Orliakas in Northwestern Macedonia

Economou Thanasis (University of Chicago)

Significant progress has been achieved in planning for a new optical telescope on mountain Orliakas in Northwestern Greece. I will give you the latest status report and bring you up to date on all the preliminary studies and the current thinking on the specifications of the research telescope.

Applications of the stellar spectrograph of the University of Athens Observatory

Gazeas Kosmas (Harvard-Smithsonian CfA)

The detailed recording of stellar spectra with the medium-resolution stellar spectrograph constructed at the Laboratory of Astronomy and Applied Optics of the University of Athens, allows the spectral classification of stars brighter than 9mag, as well as the measurement of radial velocities of binary systems. After its construction in 2006, and its subsequent modifications, extensive tests and observations confirm that, high quality spectra can be obtained, offering new opportunities for stellar astrophysics in Greece. The primary application of the spectrograph will be the spectral classification and study of eclipsing binaries, where the lack of spectroscopic observations limits the theoretical solutions and models. Measuring the radial velocities of the two members of a system, differential correction and Monte-Carlo approach methods converge easier to a solution, giving more reliable results. The goal of such an application will be to continue the David Dunlap Observatory (DDO) Contact Binary Survey, aiming the determination of radial velocities and distance of contact binaries in our neighborhood. Equally important will be the contribution of such observations in detection and/or identification of binary systems among pulsating variables with similar observational characteristics. The spectrograph can be also used for observations of transient phenomena, such as novae, supernovae, comets and cataclysmic variable stars, but also for support observations of larger telescopes around the world.

Get to know HELYCON – The alternative cosmic ray telescope.

Gizani Nectaria (Hellenic Open University)

The HEllenic LYceum Cosmic Observatories Network is a collaboration between Greek and international Universities as well as national Research Centres and Educators of the western greek prefecture. HELYCON is an original telescope, which detects extensive Air Showers of very energetic cosmic rays coming from galactic and extragalactic sources. It is used not only for scientific purposes, but also for educational ones allowing students, teachers and pupils to participate to the experiment. It consists of scintillation counters and radio antennas. The antennas are used to detect the radio signal coming from the detected cosmic rays. Each station consists of 3 detectors and one antenna. Such stations are distributed over greater Patra, Thessaloniki, and the Chios and Cyprus Islands. HELYCON is also used for the calibration of KM3NeT, the future Mediterranean neutrino telescope. We report on the design, construction and performance of this prototype detector array.

ARISTARCHOS telescope: The final phase

Goudis Christos (National Observatory of Athens / IAA, Univ. Patras)
Hantzios Panayotis (National Observatory of Athens / IAA), Boumis Panayotis (National Observatory of Athens / IAA), Xilouris Emmanouel (National Observatory of Athens / IAA), Katsiyannis Athanassios (National Observatory of Athens / IAA), Maroussis Athanassios (National Observatory of Athens / IAA)

Exhaustive observation tests have been made and detected problems have been confronted by Zeiss. Test observations with the already installed equipment (imaging CCD and ATS spectrometer) have been performed successfully and the commissioning of both instruments is finished. Preliminary tests with the MES-AT spectrometer have been made and commissioning of this instrument is expected within 2009. Further infrastructure at Helmos Observatory (i.e. DIMM telescope, fiber optics and expansion of the existing control room and guest house) is presented.

The Current State of Skinakas Observatory

Papamastorakis Yannis (University of Crete)

Over the past 20 years Skinakas Observatory, at the top of mount Ida, has been operating successfully producing high quality scientific results. A number of new instruments have been recently commissioned at the 1.3m telescope, including a high speed photometer, a near-IR camera, as well as new optical cameras. I will describe the current state of instrumentation, observational capabilities and future plans for upgrades at Skinakas Observatory.

Electrooptics of an experimental quantum-optical photometer

Solomos Nikolaos (Hellenic Naval Academy / R.F.K "EUDOXOS")

The first working version of a new ultra fast three-beam photon counting photometer has been materialized by the Applied Physics / Electrooptics Laboratory of the Hellenic Naval Academy in Piraeus. The instrument is currently being used for quantum-optical atmospheric transmission experiments of green monochromatic light over slant paths at the RFK/EUDOXOS observatories. Actively quenched Single Photon Avalance Diode detectors are deployed. The particulars of the instrument design philosophy and its optomechanical construction will be presented.

Distributed Telescope Networks in the Era of Network-Centric Astronomy

Solomos Nikolaos (Hellenic Naval Academy / R.F.K "EUDOXOS")

We review the rationale, current trends, indicative science cases, educational potential, and lessons learned, based on the long experience of the EUDOXOS' robotic observatories in the field of network-centric observation technologies.

Aspects of the Optomechanical Design of the new 1.4m TCC Reflector

Solomos Nikolaos (Hellenic Naval Academy / R.F.K "EUDOXOS")

The main mechanical and electrooptical characteristics of the new multi-role Telescope "Constantine Caratheodory" will be reviewed, with the emphasis put in the particular features that highlight its science potential and define its place in the capabilities spectrum of our national astronomy assets.

