10TH HELLENIC ASTRONOMICAL CONFERENCE
IOANNINA, 5-8 SEPTEMBER

ABSTRACTS

Κυριακή 4 Σεπτεμβρίου

Η εξερεύνηση του Τιτάνα και του συστήματος του Κρόνου

Αθηνά Κουστένη (LESIA, Observatoire de Paris-Meudon)

Από την αυγή των πολιτισμών, οι εξωτερικοί πλανήτες του Ηλιακού Συστήματος αποτελούσαν πόλο έλξης συνοδευόμενοι από μύθους και δοξασίες. Με την ραγδαία εξέλιξη της τεχνολογίας μας δίνεται η δυνατότητα όχι μόνο να πραγματοποιήσουμε το όνειρο των εμπνευσμένων προγόνων μας για εκτενή μελέτη των τοπικών συστημάτων τους, αλλά προχωρώντας ένα βήμα περισσότερο να κατανοήσουμε σε βάθος τη δομή και την εξέλιξη του Ηλιακού Συστήματος.
Ο Τιτάνας, ο μεγαλύτερος δορυφόρος του Κρόνου, είναι το μοναδικό πλανητικό σώμα στο Ηλιακό Σύστημα εκτός από τη Γη που περιβάλλεται από μια πυκνή ατμόσφαιρα αζώτου όπου πολύπλοκες οργανικές αντιδράσεις λαμβάνουν χώρα λόγω της αλληλεπίδρασης των μορίων αζώτου και μεθανίου. Αυτό το πυκνό πλούσιο σε οργανικά συστατικά πέπλο καλύπτει όλη την έκταση του δορυφόρου εμποδίζοντας ουσιαστικά την παρατήρηση της κατώτερης ατμόσφαιρας και επιφάνειας από τη Γη. Επομένως, μόνο κάποια διαστημική αποστολή μπορεί να φωτίσει τα μυστήρια του Τιτάνα. Ήδη από τον Ιούλιο του 2004, όταν τέθηκε σε τροχιά γύρω από τον Κρόνο, το διαστημόπλοιο Cassini-Huygens εκτελεί πλήθος παρατηρήσεων στο σύστημα του Κρόνου μελετώντας σε βάθος τη δομή και τη σύσταση του γιγάντιου πλανήτη, τους δακτυλίους του και το περιβάλλον των δορυφόρων του. Παράλληλα, στις 14/1/2005 πραγματοποιήθηκε η πρώτη είσοδος και προσεδάφιση ανθρώπινης κατασκευής στον Τιτάνα. Το επίτευγμα φαντάζει τεράστιο εάν αναλογιστούμε την απόσταση που διήνυσε το διαστημόπλοιο φερόμενο από το Cassini αλλά και τις αντίξοες συνθήκες που συνάντησε.
Αναμφισβήτητα, ο Τιτάνας ως ένας από τους κύριους στόχους της αποστολής Cassini, είναι το πλανητικό σώμα που προσεγγίζει το γήινο χαρακτήρα περισσότερο από κάθε άλλο. Εκτός από την αζωτούχα ατμόσφαιρα παρουσιάζει κλιματικά φαινόμενα ενώ το μεθάνιο όντας και στις τρεις καταστάσεις συμπεριφέρεται όπως το νερό στη Γη, ακολουθώντας αντίστοιχο κύκλο. Όπως επιβεβαίωσε το Cassini, ο Τιτάνας είναι επιπλέον πλούσιος και σε άλλα οργανικά μόρια (ακετυλένιο, αιθάνιο, προπάνιο) τα οποία σχηματίζονται στην ατμόσφαιρα και αποτίθενται στην επιφάνεια, όπου ερχόμενα σε επαφή με νερό σε υγρή κατάσταση μπορεί να οδηγήσουν σε οργανικές συνθέσεις που θα μπορούσαν να ικανοποιήσουν τις προοπτικές για την εμφάνιση ζωής.
Η παρουσία του μεθανίου και άλλων υδρογονανθράκων έχει άμεσο αντίκτυπο στη γεωλογία και στη γεωμορφολογία του δορυφόρου με κύριο εκπρόσωπο τις τεράστιες σε έκταση λίμνες εγγύς των πολικών περιοχών, την ανάπτυξη δικτύων απορροής και την παρουσία εκτεταμένων θινών και οροσειρών στα ισημερινά πλάτη. Πιθανή είναι η παρουσία ενός εσωτερικού ωκεανού από νερό κάτω από τους επιφανειακούς πάγους.
Στην παρούσα ομιλία θα αναφέρω την νέα γνώση που έχουμε αποκτήσει έως τώρα για το περιβάλλον του Τιτάνα δίνοντας έμφαση στην ατμοσφαιρική δομή (θερμοκρασία και πίεση) και στη φύση της επιφάνειάς του. Αξιοποιώντας γεωφυσικά δεδομένα θα παρουσιάσω την πιθανότητα ύπαρξης ωκεανού κάτω από την επιφάνεια καθώς και εποχικές μεταβολές που έχουν ήδη καταγραφεί σε αυτό το ευμετάβλητο σύστημα. Θα δείξω πως αυτά και άλλα στοιχεία μπορούν να μας δώσουν πληροφορίες για την αρχή και την εξέλιξη της ζωής.
Επίσης, θα δείξω τον τρόπο με τον οποίο τα συπεράσματα της αποστολής μπορούν να χρησιμοποιηθούν για την κατανόηση του σχηματισμού και της εξέλιξης του Τιτάνα και πως μπορούν να συνδεθούν με τις παρατηρήσεις του Κρόνου, των δακτυλίων του και των άλλων δορυφόρων.
Θα περιγράψω τα σχέδια για τη μελλοντική εξερεύνηση του Τιτάνα μέσω της νέας αποστολής TSSM (Titan and Saturn System Mission), μιας κοινής πρότασης της ESA και της NASA το 2008-2009 η οποία θα ακολουθήσει την αποστολή EJSM (Europa Jupiter System Mission) με πιθανή ημερομηνία εκτόξευσης γύρω στο 2023-2025. Το σχέδιο TSSM είναι ένα ολοκληρωμένο σύστημα μελέτης του Τιτάνα και του περιβάλλοντός του, αποτελούμενο από το Titan Orbiter κατασκευασμένο από τη NASA που θα λειτουργήσει σαν δορυφόρος του Τιτάνα. Το ίδιο διαστημόπλοιο θα μεταφέρει δύο οχήματα για *in situ* μελέτες που θα κατασκευαστούν από την ESA: ένα αερόστατο (montgolfiere) και ένα όχημα που θα προσνηωθεί σε μία από τις μεγάλες λίμνες του Τιτάνα.
Κλεινοντας, θα περιγράψω αντίστοιχες μελλοντικές αποστολές και τι μπορούν να μας διδάξουν όχι μόνο για τον Τιτάνα αλλά και για τον δικό μας πλανήτη σε σχέση με την αστροβιολογία, την προέλευση της ζωής και την κατοικισιμότητα.

Monday 5th of September

Plenary Talk: Modelling the Milky Way

J. Binney (Oxford University)

We are in the middle of an epoch of massive surveys of our Galaxy. On account of our position within the Galaxy, the contents of all survey catalogues is heavily influenced by selection biases. The obvious, and probably only, way to deal with these biases is to compare the contents of the catalogues with the predictions of models. Equilibrium dynamical models are the key type of model. I will discuss strategies for building such models and for fitting them to observational data.

Tuesday, 6th of September

Plenary Talk: The Origin of Cosmic Fireworks

T. Piran (The Hebrew University)

Gamma-Ray Bursts are the most remarkable explosions observed in our Universe. For a few seconds the burst's luminosity is comparable to the luminosity of the rest of the Universe combined. In this talk I describe the basic properties of Gamma-Ray Bursts focusing on their progenitors. Two well known groups of progenitors are Collapsars that are produce long bursts when a jet penetrate a collapsing massive star and neutron star mergers that produce short bursts. In addition there is a third group of low luminosity GRBs that are also associated also with a collapsing stars but in which case the burst are not produced via the well known Collapsar mechanism. We review the different mechanisms and the different bursts that they produce. I also discuss radio flares that arise from neutron star mergers in addition to gamma-ray bursts and their implications for the detection of gravitational waves from these sources.

Highlight talk by a young astronomer:
Lorentz-invariance violation studies with blazars: A cautionary tale

D. Emmanoulopoulos (University of Southampton)

Einstein postulated that "Light always propagates through a vacuum at a definite velocity, c, which is independent of the state of motion of the emitting body". This is the framework of classical special relativity, having no fundamental length-scale associated with it (Lorentz invariance). However, quantum effects at the Planck scale, where gravity becomes a strong force, are expected (although not yet proven) to strongly affect the nature of space-time, causing violations of this invariance. It is believed that such violations can be tested by measuring time-lags between very high energy (VHE) photons (above 100 GeV), emitted simultaneously from distant astrophysical sources, expressing possible variations of photon speed as a function of energy. Since blazars are in relatively cosmological distances and emit variable emission in VHE they are considered ideal candidates to test such deviations. I am going to present the current results on this field which up to now seem to be rather inconclusive.

Wednesday, 7th of September

Plenary Talk: Magnetic activity on the Sun

A. Hood (St Andrews University)

After a long period with very little magnetic activity, the Sun has started a new cycle. This rise in activity means it is an excellent time to study the Sun, particularly given the outstanding satellite and ground based instruments that are tracking solar phenomena with higher spectral, space and time resolution. I will discuss some of the recent observations of dynamic activity such as solar flares, Coronal Mass Ejections, prominence eruptions, outflows and jets. Most of the indicators of magnetic activity owe their existence to the emergence of new magnetic fields from the solar interior. This emergence occurs on scales from granulation to full blown active regions. Recent simulations are highlighting the important physical processes responsible, from convection driven emergence to magnetic buoyancy emergence. Finally, the interesting problem of why the solar corona is so hot will be discussed. Ideas for coronal heating will be mentioned and some recent simulations presented. What is clear is that magnetic complexity very quickly develops from relatively simple magnetic structures.