A New Formation Flying Solar Coronagraph

Tsinganos Kanaris (University of Athens)
Daglis Ioannis (National Observatory of Athens/ISARS)

We will briefly describe an investigation focusing on the development of a giant solar coronagraph instrument onboard two satellites, separated by about 100 m in formation flight (FF), for the detailed observation of the solar coronal plasma. FF is considered as the most promising approach to deploy the forthcoming generation of very large instruments in space. FF heralds a new era of coronal studies by allowing the deployment of giant coronagraphs in space capable of continuously observing the inner corona down to the solar limb under conditions of natural eclipses, a goal impossible with present space and ground-based instruments. ESA is taking a leading role in this technology and has proposed an ambitious program starting with the PROBA-3 demonstration mission and culminating with DARWIN, an interferometer aimed at the search of terrestrial exoplanets orbiting nearby stars within their habitable zone. The proposed investigation will be performed in the framework of the ESA STARTIGER program of technology demonstration by a consortium of scientific institutes and industrial partners, led by the Laboratoire d'Astrophysique de Marseille, the University of Athens, Centre Spatial de Liege, INAF-Osservatorio Astronomico Torino and the Rutherford Appleton Laboratory. Other participating organisations are the National Observatory of Athens,

the LATMOS (Laboratoire Atmosphere, Milieux, Observations Spatiales) in France, the University of Padova and the University of Firenze.

H.A.A. & Z.P.O.: Informal Astronomical Education in Greece

Kleidis Stylianos[1],
A. Ayiomamitis[1], S. Kleidis[1,2], N. Matsopoulos[1,2], A. Mylonas[1], J. Yangos[1]
1) Hellenic Astronomical Association (H.A.A.) 2) Zagori Public Observatory (Z.P.O.)

Helliniki Astronomiki Enosi (Hellenic Astronomical Association, H.A.A.), an amateur astronomer's club and Zagori Observatory (Z.P.O.), a public observatory located in Epirus, are two collaborative non-profit organizations pursuing the development of informal astronomical education in Greece. The means employed for this purpose are: training of members in observational techniques and methods, educational seminars by invited lecturers, maintaining an informative website and presence in important public outreach events. Results of these efforts are among others: award winning astrophotography, numerous publications in scientific magazines based on a vast number of photometric observations, close collaboration with organizations like National Observatory of Athens (N.O.A.) and foreign observatories and institutions, Hel.A.S., Universities of Athens and Patras, Hellenic Mathematical Society and others.

Session 6: History and Education in Astronomy

The eternal role of Astronomy in history and civilization

Manimanis Vassilios & Theodossiou Efstratios (University of Athens)

Astronomy is the most ancient of all natural ("positive") sciences. From its roots in the stellar observations of the Babylonians and ancient Egyptians, and through its formulation into a science from the Greek pre-Socratic natural philosophers, it defined the measurement of time by the human societies. The stellar eras and the applications of Astronomy were incorporated in temples, royal palaces, in paintings, sculptures and in Art in general. Many temples and the pyramids of Egypt were built with astronomical orientations; sculptures were based on the ancient stellar eras. Today, the value of Astronomy on practical matters, such as the precise measurement and keeping of time, or the navigation, has diminished. However, the eternal questions connected basically with Astronomy, those that people still wait their answers from it, are: Who are we and where did we come from? Is there other intelligent life in the Universe? What will our future be? How and why was the Universe born? What existed before its creation? How does the Universe evolve and what will be its ultimate fate? The greatest qualitative change in the answers to this kind of questions came with the so-called "Copernican revolution", mostly in the first half of 17th Century. The progress of Astronomy in the 400 years since then answered questions of thousands of years, giving an end to all kinds of superstitions and prejudices – a vast contribution to the building of human civilization. Finally, Astronomy's development as astrophysics gave us the opportunity to realize that we live inside a violent and explosively developing Universe, whose structure evolves in a dynamical way.

Science, theology and new civilization

Manimanis Vassilios, Theodossiou Efstratios, & Danezis Emmanuel (University of Athens)

This work explores the relation and mutual dependence among theology, science and social structure within the framework of a new "Cultural Current", which will probably prevail in the Western societies, through the study of the development of the cultural currents in the ages. The now prevailing in these societies Positivist Cultural Current suffers from the weakness that it is no longer supported by the modern scientific theories of physics and other natural sciences. The new reality will include a more philosophical view of science, as well as a re-harmonization of its relations with the other two "cultural pillars" on which all human societies are based: the sociopolitical (social philosophy) and the metaphysical (inner philosophy).

Invisible world and modern physics: Modern science and theology

Manimanis Vassilios, Theodossiou Efstratios, & Danezis Emmanuel (University of Athens)

A characteristic of the Western thought is the effort to counter the transcendental dogma of Christian theology through the expression of views based on the scientific discoveries (antirrhetic theology). Two objections can be raised against this trait: a) Modern science considers as a fact the future expansions, corrections, even total abolishment of scientific knowledge in the face of new discoveries. Therefore, dogmatic positions must not be based on temporary scientific views. b) In several instances, antirrhetic theology is based on out-of-date scientific views of the 17th and 18th Centuries, which are not valid any more. The example of modern physics and cosmology is prime among them; in these sciences, the prevailing theories are based on the existence of an invisible and imperceptible reality, or on apparently "illogical" (in the sense of classical logic) fundamental properties of matter and its particles in quantum mechanics.