S1: Sun, Planets and Interplanetary Medium - Oral Presentations

Tuesday, 6th of September

Atmospheric variations in Titan's atmosphere after one Titanian year (Inv. Talk)

A. Coustenis (LESIA, Paris Observatory), Bampasidis G. (University of Athens), Achterberg R. (Department of Astronomy, Univ. Of Maryland), Vinatier S. (LESIA, Paris Observatory), Jennings D. (NASA/Goddard Space Flight Center), Nixon C. (NASA/Goddard Space Flight Center), Lavvas P. (LPL, Univ. of Arizona),Flasar F. M. (NASA/Goddard Space Flight Center), Moussas X. (University of Athens) & Preka-Papadema P. (University of Athens)

In 2010 a whole Saturnian year has been completed since the Voyager visit on 1980. After Voyager and a series of ground-based observations, the Cassini-Huygens mission has entirely revolutionized our perspective of Titan, Saturn's largest satellite, since its arrival in the Saturnian system in July 2004. Titan's atmosphere and surface present many similarities with the Earth, harbouring a dense dinitrogen (98%) atmosphere, rich in methane (1.4%) and other organics in combination with a diverse surface curved by terrestrial-like features. By comparing all the available space data pertaining to the neutral atmosphere of Titan (Cassini/CIRS, Voyager/IRIS and ISO/SWS essentially), we can therefore look for temporal variations of its temperature and composition. These spectra are analysed by using a radiative transfer code and then compared also with ground- and/or space- based acquisitions. We then also compare these results with other inferences from the Voyager missions and other ground/ space –based observations like ISO [3] to obtain information as to the interannual variations and seasonal effects on Titan. Studying Titan's organic budget by the Cassini-Huygens instrumentation will enable scientists not only to understand the origin, evolution and dynamics of its atmosphere, but also to investigate its astrobiological potential. We will also discuss current models and possible future in situ exploration that could help us better understand this complex environment.

Ion sputtering and radiolysis of ice at the Galilean moons

C.Plainaki (IFSI-INAF), Milillo A. (IFSI-INAF), Mura A. (IFSI-INAF),Massetti S. (IFSI-INAF) & Orsini S. (IFSI-INAF).

The exosphere of an icy moon is the result of different surface release processes and subsequent modification of the released particles. The main constituent of the icy surface is water with minor portion of heavy water H_2O_2 and other impurities. This means that probably the major released species is H_2O. Nevertheless, the particles experience photolysis and radiolysis due to solar UV and Jupiter's magnetospheric plasma respectively. The initial species of these processes in ice are OH, H and O, with the possibility of H_2. These dissociated species can react to reform water and/or new species, creating an exosphere that, at the end, is a mixture of different molecules. Specifically, the presence of initially excited O_2 in ice has been inferred from the associated luminescence bands produced via O+O->O_2.Moreover, the Hubble Space Telescope observations, initially, revealed the existence of a tenuous O_2 atmosphere in Europa, with a column density of about (0.24-1.4) 10^{15} cm^{-2}, whereas, later, the Ultraviolet Imaging Spectrograph on the Cassini, during its flyby of Jupiter, confirmed this discovery. In this work, starting from a previously developed MC model for the generation of Europa's exosphere, where the only considered species was water, we make a first attempt to simulate the more realistic O_2 atmosphere of Europa. Due to radiolysis of ice and subsequent release of O_2, considering a) a specific configuration where leading hemisphere coincides with sunlit hemisphere and b) the moon's surface temperature map, we estimate along the Europa-Sun line a column density of about 1.4 10^{15} cm^{-2} at the dayside and 2 10^{14} cm^{-2}, at the nightside. We also make a more detailed estimation of the sputtered-water exosphere of this moon, taking into consideration the trailing-leading hemispheres asymmetry in the magnetospheric ion bombardment. We compare the results of this analysis with those obtained by other models and with the in situ measurements and discuss them, in the context of future missions.

Nonlinear force-free reconstruction of the global solar magnetic field

I. Contopoulos (RCAAM, Academy of Athens)

We present a novel numerical method that allows the calculation of nonlinear force-free magnetostatic solutions above a boundary surface on which only the distribution of the normal magnetic field component is given. The method relies on the theory of force-free electrodynamics and applies directly to the reconstruction of the solar coronal magnetic field for a given distribution of the photospheric radial field component. The method works as follows: we start with any initial magnetostatic global field configuration (e.g. zero, dipole), and along the boundary surface we create an evolving distribution of tangential (horizontal) electric fields that, via Faraday's equation, give rise to a respective normal field distribution approaching asymptotically the target distribution. At the same time, these electric fields are used as boundary condition to numerically evolve the resulting electromagnetic field above the boundary surface, modeled as a thin ideal plasma with non-reflecting, perfectly absorbing outer boundaries. The simulation relaxes to a nonlinear force-free configuration that satisfies the given normal field distribution on the boundary. This is different from existing methods relying on a fixed boundary condition - the boundary evolves toward the a priori given one, at the same time evolving the three-dimensional field solution above it. Moreover, this is the first time a nonlinear force-free solution is reached by using only the normal field component on the boundary. This solution is not unique, but depends on the initial magnetic field configuration and on the evolutionary course along the boundary surface. To our knowledge, this is the first time that the formalism of force-free electrodynamics, used very successfully in other astrophysical contexts, is applied to the global solar magnetic field.

Two cases of atmospheric escape in the Solar System: Titan and Earth (Inv. Talk)

I. Dandouras (IRAP / CNRS)

Escape into space of the constituents of a planetary upper atmosphere can occur either in the form of neutral gas (thermal escape or non-thermal escape), or in the form of plasma. The long-term stability of an atmosphere results from the balance between source and escape rates. Two cases will be examined: Titan and Earth. Titan is the second largest planetary satellite in the Solar System and is the only one that has an atmosphere as substantial as that of the Earth. Titan's nitrogen rich atmosphere is embedded within Saturn's magnetosphere, and is directly bombarded by energetic ions due to Titan's lack of a significant intrinsic magnetic field. In addition to thermal escape, energy input from Saturn's magnetosphere and from Solar UV radiation can drive several non-thermal escape mechanisms in Titan's upper atmosphere: sputtering, dissociation and dissociative ionization of molecular nitrogen producing pick-up ions, photochemical production of fast neutrals etc. Earth also constantly loses matter, mostly in the form of H+ and O+ ions, through various outflow processes from the upper atmosphere and ionosphere. Most of the ions are low-energy (< 1 eV) but can escape from the high-latitude ionosphere and travel along open magnetic field lines into the magnetospheric tail lobes. At lower latitudes the main magnetospheric plasma reservoir is the plasmasphere, which is a toroïdal region encircling the Earth and containing cold and dense plasma. Plasma plumes, forming in the outer plasmasphere and released outwards, constitute a well-established mode for plasmaspheric material release to the magnetosphere. They are associated to geomagnetically active periods and the related electric field change. In 1992 Lemaire and Shunk proposed the existence of an additional mode for plasmaspheric material release and escape: a plasmaspheric wind, steadily transporting cold plasmaspheric plasma outwards across the geomagnetic field lines. This has been proposed on a theoretical basis. Direct detection of this wind has, however, eluded observation in the past. Analysis of ion measurements, acquired in the outer plasmasphere by the CIS experiment onboard the four Cluster spacecraft provide now, for the first time, an experimental confirmation of the plasmaspheric wind.

Greek Participation to Solar Orbiter Development

A. Katsiyannis (National Observatory of Athens/IAA)

Greece, via its PRODEX membership intends to meaningfully participate to the instrument development of a flagship ESA mission, the Solar Orbiter (SolO). This involvement pertains to hardware development for SolO's Spectrometer/Telescope for Imaging X-rays (STIX), namely, STIX's movable attenuator. SolO will allow close-up and high-latitude studies of our mother star, the Sun, based mostly on remote-sensing measurements (imaging). STIX is a critical SolO instrument, enabling one of its major science goals: understanding and acceleration of electrons at the Sun and their transport into interplanetary space. The attenuator, or shutter, that will be developed by the Greek team, is a critical component of the STIX instrument. Attenuators are dictated by the substantial dynamical range of incident X-ray fluxes from solar flares: the largest X-ray flares can give as many as 10^5 more count rates in X-ray photons compared to those of the smallest microflare that STIX can detect. It is proposed that two mechanisms are developed for a comparative study. First, a mechanism based on sensitive Shape Memory Alloy actuators and, second, one based on a piezoelectric actuator module. Both mechanisms will be designed and manufactured and then tested in vacuum and alternating high-low temperature conditions. Evaluation of reliability and accuracy in assembly and operation will follow. A vibrating table will be used for the dynamical analysis of the mechanism and independent strength tests of the various parts of the mechanism will follow.

Solar observations with a low frequency radio telescope

I. Myserlis (University of Thessaloniki), Seiradakis J. (University of Thessaloniki) &
Dogramatzidis M. (Gymnasium Nikiforou, Drama)

We have set up a low frequency radio monitoring station for solar bursts at the Observatory of the Aristotle University in Thessaloniki. The station consists of a dual dipole phased array, a radio receiver and a dedicated computer with the necessary software installed. The constructed radio receiver is based on NASA's Radio Jove project. It operates continuously, since July 2010, at 20.1 MHz (close to the long-wavelength ionospheric cut-off of the radio window) with a narrow bandwidth (~5 kHz). The system is properly calibrated, so that the recorded data are expressed in antenna temperature. Despite the high interference level of an urban region like Thessaloniki (strong broadcasting shortwave radio stations, periodic experimental signals, CBs, etc), we have detected several low frequency solar radio bursts and correlated them with solar flares, X-ray events and other low frequency solar observations. The received signal is monitored in ordinary ASCII format and as audio signal, in order to investigate and exclude man-made radio interference. In order to exclude narrow band interference and calculate the spectral indices of the observed events, a second monitoring station, working at 36 MHz, is under construction at the village of Nikiforos near the town of Drama, about 130 km away of Thessaloniki. Finally, we plan to construct a third monitoring station at 58 MHz, in Thessaloniki. This frequency was revealed to be relatively free of interference, after a thorough investigation of the region.

Wednesday, 7th of September

Solar chromospheric fine scale structures: dynamics and energetics (Inv. Talk)

K. Tziotziou (RCAAM, Academy of Athens & National Observatory of Athens)

The solar chromosphere is a very inhomogeneous and dynamic layer of the solar atmosphere that exhibits several phenomena on a wide range of spatial and temporal scales. High-resolution and long-duration observations, employing mostly lines, such as Halpha, the Ca II infrared lines and the Ca II H and K lines, obtained both from ground-based telescope facilities (e.g. DST, VTT, THEMIS, SST, DOT), as well as state-of-the-art satellites (e.g. SOHO, TRACE, HINODE) reveal an incredibly rich, dynamic and highly structured chromospheric environment. What is known in literature as the chromospheric fine-scale structure mainly consists of small fibrilar-like features that connect various parts of quiet/active regions or span across the chromospheric network cell interiors, showing a large diversity of both physical and dynamic characteristics. The highly dynamic, fine-scale chromospheric structures are mostly governed by flows which reflect the complex geometry and dynamics of the local magnetic field and play an important role in the propagation and dissipation of waves. A comprehensive study of these structures requires deep understanding of the physical processes involved and investigation of their intricate link with structures/processes at lower photospheric levels. Furthermore, due to their large number present on the solar surface, it is essential to investigate their impact on the mass and energy transport to higher atmospheric layers through processes such as magnetic reconnection and propagation of waves. The in-depth study of all aforementioned characteristics and processes, with the further addition of non-LTE physics, as well as the use of three-dimensional numerical simulations poses a fascinating challenge for both theory and numerical modeling of chromospheric fine-scale structures.

Multi-wavelengths observations of oscillatory phenomena in a solar network region and their relation to the magnetic field

I. Kontogiannis (University of Athens), Tsiropoula G. (National Observatory of Athens) & Tziotziou K. (RCAAM, Academy of Athens & National Observatory of Athens)

The chromosphere is an inhomogeneous and highly dynamic layer of the solar atmosphere. New high resolution observations have revealed that it consists mainly of fine-scale structures which are directly related to the magnetic field. In this work we use multi-wavelength observations to study oscillatory phenomena in the quiet Sun and their relation to the magnetic field and the chromospheric fine-scale structures. The observations were obtained during a coordinated campaign which included space-borne instruments (i.e. the Transition Region and Coronal Explorer, the Michelson Doppler Imager onboard SoHO, and the Specropolarimeter onboard the Hinode spacecraft) and a ground-based telescope (i.e. the Dutch Open Telescope). The analysed data consist of time series of filtergrams of a solar network region observed at different atmospheric layers from the photosphere through the temperature minimum region and well into the chromosphere and also of high resolution magnetograms. Using wavelet analysis we investigate the oscillatory power distribution in the 2D field-of-view, as well as its vertical distribution and its relation with the fine-scale chromospheric mottles, while through phase difference analysis we investigate wave propagation characteristics. Our results show that the oscillatory power has a fibrilar distribution and that chromospheric mottles are directly related to power enhancement (power halo) or suppression (magnetic shadow). This finding is attributed to the interaction between acoustic oscillations and mottles which outline inclined magnetic fields and clearly indicate that mottles are the loci of wave tranmission, reflection and refraction. It also leads to the conclusion that these structures are directly related to the formation of the magnetic canopy, i.e. the layer that divides the atmosphere into two components, a magnetized and a non magnetized one. Extrapolation of the photospheric magnetic field up to the chromosphere using the current-free assumption and use of the VAL C atmospheric model allows the determination of the height of formation of the magnetic canopy and provide the opportunity to highlight the details of the interaction between acoustic oscillations and the magnetic field.

Multi-wavelength Observations of a Metric Type-II Event

C. Alissandrakis (University of Ioannina), Nindos A. (University of Ioannina), Patsourakos S. (University of Ioannina), Hillaris Al. (University of Athens) & The ARTEMIS Group

We have studied a complex metric radio event,observed with the ARTEMIS radiospectrogarph on February 12, 2010. The event was associated with a surge observed at 195 and 304 A and with a coronal mass ejection observed by STEREO A and B instruments near the East wnd West limbs respectively. On the disk the event was observed at 10 frequencies by the Nancay Radioheliograph (NRH), in H-alpha by the Catania observatory and in soft x-rays by GOES SXI. We combined these data, together with MDI longitudinal magnetic field, to get as complete a picture of the event as possible. Our emphasis is on two type-II bursts that occured near respective maxima in the GOES light curves. The first, associated with the main peak of the event, showed a clear foundamental-harmonic structure, while the emission of the second consisted of three well-separated bands. Using positional infornation for the type-IIs from the NRH we explore their possible association with the surge, the coronal front and the CME. We also studied fine structured and foundamental harmonic structure in the metric dynamic spectrum.

New Views of the Solar Corona from STEREO and SDO

A. Vourlidas (Naval Research Laboratory)

In the last few years, we have been treated to an unusual visual feast of solar observations of the corona in EUV wavelengths. The observations from the two vantage points of STEREO/SECCHI are now capturing the entire solar atmosphere simultaneously in four wavelengths. The SDO/AIA images provide us with arcsecond resolution images of the full visible disk in ten wavelengths. All these data are captured with cadences of a few seconds to a few minutes. In this talk, I review some intriguing results from our first attempts to deal with these observations which touch upon the problems of coronal mass ejection initiation and solar wind generation. I will also discuss data processing techniques that may help us recover even more information from the images. The talk will contain a generous portion of beautiful EUV images and movies of the solar corona.

Constraining a Model for EUV Wave Formation with SDO and STEREO Quadrature Observations

S. Patsourakos (University of Ioannina), Vourlidas A. (NRL) & Olmedo O. (NRC fellow at NRL)

The generation mechanism(s) of large-scale propagating intensity fronts seen in the EUV, often called EUV waves, in association with impulsive Coronal Mass Ejection (CMEs) is currently a matter of debate. The strong lateral expansion which some impulsive CMEs undergo during their early phases, when they are observed in the inner corona by EUV imagers, is one possible mechanism for the generation of EUV waves. One impulsive CME - EUV wave pair was observed during 15 February 2011 in quadrature by SDO and STEREO. The source active region was close to disk center as seen by SDO and at the limb as seen by STEREO. This configuration allowed us to determine the kinematics of the EUV wave and of the early EUV CME by AIA/SDO and EUVI/STEREO respectively. The detailed kinematics of the early EUV CME (height and radius evolution of the erupting flux) were then used to constrain a simple model of EUV wave formation, invoking the erupting flux as the wave driver. The ground tracks of the EUV wave as predicted by this data-driven model were then compared with those of the observed wave.

Nanoflare heating of coronal loops in an active region triggered by reconnecting current sheets

C. Gontikakis (RCAAM, Academy of Athens), Patsourakos S. (University of Ioannina), Efthymiopoulos C. (RCAAM, Academy of Athens), Anastasiadis A.(National Observatory of Athens/ISARS) & Georgoulis M. (RCAAM, Academy of Athens)

The purpose of this work is to study the heating of coronal loops, produced by the acceleration of particles inside reconnecting current sheets (RCS) which represent nanoflares. We also study the hydrodynamic response of the loops atmosphere to such a heating event. The RCS are formed as discontinuities of the loop magnetic field caused by the photospheric shuffling motions. The coronal loops are represented by the closed magnetic lines of force calculated by the magnetic field extrapolation of the active region NOAA 9114 magnetogram. The photospheric motions at the loops footpoints are measured using local correlation tracking. The magnetic and electric fields accelerating particles at the RCS are computed using the loop magnetic fields and the photospheric motions. We further discuss the question of energy conservation inside the current sheet, and we present the statistical distributions of quantities relevant for particles acceleration and coronal heating for a number of the active region's coronal loops.

Solar wind influence in ULF wave activity in the magnetosphere (Inv. Talk)

T. Sarris (University of Thrace)

Geomagnetic pulsations of Ultra Low Frequency (ULF waves) are large-scale oscillations in the Earth's magnetosphere with frequencies roughly 1 mHz to 1 Hz. They are often observed by orbiting spacecraft as well as by ground-based magnetometers, and their source of excitation has been studied from the early days of space exploration, both through modeling and observation; however positively identifying their excitation mechanism has proven to be a difficult task. This is primarily due to limitations in observation, which have mostly come from single- or two-point measurements in space, at times with limited instrumentation, or from orbits that provide ambiguous measurements of ULF waves; ground magnetometers also have limitations, as some ULF waves are screened and/or altered by the ionosphere. We will present how we used multi-point measurements from the recent THEMIS constellation of spacecraft as well as from GEOTAIL and GOES satellites combined with ground magnetometers to identify the extent and excitation mechanism of ULF field line resonances in the magnetosphere and we will explore cases that demonstrate the nature of the solar wind influence in ULF wave activity in the magnetosphere.

Space Weather Research at IAA/NOA: Solar Energetic Particle Investigations

O.Malandraki (NOA/IAA), Tylka A. J. (Space Science Division, Naval Research Laboratory), Ng C. K. (College of Science, George Mason University), Marsden R. G. (ESA/SRE-SM, ESTEC), Tranquille C. (ESA/SRE-SM, ESTEC), Klein K.–L. (Observatoire de Paris), Patterson J. D. (Fundamental Technologies Inc.), Armstrong T. P. (Fundamental Technologies Inc.), Lanzerotti L. J. (New Jersey Institute of Technology & Bell Laboratories), Papaioannou A. (University of Athens, & NOA/IAA), Marhavilas P. K. (NOA/IAA), Tziotziou K. (NOA/IAA), Crosby N. (Belgian Institute for Space Aeronomy) & Vainio R. (University of Helsinki)

During an eleven year cycle the Sun goes from quiet conditions at minimum to levels of high activity at maximum. In the latter case, energetic phenomena such as coronal mass ejections (CMEs) and solar flares (SFs) accompanied by explosive releases of mass, magnetic flux and solar energetic particles (SEPs) are common.