Non-prevailable political calendrical systems in the European history

Manimanis Vassilios & Theodossiou Efstratios (University of Athens)

In the history of calendrical reforms the Julian calendar that prevailed for at least 16 centuries was gradually replaced by the Gregorian one, from 1582 onwards. The Gregorian calendar was necessary, because it corrected the Julian one and returned the vernal equinox in its true astronomical date; however, it did not change the months, or the days of the week (their number and names): it just changed the way of calculation of the leap years. After these two calendars, some other calendrical systems were introduced in Europe, none of which prevailed beyond its limited (in time and place) political environment. In this work the following such unsuccessful calendars are reviewed: The French Revolutionary Calendar, the Theosebic calendar invented by Th. Kairis, the Revolutionary Calendar of the Soviet Union (or "Bolshevi? calendar"), the fascist calendar in Italy and the calendar of the Metaxas dictatorship in Greece.

The large built water clock of Amphiaraeion

Manimanis Vassilios (University of Athens)
Theodossiou Efstratios (University of Athens), Katsiotis Markos (National Technical University of Athens), Mantarakis Peter

A very well preserved ancient water-clock was discovered during excavations at the Amphiaraeion, in Oropos, Greece. The Amphiaraeion, sanctuary of the mythical oracle and deified healer Amphiaraus, a famous religious and oracle center, was active from the pre-classic period until the replacement of the ancient religion by Christianity in the 5th Century A.D.. The foretelling was being done through the dreams sent by the god to the believers sleeping in a special gallery. In these dreams the god was suggesting to them the therapy for their illness or the solution to their problems. Then, they were throwing coins in a spring of the sanctuary. In a place like that, the measurement of time was necessary. Therefore, time was kept with both a conical sundial and a water-clock in the form of a fountain, a large built structure that was measuring the time for the sanctuary and, according to the archaeologists, dates from the 4th Century B.C..

Astronomical Activities for students-Motivating students interest in Physical Science through Astronomy

Matthaiou Alexis & Metaxa Margarita (Filekpaideutiki Etaireia)

School education aims not only to providing the necessary knowledge to the students but also to inspire and motivate them to realize their special abilities and inclinations and use their potential for making a joyful future for their lives. In this direction we present some activities held in the Arsakeio School of Patras during the years 2005-2008 in the field of Astronomy and Astrophysics, in order to share our experience with the teachers' community. Students from all grades of primary and secondary education participated with enthusiasm. In particular, they observed the Partial Solar Eclipse of October 3rd, 2005,and the Total Solar Eclipse of March 29th, 2006. They took part in observing and registering Solar Spots, using Astronomical equipments like different types of telescopes with filters and solar scopes. Students studied further the nature of Solar Phenomena and their effects on life, participating in the Environmental Program "Sun and Life"(2006-2007). Moreover, students took part in the International Program for measuring the Light Pollution "Globe at Night" (2006-2007) with observing and registering the luminosity of the Orion constellation in the night sky above their residence. Finally, the students participated in the European program "Hands on Universe" (HOU) (2005-2008) working on a project, which was the Greek contribution to HOU, developed from "Philekpaideftiki Etaireia". In particular, they studied the stars' spectrum and acquired information about the stars' life and age of stellar systems, using interactive multimedia technology.

Teaching Astronomy in upper secondary schools using educational material that has been developed by the ESA and the ESO

Pierratos Theodoros (2nd Lyceum of Echedoros, Thessaloniki)
Polatolgou Hariton (Assoc. Prof. Physics Department. Aristotle University of Thessaloniki)

Over the last few years the NASA, ESA, Hubble Space Telescope and the ESO telescopes at the La Silla and Paranal Observatories in Chile have presented ever deeper and more spectacular views of the Universe. The analysis of such observations, while often highly sophisticated in detail, is at times sufficiently simple in principle to give secondary level students the opportunity to repeat it for themselves. So, a series of exercises has been produced by ESA and ESO (ESA/ESO Astronomy Exercise Series) aiming to present various small projects that will pass on some of the excitement and satisfaction in scientific discovery to the students. All the exercises, written in English language, are constructed with a background text followed by a series of questions, measurements and calculations. In this work will be attempted the assessment of the exercises, the interest that arouses to the students as well as the scientific precision of the results. These exercises were given, during last academic year, as science projects to students of K-10 grade level in the course of Technology. Using elementary geometrical and physical considerations, the students were able to derive answers that are comparable with the results of much more sophisticated analyses described in the scientific literature. Despite the problems they had with the English technical terminology, the students expressed outstanding interest for the exercises declaring their intention to attend the course of Astronomy, which is offered as an optional course, the next academic year. As these exercises are freely accessible in ESA's website, it seems that they can be used as a powerful educational tool in teaching Astronomy in upper secondary schools.