Damaging effects, as a result of these phenomena, have been recorded on satellites, on-board detectors and in extreme cases on ground based systems (e.g. oil and natural gas pipelines, communication systems, aircraft electronics, power-grids). Furthermore, the intense SEP radiation can damage human DNA and cause cell replications. To this end, ensuring the safety of astronauts working in the extreme conditions of space, especially the energetic particle environments, is a key goal for both ESA and NASA. The analysis, the risk assessment and management and the possible forecasting of such events constitutes the scientific field of Space Weather. The Institute of Astronomy and Astrophysics (IAA) of the National Observatory of Athens (NOA) is currently strongly involved in two collaborative projects funded by the seventh framework program of the European Union, namely: 'SEPServer' and 'COMESEP'. 'SEPServer' focuses on the implementation of a comprehensive and up to date SEP analysis service including scientific data driven analysis both for 1 AU and for > 1 AU using data from the SOHO/ ERNE, SOHO/EPHIN, ACE/EPAM, ACE/SIS, WIND/3DP, Ulysses/HISCALE, Ulysses/COSPIN/LET and Ulysses/COSPIN/KET experiments. SEPServer will also provide for the first time the release of the HELIOS data set in a reasonable format and in full time resolution, thus making available data also for orbits inside 1 AU (down to 0.3 AU). Observational data-driven analysis methods such as: onset determination, velocity dispersion, and/or time-shifting analysis, direct comparison of observed SEP fluxes, spectra and abundance ratios with the associated electromagnetic emission data will be applied. 'SEPServer' will enhance our understanding of the source, acceleration and transport of SEPs which is directly related to space weather research progress. 'COMESEP' sets out to develop tools for forecasting SEP radiation storms and geomagnetic storms based on scientific data analysis and extensive modeling. It is foreseen that these forecasting tools will be incorporated into an automated operational European Space Weather Alert system, which is the 'COMESEP' primary goal. Basic research activities on Space Weather carried out at IAA/NOA within the framework of these two projects will be presented including the analysis of SEPs and the associated electromagnetic emissions for selected case studies, the detailed study of the so-called 'reservoir effect' in the heliosphere as well as the impact of the large-scale structure of the IMF on the SEP profiles and its space weather implications. These project-related activities will provide the basis for future solar missions such as Solar Orbiter - in which IAA/NOA participates as a Co-Investigator (EPD instrument).

Monitoring solar energetic particles with an armada of European spacecraft and the new automated SEPF (Solar Energetic Proton Fluxes) Tool

I. Sandberg (NOA/ISARS), Daglis I. (NOA/ISARS), Anastasiadis A. (NOA/ISARS), Balasis George (NOA/ISARS), Georgoulis M. (RCAAM, Academy of Athens), Nieminen P. (ESA/ESTEC), Evans H. (ESA/ESTEC) & Daly E. (ESA/ESTEC)

Solar energetic particles (SEPs) observed in interplanetary medium consist of electrons, protons, alpha particles and heavier ions (up to Fe), with energies from dozens of keVs to a few GeVs. SEP events, or SEPEs, are particle flux enhancements from background level (< 1 pfu, particle flux unit = particle $cm^{-2}sr^{-1}s^{-1}$) to several orders of magnitude in the MeV range, and lasting from several hours to a few days. Intense SEPEs can reach fluence values as high as 10^{10} protons cm-2 for E > 30 MeV. The main part of SEPEs results from the acceleration of particles either by solar flares and/or by interplanetary shocks driven by Coronal Mass Ejections (CMEs); these accelerated particles propagate through the heliosphere, traveling along the interplanetary magnetic field (IMF). SEPEs show significant variability from one event to another and are an important part of space weather, because they pose a serious health risk to humans in space and a serious radiation hazard for the spacecraft hardware which may lead to severe damages. As a consequence, engineering models, observations and theoretical investigations related to the high energy particle environment is a priority issue for both robotic and manned space missions. The European Space Agency operates the Standard Radiation Environment Monitor (SREM) on-board six spacecraft: Proba-1, INTEGRAL, Rosetta, Giove-B, Herschel and Planck, which measures high-energy protons and electrons with a fair angular and spectral resolution. The fact that several SREM units operate in different orbits provides a unique chance for comparative studies of the radiation environment based on multiple data gathered by identical detectors. Furthermore, the radiation environment monitoring by the SREM unit onboard Rosetta may reveal unknown characteristics of SEPEs properties given the fact that the majority of the available radiation data and models only refer to 1AU solar distances. The Institute for Space Applications and Remote Sensing of the National Observatory of Athens (ISARS/NOA) has developed and validated a novel method to obtain flux spectra from SREM count rates. Using this method and by conducting detailed scientific studies we have showed in previous presentations and papers that the exploration and analysis of SREM data may contribute significantly to investigations and modeling efforts of SPE generation and propagation in the heliosphere and in the Earth's magnetosphere. ISARS/NOA recently released an automated software tool for the monitoring of Solar Energetic Proton Fluxes (SEPF) using measurements of SREM.

The SEPF tool is based on the automated implementation of the inverse method developed by ISARS/NOA, permitting the calculation of high-energy proton fluxes from SREM data. Results of the method have been validated for selected number of past solar energetic particle events using measurements from other space-born proton monitors. The SEPF tool unfolds downlinked SREM count-rates, calculates the omnidirectional differential proton fluxes and provides results to the space weather community acting as a multi-point proton flux monitor on a daily-basis. The SEPF tool is a significant European space weather asset and will support the efforts towards an efficient European Space Situational Awareness programme.

Arrival Times of Interplanetary CMEs and Shocks into the Earth's Vicinity: STEREO Observations and Analytical Modeling

V. Ontiveros (University of Ioannina), S. Patsourakos (University of Ioannina), P. Corona-Romero (Universidad Nacional Autonoma de Mexico, UNAM) & J.A. Gonzalez-Esparza (UNAM)

Interplanetary Coronal Mass Ejections (ICMEs) are one of the largest disturbances in the solar system. ICMEs and their associated shocks are the main cause of intense geomagnetic perturbations, that might affect satellite orbits and telecommunications among other systems. These important repercussions in the Space Weather have lead to a continuous effort to predict the arrival times of the ICMEs and their shocks into the Earth's vicinity, but still the current accuracy in their arrival time to Earth of few hours needs further ramification, in particular for operational purposes. White light images from the STEREO coronagraphs and heliospheric imagers provide an early detection of coronal mass ejections (CMEs) and ICMEs. In February 6, 2011, spacecrafts A and B were 180 degrees apart, each one looking down on a different hemisphere of the Sun and therefore they view from the side Earth-directed events, allowing a better determination of the physical parameters of the events and their kinematics in particular. We take advantage of this configuration and determine the kinematics of the CMEs and ICMEs of Feb 15th (01:56), March 7th (19:43) and June 21st (16:03 UT), 2011. These events have an interplanetary counterpart with Earth arrivals in Feb 18th (00:40 UT), March 10th (05:45 UT) and Jun 23rd (02:18 UT) respectively, as observed by the ACE spacecraft. We perform 3D fittings of the CME-ICME-shock systems viewed by COR1, COR2 HI1 and HI2 to deduce their kinematics and we use our measurements to constrain an analytical model of ICME and shock propagation from the Sun to Earth and compare with the in-situ arrival times to Earth's orbit. This model is applied where the dynamic pressure parameter dominates the solar wind dynamics and it is focused on the role of the transmission of momentum in the ICME-shock system.

S1: Sun, Planets and Interplanetary Medium – Poster Presentations

S1-3: A wavelet spectral analysis tool for multipoint space and ground-based observations of ULF wave activity

I. Daglis (National Observatory of Athens/ISARS), Balasis G. (National Observatory of Athens/ISARS), Georgiou M. (National Observatory of Athens/ISARS and Univ. of Athens), Papadimitriou C. (National Observatory of Athens/ISARS and Univ. of Athens), Zesta E. (Space Vehicles Directorate AFRL/RVBXP) & Anastasiadis A. (National Observatory of Athens/ISARS)

Magnetospheric ULF waves influence radiation belt dynamics and are therefore of particular relevance for space weather nowcasting and forecasting efforts. We have used novel algorithms based on wavelet spectral methods to analyze multipoint observations of ULF wave activity by the Cluster and THEMIS missions and by ground-based magnetometers. Wavelet analysis is becoming a common tool for analyzing localized variations of power within a time series. By decomposing a time series into time-frequency space, we are able to determine both the dominant modes of variability and how these modes vary in time. The advantage of analyzing a signal with wavelets as the analyzing kernel is that it enables us to study features of the signal locally with a detail matched to their scale. Owing to its unique time-frequency localization, wavelet analysis is especially useful for signals that are non-stationary, have short-lived transient components, have features at different scales, or have singularities. The results are rather promising for the development of automatic identification tools, which will allow the detection and classification of various categories of ULF waves from multipoint magnetospheric observations according to well-defined criteria.

S1-4: Enhancing space data exploitation through advanced data routing protocols

I. Daglis (NOA/ISARS), Rontogiannis A. (NOA/ISARS), Anastasiadis A. (NOA/ISARS), Sykioti O. (NOA/ISARS), Balasis G. (NOA/ISARS), Keramitsoglou I. (NOA/ISARS), Paronis D. (NOA/ISARS), Tsaoussidis V. (University of Thrace) & Diamantopoulos S. (University of Thrace)

Data sharing and access are major issues in space sciences, as they influence the degree of data exploitation. The project “Space-Data Routers”, which was initiated recently, has the aim of allowing space agencies, academic institutes and research centres to share space-data generated by single or multiple missions, in an efficient, secure and automated manner. The approach of “Space-Data Routers” relies on space internetworking – and in particular on Delay-Tolerant Networking (DTN), which marks the new era in space communications, unifies space and earth communication infrastructures and delivers a set of tools and protocols for space-data exploitation. The project has started with defining limitations currently imposed by typical space mission scenarios, in which the National Observatory of Athens (NOA) is currently involved, including space exploration, planetary exploration and Earth observation missions. Here we are presenting the mission scenarios and the associated major scientific objectives of “Space-Data Routers”, with an emphasis on the Sun-Earth connection and the Mars hyperspectral imaging spectroscopy scenarios. In the case of the Sun-Earth connection scenario, we plan to test and validate the capabilities of Space-Data Routers in providing: a) Simultaneous real- time sampling of space plasmas from multiple points with cost-effective means and measuring of phenomena with higher resolution and better coverage to address outstanding science questions and b) Successful data transmission even in hostile communication conditions. In the case of the Mars hyperspectral imaging spectroscopy scenario we plan to test and validate the capabilities of Space-Data Routers in augmenting the data volume received from Mars Express, through the increase of Mars Express connectivity with ground stations and through the increase of access speed to the hyperspectral data depository.

S1-5: Solar Energetic Particle Events detected by the Standard Radiation Environment Monitor (SREM) onboard INTEGRAL

M. Georgoulis (Academy of Athens/RCAAM), Daglis I. (NOA/ISARS),Anastasiadis A. (NOA/ISARS), Sandberg I. (NOA/ISARS), Balasis G. (NOA/ISARS) & Nieminen P. (ESA/ESTEC)

The SREM is a cost-effective instrument mounted onboard multiple ESA missions. The SREM objective is the in-situ measurement of high-energy solar particles at the spacecraft location. Within the previous solar cycle 23, SREM units onboard ESA's INTEGRAL and Rosetta missions detected several tens of SEPEs and accurately pinpointed their onset, rise, and decay times. We have undertaken a detailed study to determine the solar sources and subsequent interplanetary coronal mass ejections (ICMEs) that gave rise to these events, as well as the timing of SEPEs with the onset of possible geomagnetic activity triggered by these ICMEs. We find that virtually all SREM SEPEs may be associated with CME-driven shocks. For a number of well-studied INTEGRAL/SREM SEPEs, moreover, we see an association between the SEPE peak and the shock passage at L1. Shortly (typically within a few hours) after the SEPE peak, the ICME-driven modulation of the magnetosphere kicks in, with either an increase or a dip of the Dst index, indicating stormy conditions in geospace. We conclude that, pending additional investigation, SREM units may prove useful for a short-term prediction of inclement space-weather conditions in Geospace, especially if mounted onboard dayside missions ahead of the magnetospheric bow shock.

S1-6: Calculation of the rotational period of the "Mars crosser" asteroid (32910) 1994TE15

C. Avdellidou (Univesrity of Thessaloniki), P. Ioannidis P. (UoT), K. Tsiganis K. (UoT), J. H. Seiradakis (UoT) & G. Apostolovska (Ss. Cyril and Methodious University)

We present the lightcurves and the derived rotational period of the inner main belt asteroid (32910) 1994TE15. The asteroid was selected because it seems to have close encounters with the orbit of Mars (Mars crosser). The observations were undertaken during August 2010 at Skinakas Observatory, Crete, using the 1.3m Telescope with an Andor DZ436 CCD camera and a Johnson-Cousins RIter. The magnitude of the target was 15.3 during the observations and the amplitude of the lightcurve was 0.13 mag.

S1-7: Study of a microflare observed with SUMER and TRACE.

C. Gontikakis (RCAAM/Academy of Athens) & Winebarger A. R. (NASA, MSFC)

We study a GOES-A1 microflare, observed in active region NOAA 8541 on May 15, 1999 with TRACE images, SUMER spectra and MDI magnetograms. In TRACE filtergrams of 171A and 195A, the microflare is composed of two interacting, 20Mm long, loops. SUMER observations include four spectral lines: the Si II 1533A (a chromospheric line), the C IV 1548A, 1550 A (transition region lines) and the Ne VIII 770 A (a coronal line). These spectra record the impulsive stage of the microflare, which appears as a bright feature at the west footpoint of the TRACE loops. In an area adjacent to the microflare we observe, for the first time on the solar disk, a region where the lines intensity ratio 1548A/1550A equals to 4 which means that resonant scattering dominates the emission process. Over the microflare, the SUMER spectral lines are blue shifted, indicating upflows due to explosive evaporation, as well as red shifted, indicating, cooling downward motions. Moreover, the C IV microflare spectral profiles, indicate upflows of ~200 km/s even if most of them are damaged due to the SUMER detector over exposure, while the Si II 1533A profiles are self-reversed due to opacity effects.

S1-8: A review of infrared limb observations of tenuous atmosphers. Suggestions for future work at the Jupiter system

D. Grassi (IFSI-INAF)

We review several historical observations of tenuous planetary atmospheres by IR spectroimagers operating in limb scan mode. Limb observations are characterized by long optical paths and could detect very weak emission lines, often associated to the non-LTE conditions or photochemical phenomena encountered at low densities. Literature studies are used as a guideline to recommend observations by future Jupiter system missions, where oxygen in the atmospheres of Europa, Ganymede and Callisto is an obvious subject of interest. Integration of IR observations with the results of other payload components (Plasma and Particles Instrument/INMS) is also discussed, with possible synergies in defining the surface/space environment interactions that eventually lead to the formation of atmospheres of icy satellites.

S1-9: Magnetospheric cut-off rigidity variations recorded by Neutron Monitors during the events of 8 and 10 November 2004

H. Mavromichalaki (UoA), Eroshenko E.(Russian Academy of Science), Belov A.(Russian Academy of Science), Yanke v.(Russian Academy of Science), Mariatos G.(University of Athens), Laoutaris A.(University of Athens) & Kontiza A. (University of Athens)

During a geomagnetic storm, characteristic variations of cosmic ray intensity recorded by the worldwide network of neutron monitor stations are observed. More specifically, a characteristic increase of Cosmic Ray intensity is observed mainly in the middle latitude stations, due to the geomagnetic cut-off rigidity changes. Athens neutron monitor is considered as one of the most suitable worldwide for observing this kind of phenomena. During the time period 2000-2010 about 7 geomagnetic effects were observed with the most significant being the one on November of 2003, which is considered as the largest magnetic storm in the history of neutron monitors. The contribution of middle latitude stations in the prediction and observation of such effects is significant. In this work the magnetic storms at 8 and 10 November 2004 are analyzed using data from Athens Neutron Monitor and other stations from the worldwide Neutron Monitors network as well. The variations of the cosmic ray intensity were studied with respect to the geomagnetic indices Dst and Kp and using the global spectrographic survey method (GSM) the changes of the geomagnetic cut-off rigidities during these events were calculated. From our analysis it was shown that the maximum cut-off rigidity changes were observed at the range around 6.5-9 GV. This corresponds to unusually low latitudes for maximal effect. The largest effect of the examined events was the one at 8th November 2004, best observed at the Athens (37.58°N, 23.47°E, 8.53GV) and Potchefstroom (-26.68°S, 27.10°E, 7.0 GV) neutron monitors.

S1-10: Study of spicules observed in the CaII H and Ha lines with Hinode/SOT

I. Kontogiannis (University of Athens), Tsiropoula G. (National Observatory of Athens) & Tziotziou K. (RCAAM, Academy of Athens & National Observatory of Athens)

We use a dataset of simultaneous image sequences obtained by Hinode/SOT with the Ca II H filter, as well as in Ha+-0.2A. SOT was looking at the SW solar limb. The high temporal and spatial resolution allows us to study the structure and dynamics of spicules seen at the different filters. Individual spicules have been selected and intensity and velocity distributions at different heights along their central axes are examined along with transversal fluctuations.

S1-11: Radio Emission Associated with Solar Energetic Particle Events

A. Kouloumvakos (University of Athens), Nindos A. (University of Ioannina), Preka-Papadema P. (UoA), Hillaris A. (UoA), Caroubalos C. (UoA), Moussas X. (UoA), Alissandrakis C. (University of Ioannina), Tsitsipis P.(TEI of Lamia) & Kontogeorgos A. (TEI of Lamia)

The corona probed at meter and decimeter wavelengths is a crucial region for the acceleration and propagation of solar energetic particles (SEPs), and radio diagnostics in this plasma plays a major role in assessing the origin of SEP events. Using data from the ARTEMIS IV solar radio spectrograph, we report the properties of the radio emission associated with several major SEP events. The association of the radio emission with the related flares and CMEs is also investigated.

S1-12: Type II Radio Emission from Shock Formation In The Low Corona on 13-Jun-2010: Combined Observations from the ARTEMIS-IV Radiospectrograph and SDO/AIA

A. Kouloumvakos (University of Athens), Vourlidas A. (Naval Research Laboratory), Preka-Papadema P. (UoA), Hillaris A. (UoA),Caroubalos C. (UoA), Moussas X. (UoA), Tsitsipis P. (Technological Education Institute of Lamia) & Kontogeorgos A. (TEI of Lamia)

High cadence observations in the low corona from AIA imagers combined with radiospectrograph high-resolution recordings give a new perspective of shock formation in the low corona. Using ARTEMIS-IV observations of drifting type-II metric radio emission and ultra-high resolution observations from the AIA imagers we present direct observation of shock formation in the EUV and its association to the accompanying type-II during the 13-Jun-2010 Event. We will show that, in this case, the coronal expansion driven by the formation of the CME ejecta is responsible for both EUV and radio emissions.

S1-14: The Photometric Software for Transits (PhoS-T)

D. Mislis (University of Cambridge / IoA), Heller R. (AIP), Fernandez J. (University of Goettingen), Seemann U. (University of Goettingen), Ioannidis P. & Avdellidou C. (University of Thessaloniki)

We present the Photometric Software for Transits (Phos-T), a user-friendly stand-alone astronomical software built to study in detail photometric data of transiting extra-solar planets. Through a simple and clean graphical environment, PhoS-T can perform data calibration, point-source differential photometry, and transit light curve modelling. Here we present a detailed description of the software, together with the analysis of a recent transit of the extra-solar planet HAT-P-19b, observed from Holomon astronomical station. The results obtained using PhoS-T are in good agreement with previous works, and provide a precise time-of-transit for HAT-P-19b.

S1-15: Solar Energetic Particles (SEPs) on a heliospheric scale – an attempt to compile the complete Ulysses event list over solar cycle 23

A. Papaioannou (UoA & NOA/IAA), Malandraki O.E. (NOA/IAA) & Tziotziou K. (NOA/IAA)

The intensities of Solar Energetic Particles (SEPs) are strongly affected by the variations in the level of solar activity, the characteristics of the solar wind and the properties of the interplanetary magnetic field that enable the acceleration and propagation of SEPs throughout the heliosphere. The study of SEPs at different latitudes and under different heliospheric conditions provides useful information about the global structure of the heliosphere during solar minimum and solar maximum, as well as on the mechanisms and the physics of solar particle propagation and acceleration. Due to its eccentric orbit over the solar poles and its continuous presence in space for 18 years, Ulysses spacecraft has been the only solar mission so far that allowed us to study the characteristics of SEPs at low and high latitudes and their distribution over a solar cycle. In this work, the Heliosphere Instrument for Spectra, Composition and Anisotropy in Low-Energies (HI-SCALE) and the Low-Energy Telescope (LET) of the Cosmic Ray and Solar Particle Investigation (COSPIN) onboard Ulysses have been used in order to identify all SEPs observed in and out of the ecliptic plane over solar cycle 23. A scan has been performed on the recordings of the low-energy protons of COSPIN/LET (energy range: 0.9-8.0 MeV) and the Deflected Electrons (DEs) of HI-SCALE (energy range: 38-315 keV). As a result, a list of about 150 well-defined events has been compiled. A part of this list, together with the analysis of case studies is being discussed. Furthermore, ongoing work includes the single treatment of each event and the possible identification of its solar source which could also be used as the basis for future solar missions such as Solar Orbiter in which IAA/NOA participates as a Co-Investigator (EPD instrument).

S1-16: Modeling ground level enhancements of solar cosmic rays

C. Plainaki (IFSI-INAF), Mavromichalaki H. (University of Athens), Belov A. (IZMIRAN), Eroshenko E. (IZMIRAN), Andriopoulou M. (MPI-Solar System Research) & Yanke V. (IZMIRAN)

The ground level enhancements of solar cosmic rays (GLEs) constitute the relativistic extension of the solar energetic particle (SEP) events and can be defined as the manifestation of a cosmic ray phenomenon in association with powerful solar flares and the fast (> 1000 km/s) Coronal Mass Ejections (CMEs). Among the several techniques available, for modeling the dynamical behavior of GLEs throughout their evolution, the Neutron Monitor Based Anisotropic GLE Pure Power Law (NMBANGLE PPOLA) Model couples primary solar cosmic rays at the top of the Earth's atmosphere with the secondary ones detected at ground level by neutron monitors of the worldwide network. The NMBANGLE PPOLA Model constitutes a new version of the already existing NMBANGLE Model, applied already in various GLEs of the past (events of 20 January 2005, 13 December 2006, and 15 April 2001), differing in the solar cosmic ray spectrum assumed. The total output of the NMBANGLE PPOLA model is a multi-dimensional GLE picture that reveals part of the characteristics of the big solar proton events recorded at ground level. In this work, the characteristics and the main considerations of the NMBANGLE PPOLA model shall be presented, as well as the results of its application at the GLE of 15 April 2001. The important role of the existence of an accurate database of neutron monitors, widely distributed around the world, for this kind of studies will be also discussed.

S1-17: Potentially active regions on Titan: Application of PCA to Cassini/VIMS data and atmospheric subtraction

A. Solomonidou (University of Athens and Observatoire de Paris)

We present a study of Titan's geology with a view to enhance our current understanding of the satellite's potentially active zones. The determination of Titan's surface chemical composition is critical in order to unveil its geology and investigate the interactions between the interior, the surface and the atmosphere. Cassini/VIMS acquired a large amount of spectra and images taken within the narrow methane spectral windows centered at 0.93, 1.08, 1.27, 1.59, 2.03, 2.8 and 5 μm. However, the surficial imaging is still ambiguous due to haze scattering and particle absorption and needs to be clearly defined. We combine here Principal Component Analysis and "atmosphere subtraction", as a prelude to "differential spectroscopy" on three potentially active regions on Titan, namely Tui Regio, Hotei Regio, and Sotra Facula. With the statistical method of Principal Component Analysis, we have managed to isolate specific regions of interest of distinct spectral behaviouro and hence of diverse chemical composition; then, by means of atmospheric subtraction, we have reduced the effect of the contribution of the atmosphere within the atmospheric methane windows, to better focus on the real alterations in surface composition, by comparing the spectral behaviours of these regions. We present some suggestions for the chemical composition and the correlation with the morphotectonic features within these three cryovolcanic candidate areas.

S1-18: Coronal temperature during total solar eclipses at the extended solar minimum of solar cycle 23

I. M. Strikis (Hellenic Elizabeth Observatory of Athens), Kouloumvakos A. (University of Athens) & Xystouris G. (University of Athens)

Coronal temperature diagnostics are essential for the general understanding of coronal properties during a solar cycle. With spectroscopic measurements during total solar eclipses, temperature can be derived from the forbidden iron lines ratio. We will present our results of temperature variations from the measurements of FeXIV/FeX line ratio during 2006-2010 total solar eclipses. Also a correlation of temperature with sunspot number, radio flux and flare occurrence will be presented.

S1-19: STEREO and SDO observations of several solar jets

K. Tsinganos (National Observatory of Athens & Univ. of Athens),
Moschou S. (University of Athens), & Vourlidas A. (Naval Research Laboratory)

We present an analysis of recent observations of several solar jets observed at the solar limb with STEREO A/B and the Solar Dynamics Observatory (SDO). We construct fitted height-time diagrams at all wavelengths and calculate the temporal evolution of the jet speed and acceleration. The first case is a large solar jet observed on 06/30/2010, simultaneously by STEREO & SDO in the north solar pole, at many wavelengths, from 171 to 304 Angstroms. It has a precursor and lasts in total for about 60 minutes, while the main jet reaches a height of 0.3 Ro and a maximum speed of about 250 km/sec. The second sample contains a set of four solar limb jets observed 5 days earlier than the previous one, i.e., 06/25/2010. All jets are observed with SDO while two of them are simultaneously observed with STEREO. Two jets have a precursor and last from 60 – 120 minutes, reaching heights of less than 0.2 Ro. Finally, we analyse a jet observed by STEREO on 11/12/2008

in 174, 195, 284 and 304 Angstroms. The jet reaches a height of 0.25 Ro and a maximum speed of about 150 km/sec. Magnetograms during the jet appearances show the corresponding magnetic topologies. The velocities involved are smaller than the escape speed from the sun at each radius. The results are preliminarily discussed in relation to possible jet formation mechanisms.

S1-20: On the initiation of Coronal Mass Ejections observed by STEREO/EUVI

P. Syntelis (RCAAM, Academy of Athens), K. Tsinganos (National Observatory of Athens & Univ. of Athens), A. Vourlidas (Naval Research Laboratory) & C. Gontikakis (RCAAM, Academy of Athens)

This study examines different stages of a Coronal Mass Ejection's (CME) initiation in NOAA Active Region (AR) 10980, observed on January 2, 2008 by STEREO's Extreme UltraViolet Imager (EUVI). We identify a first phase consisting of an upward motion, which at $1.58R_{\odot}$ reaches the velocity of 70 (4) km/s. Those measurements are extrapolated to later time frames to examine whether this initial acceleration drives the CME's propagation later on. We also identify an ascending new flux-rope beneath the CME. During the CME's rise, there are indications that some adjacent loops incline to the main CME body. At the later phase of the initiation, some moving blob-like structures appear along the CME flanks. Propagation speeds of these blobs are measured. These blobs could be indications that a siphon flow exists along the CME.

S1-21: On the shape of active region coronal loops observed by Hinode/EIS.

P. Syntelis (RCAAM), C. Gontikakis (RCAAM), C. E. Alissandrakis (University of Ioannina), M. Georgoulis (RCAAM), & K. Tsinganos (National Observatory of Athens & Univ. of Athens)

We study plasma flows in NOAA Active Region (AR) 10926, observed on December 3, 2006 with Hinode's EUV Imaging Spectrograph (EIS). We measured the line-of-sight velocity along coronal loops in the Fe VIII 185A, Fe X 184A , Fe XII 195A, Fe XIII 202A, and Fe XV 284A spectral lines and reconstructed the three dimensional (3D) shape and velocity of plasma flow using a simple geometrical model. In most cases the flow is unidirectional from one footpoint to the other, resembling siphon flow. However there are also cases of draining motions from the top of the loops to their footpoints. The multi-wavelength observations of the AR indicate that similar loops may show different flow patterns if observed in different spectral lines. We have also carried out magnetic field extrapolations using an SOHO/MDI and an SOT/Spectropolarimeter (SP) magnetogram, in order to identify magnetic field lines corresponding to the reconstructed 3D loops.

S2: Extragalactic Astrophysics and Cosmology - Oral Presentations

Monday, 5th of September

Strong gravitational lensing, the structure of galaxies and clusters, and why we care (Inv. Talk)

L. Moustakas (JPL/Caltech)

Strong gravitational lensing is an observed phenomenon that creates multiple images of distant objects through a gravitational focusing effect by massive foreground objects. While lensing can be used for precision cosmography and for studying (magnified) strongly-lensed distant galaxies or AGN, it is also a unique probe of the cluster or galaxy that is acting as the lens. With tailored observations of strong lenses of different scales, it is possible to determine the mass-density profile of galaxies and galaxy clusters, gain insight into the Fundamental Plane relation for early type galaxies, and map the properties of predicted structures at mass scales below those of dwarf galaxies within lensing galaxies. The unifying themes for all of these capabilities that strong lensing observations enables is in the nature of dark matter, and the formation and evolution of structure in the universe. I will draw these connections, and present recent and planned work and techniques that push these frontiers, including from SLACS, CLASH, and the OMEGA Explorer.

Alternative tracers to estimate the Dark Energy equation of state

M. Plionis (IAA, NOA)

We explore the possibility of setting stringent constraints to the Dark Energy equation of state using alternative cosmic tracers like: (a) the Hubble relation using HII galaxies, which can be observed at much higher redshifts ($z < 3.5$) than those currently traced by SNIa samples, and (b) the large-scale structure using the clustering of X-ray selected AGN, which have a redshift distribution peaking at $z \sim 1$.

Testing gravity at cosmological scales

S. Basilakos (RCAAM-Academy of Athens & Un. of Barcelona)

We derive an exact analytical solution for the redshift evolution of linear and scale-independent bias, by solving a second order differential equation based on linear perturbation theory. This bias evolution model is applicable to all different types of dark energy and modified gravity models. We propose that the combination of the current bias evolution model with data on the bias of extragalactic mass tracers could provide an efficient way to discriminate between "geometrical" dark energy models and dark energy models that adhere to general relativity.

Weak gravitational lensing as a tool for cosmology

C. S. Carvalho (IPFN, IST/RCAAM, Academy of Athens)

I will speak about recent developments in the measurements of the weak gravitational signal from maps of the cosmic microwave background (CMB) radiation. This signal is regarded as a contaminant of the primordial signal, but simultaneously it contains information on the large-scale matter distribution. Weak lensing of the CMB results from the coupling of the CMB photons to the gravitational potential integrated along the line of sight. Whereas lensing of galaxy shapes probes up to z~2, lensing of the CMB probes up to the last-scattering surface at z~1000 thus being a powerful tool for cosmology. Weak lensing generates a non-Gaussian pattern on the CMB temperature, while conserving the surface brightness. Hence, estimators of the weak lensing signal are quadratic in the temperature maps. I will then speak about a novel estimator which acts in real space, contrary to conventional estimators which act in harmonic space. The novel estimator performs well in the presence of detector noise and cuts in the maps due to point source excisions. Time allowing, I will also speak about how to use weak lensing to study the nature of dark matter and constrain deviations from general relativity at cosmological scales.

Searches for Solar Axions at CERN with the CAST Telescope

C. Eleftheriadis (Aristotle University of Thessaloniki)

Axions are candidate particles for the Dark Matter of the Universe. They have been introduced as a solution to the long standing Strong CP Problem in the Standard Model in Particle Physics. The CERN Axion Solar Telescope (CAST), which is the worldwide state-of-the-art experiment searching for solar axions, will be presented, as well as recent results, approaching for the first time cosmological hot dark matter bounds.

Evolution of X-ray Binaries Across Cosmic Time and Energy Feedback at High Redshift

T. Fragos (Harvard-Smithsonian CfA), M. Tremmel (Northwestern University), B. Lehmer (NASA-GSFC), A. Hornschemeier (NASA-GSFC), V. Kalogera (Northwestern University), P. Tzanavaris (NASA-GSFC), A. Zezas (University of Crete), L. Jenkins (NASA-GSFC), A. Ptak (NASA-GSFC), & C. Belczynski (New Mexico State University)

High redshift galaxies are unique laboratories for studying the formation and evolution of X-ray binary (XRB) populations on cosmological timescales, as they probe metallicities and star-formation rates not present in the local universe. I will present results from a large scale population synthesis study that models the XRB populations from the first galaxies of the universe until today. We use as input in our modeling the Millennium II Cosmological Simulation and the updated semi-analytic galaxy catalog by Guo et al. (2011), in order to properly account for the star formation history and metallicity evolution of the universe. Our modeling, which is compared to the most recent Chandra surveys of distant galaxies, gives prediction about the integrated specific X-ray luminosity as a function of redshift and the evolution of the galaxy X-ray luminosity function of normal galaxies in different redshift bins. Finally, I will discuss the energy feedback of XRBs in high redshift galaxies, and its possible contribution to the re-ionization and the thermal evolution of the early Universe.

A multi-wavelength analysis of Hickson Compact Groups of galaxies

T. Bitsakis (University of Crete) & V. Charmandaris (University of Crete & FORTH)

We present a comprehensive study on the impact of the environment of compact galaxy groups on the evolution of their members using a multi-wavelength analysis, from the UV to the infrared, for a sample of 32 Hickson compact groups (HCGs) containing 135 galaxies. Fitting the SEDs of all galaxies with the state-of-the-art model of da Cunha (2008) we can accurately calculate their mass, SFR, and extinction, as well as estimate their infrared luminosity and dust content. We compare our findings with samples of field galaxies, early-stage interacting pairs, and cluster galaxies with similar data. We find that classifying the groups as dynamically "old" or "young", depending on whether or not at least one quarter of their members are early-type systems, is physical and consistent with past classifications of HCGs based on their atomic gas content.

Dynamically "old" groups are more compact and display higher velocity dispersions than "young" groups. Late-type galaxies in dynamically "young" groups have specific star formation rates (sSFRs), NUV-r, and mid-infrared colors which are similar to those of field and early stage interacting pair spirals. Late-type galaxies in dynamically "old" groups have redder NUV-r colors, as they have likely experienced several tidal encounters in the past building up their stellar mass, and display lower sSFRs. We identify several late-type galaxies which have sSFRs and colors similar to those of elliptical galaxies, since they lost part of their gas due to numerous interactions with other group members. Also, 25% of the elliptical galaxies in these groups have bluer UV/optical colors than normal ellipticals in the field, probably due to star formation as they accreted gas from other galaxies of the group, or via merging of dwarf companions. Finally, our SED modeling suggests that in 13 groups, 10 of which are dynamically "old", there is diffuse cold dust in the intragroup medium. All this evidence point to an evolutionary scenario in which the effects of the group environment and the properties of the galaxy members are not instantaneous. Early on, the influence of close companions to group galaxies is similar to the one of galaxy pairs in the field. However, as the time progresses, the effects of tidal torques and minor merging, shape the morphology and star formation history of the group galaxies, leading to an increase of the fraction of early-type members and a rapid built up of the stellar mass in the remaining late-type galaxies.

Extended Infrared Emission from (U)LIRGs

V. Charmandaris (University of Crete & FORTH)

I will present recent findings on the presence the extended emission of a volume limited (d < 82 Mpc) sample of luminous infrared galaxies (LIRGs) drawn from the Great Observatories All-sky LIRG Survey (GOALS) galaxy sample. Using Spitzer/IRS spectra to determine the fraction of emission arising from their extended component, we find the majority of LIRGs, at least 20 to 80% of their emission stems from an extended component. The IRS spectra also allow us to separate the different emission components (dust continuum and PAH feature emission, ionized and molecular gas) and calculate their corresponding spatial extent. We find that in several galaxies the PAH feature emission is up to 3 times more extended than that of the mid-infrared continuum. These results suggest that the mid-infrared emission of LIRGs is not as compact as in their more luminous counterparts (ULIRGs) but instead it is distributed across their disks. Analysis of the extent of the different spectral features also enables us to ascertain whether the high redshift, higher luminosity submillimeter galaxies (SMGs), which also display fairly extended star formation, can be considered the scaled-up luminosity examples of local LIRGs, rather than ULIRGs.

High-redshift Luminous Red Galaxies clustering analysis in SDSS Stripe82

N. Nikoloudakis (University of Durham)

We have measured the clustering of Luminous Red Galaxies in Stripe 82 using the angular correlation function. We have selected 130000 LRGs via colour cuts in R-I:I-K with the K band data coming from UKIDSS LAS. We have used the cross-correlation technique of Newman (2008) to establish the redshift distribution of the LRGs as a function of colour cut, cross-correlating the LRGs with SDSS QSOs, DEEP2 and VVDS galaxies. We also used the AUS LRG redshift survey to establish the n(z) at z<1. We then compare the w(theta) results to the results of Sawangwit et al (2010) from 3 samples of SDSS LRGs at lower redshift to measure the dependence of clustering on redshift and LRG luminosity. We have compared the results for luminosity-matched LRG samples with simple evolutionary models, such as those expected from long-lived, passive models for LRGs and for the HOD models of Wake et al (2009) and find that the long-lived model may be a poorer fit than at lower redshifts. We find some evidence for evolution in the LRG correlation function slope in that the 2-halo term appears to flatten in slope at z>1. We present arguments that this is not caused by systematics.

An optical spectroscopic study of a LLQSOs sample and the impact of the aperture effect on its classification

E. Tremou (University of Cologne), A. Eckart (University of Cologne), &
M. M. Garcia (University of Cologne)

Low Luminosity Quasi Stellar Objects comprise key objects in the context of galaxy evolution scenarios. They may represent the transition population between luminous QSOs and less luminous local galaxies and Seyferts. By analyzing the ionizing source within a galaxy, we distinguish different excitation mechanisms in a nearby sample of low luminosity QSOs. The diagnostic diagrams are a well-known tool for the taxonomy of sources dominating by AGN/Seyfert, LINER and Starburst activity. A significant number of the LLQSOs sample members show strong star forming activity, despite the fact that they were initially selected to be Seyfert-1. Furthermore, four galaxies were detected with a double narrow component in their spectral profile, indicating the possible existence of "superwinds".

The comparison of the diagnostic diagrams coming from two data sets observed with different instruments drove to a certain "shift" in the classification of the sources, so called "aperture effect". The different techniques that can be used in order to obtain spectroscopic observations apply different aperture sizes, and this issue can play a critical role in the classification of the observed objects. An extended study on simulating such galaxies results to a solid explanation of variations in the diagnostic diagrams. An interesting result is the impact of the aperture effect not only in the local universe but also in larger cosmological distances. The importance of the individual classification of the galaxy region (nucleus, bulge, disk), as well as its effective area are also going to be presented. These two parameters are ultimately related and are needed to understand how an instrument configuration affects the final galaxy classification.

Tuesday, 6th of September

Jets from stellar tidal disruption by massive black holes (Inv. Talk)

D. Giannios (Princeton University)

The tidal disruption of a star by a supermassive black hole provides us with a rare glimpse of these otherwise dormant beasts. It has long been predicted that the disruption will be accompanied by a thermal `flare', powered by the accretion of bound stellar debris. Several candidate disruptions have been discovered in this manner at optical, UV and X-ray wavelengths. Here I explore the observational consequences if a modest fraction of the accretion power is channeled into an ultra-relativistic outflow. I show that a relativistic jet decelerates due to its interaction with the interstellar medium at sub-parsec distances from the black hole. Synchrotron radiation from electrons accelerated by the external shocks powers a bright radio-infrared transient that peaks on a timescale ~1 yr after disruption. The, recently detected, high-energy transient Sw 1644+57 provides strong support to the presence of powerful relativistic jets during tidal disruption events. Upcoming radio transient surveys may independently discover tens to hundreds of tidal disruptions per year, complimenting searches at other wavelengths.

The time-dependent one-zone hadronic model

A. Mastichiadis (University of Athens)

We investigate the radiative signatures of the one zone hadronic model, solving five space averaged, time-dependent coupled kinetic equations which describe the evolution of relativistic protons, electrons, photons, neutrons and neutrinos in a spherical volume containing a magnetic field. Protons are injected and lose energy by synchrotron, photopair and photopion production. We model photopair and photopion using the results of relevant MC codes, like the SOPHIA code in the case of photopion, which give accurate description for the injection of secondaries which then become source functions in their respective equations. Using these we model the corresponding proton losses and thus the code is self-consistent in the sense that the amount of energy lost by the protons is given to the secondaries. Furthermore, we treat the leptonic part of the system by including all relevant processes of the leptonic one-zone models. This approach allows us to examine questions like the efficiency of proton conversion to secondaries in addition to calculating self consistently the neutrino and photon spectra. We also show that the hadronic models are inherently unstable due to various supercriticalities which explosively transfer energy from protons to secondaries leading the system to a very rich temporal and spectral behavior.

Signatures of particle acceleration on Gamma Ray Burst afterglow light curves

M. Petropoulou (University of Athens)

We investigate the behavior of the X-ray lightcurves in the afterglow phase of Gamma Ray Bursts (GRB), after taking into account the maximum electron Lorentz factor (gamma_max) as an additional parameter of the problem. First, we treat gamma_max as a free parameter and we examine the lightcurves that one obtains for different values of the ratio gamma_max/gamma_min, where gamma_min is the minimum electron energy. We find that the lightcurves depend strongly on this ratio showing a variety of morphologies, with some having a strong resemblance to the observations. As a next step, we introduce particle acceleration and calculate gamma_max in a self-consistent way by balancing the energy losses with the energy gains of the accelerating electrons. The physical picture corresponds to particles injected at low energies and accelerated in the downstream region of the external GRB shock wave. We simulate that by introducing an acceleration term in the equation that describes the evolution of the electron distribution. We show some first results of the radiated synchrotron photon spectra obtained at various radii of the blast wave. Finally, we discuss possible implications of such 'one-zone' acceleration models for GRB afterglows.

F-GAMMA program: Unification and physical interpretation of the radio spectra variability patterns in Fermi blazars and detection of radio jet emission from NLSY1 galaxies

E. Angelakis (MPIfR, Bonn)

The F-GAMMA program aims at understanding the physics at work in AGN via a multi-frequency monitoring approach. A number of roughly 65 Fermi-GST detectable blazars are being monitored monthly since January 2007 at radio wavelengths. The core program relies on the 100-m Effelsberg telescope operating at 8 frequencies between 2.6 and 43 GHz, the 30-m IRAM telescope observing at 86, 145 and 240 GHz and the APEX 12-m telescope at 345 GHz. For the targeted sources the LAT instrument onboard Fermi-GST provides gamma-ray light curves sampled daily. Here we discuss two recent findings: A). On the basis of their variability pattern, the observed quasi-simultaneous broad-band spectra can be classified to merely 5 classes. The variability for the first 4 is clearly dominated by spectral-evolution. Sources of the last class vary self-similarly with almost no apparent shift of the peak frequency. The former classes can be attributed to a two-component principal system made of a quiescent optically thin spectrum and a super-imposed flaring event. The later class must be interpreted in terms of a completely different mechanism. The apparent differences among the classes are explained in terms of a redshift modulus and an intrinsic-source/flare parameters modulus. Numerical simulations have shown that a shock-in-jet model can very well describe the observed behavior. It is concluded therefore that only two mechanisms seem to be producing variability. None of the almost 90 sources used for this study show a switch of class indicating that the variability mechanism is either (a) a finger-print of the source, or (b) remains stable on timescales far longer than the monitoring period of almost 4 years. B). Recently it has been disclosed that Narrow Line Seyfert 1 galaxies show gamma-ray emission. Within the F-GAMMA program radio jet emission has been detected from 3 such sources challenging the belief that jets are associated with elliptical galaxies. The recent findings in this area will be discussed.

On the role of pc- to kpc-scale jet asymmetry and cosmic ray acceleration

N. Gizani (Hellenic Open University) & M.A.G. Garrett (ASTRON/Netherlands)

We probe the generation and acceleration mechanisms of cosmic rays due to relativistic outflows of powerful Active Galactic Nuclei. We have mapped weak parsec-scale radio jets of powerful radiogalaxies and traced them out to their kiloparsec scale powerful counterparts, using VLBI and VLA data. We report on ring-like featured radio sources.

Studying the asymmetry of the GC population of NGC 4261

P. Bonfini (University of Crete)

We present an analysis of the Globular Cluster (GC) population of the elliptical galaxy NGC4261 based on HST WFPC2 data in the B, V and I bands. We study the spatial distribution of the GCs in order to probe the anisotropy in the azimuthal distribution of the discrete X-ray sources in the galaxy revealed by Chandra images (Zezas et al. 2003). The luminosity function of our GC sample (complete at the 90% level for V<24 mag) peaks at $V = 24.9_{-0.5}^{+1.0}$ mag, identifying a distance of $28.8_{-6.6}^{+13.3}$ Mpc. The colour distribution can be interpreted as being composed by a blue and a red (predominant) subpopulations with average colours $V\text{-}I = 1.00_{-0.05}^{+0.06}$ and $1.25_{-0.07}^{+0.06}$, respectively. Both the blue and red GC radial profiles differ significantly from the profile of the galaxy surface brightness. The most striking finding, however, is the significant asymmetry in the azimuthal distribution of the GC population about a NE-SW axis. The lack of any obvious feature in the morphology of the galaxy suggests that the asymmetry could be the result of an interaction or a dry merger.

Revealing new optically-emitting extragalactic Supernova Remnants

I. Leonidaki (NOA - IAA), P. Boumis (NOA – IAA) & A. Zezas (University of Crete & FORTH)

We present the detection of new optically emitting Supernova Remnants (SNRs) in six nearby galaxies, using deep narrow band Halpha and [S II] images as well as spectroscopic observations. The SNR classification was based on the detected sources that fulfill the well-established emission line flux criterion of [S II]/Halpha > 0.4. This study revealed ~400 photometric SNRs down to a limiting flux of 10^{-16} erg/sec /cm^2, ~350 of which are new identifications. 130 photometric SNRs were spectroscopically observed and 63 outlined their shock-excited nature, verifying that the used photometric method is a robust diagnostic tool for the preliminary identification of SNRs. We compare the derived SNR properties (such as electron density, luminosity, number of SNRs) in different types of galaxies and hence different environments, in order to investigate their interaction with the surrounding interstellar medium. We also cross-correlate parameters of the optically detected SNRs ([S II]/Halpha ratio, luminosity) with parameters (temperature, luminosity) of coincident X- ray emitting SNRs, resulted from our previous studies in the same sample of galaxies, in order to understand their evolution and investigate possible selection effects.

S2: Extragalactic Astrophysics and Cosmology - Poster Presentations

S2-1: Alternative Astronomical FITS imaging

N. Gizani (Hellenic Open University) & E. Varsaki (Hellenic Open university)

Astronomical radio maps are presented mainly in FITS format. Astronomical Image Processing Software (AIPS) uses a set of tables attached to the output map to include all sorts of information concerning the production of the image. However this information together with information on the flux and noise of the map is lost as soon as the image of the radio source in fits or other format is taken out from AIPS. This information would have been valuable to another astronomer who just uses NED, for example, to download the map. In the current work, we show a method of data hiding inside the radio map, which can be preserved under transformations, even for example while the format of the map is changed from fits to other available image formats.

S2-5: Blazar variability patterns

K. Moraitis (University of Athens) & A. Mastichiadis (University of Athens)

We study the expected variability patterns of blazars within a two-zone acceleration model, focusing on flare shapes and spectral lags. The kinetic equations describing particle evolution in the acceleration and radiation zone are semi-analytically solved. We then perturb the solutions by introducing variations in its key parameters and examine the flaring behavior of the system. We apply the above to the X-ray observations of blazar 1ES 1218+304, which exhibited a hard-lag behavior during a flaring episode and discuss possibilities of producing it within the context of our model. Finally, we examine the capabilities of the model for producing high-energy gamma-ray flares.

S2-6: Steady-state rarefaction waves in magnetized flows and their application to gamma-ray burst outflows

K. Sapountzis (University of Athens) & N. Vlahakis (University of Athens)

We investigate the characteristics of a relativistic magnetized fluid flowing around a corner. If the flow is faster than the fast-magnetosonic speed the non-smooth boundary induces a rarefaction wave propagating in the body of the flow. The subsequent expansion is accompanied with a very efficient increase of the flow speed and bulk Lorentz factor. We apply this "rarefaction acceleration mechanism" to the collapsar model of gamma-ray bursts, in which a relativistic jet initially propagates in the interior of the progenitor star, before crossing the stellar surface with a simultaneous drop in the external pressure support. We integrate the steady-state equations using a special set of partial (r-self similar) solutions. The use of these solutions degrades the system of the complex, non-linear, 2nd order partial differential equations into a system of two 1st order ordinary differential equations whose integration is straightforward. For the conditions expected in a gamma-ray burst, a fully analytical solution can be obtained. The aim of this work is to better understand the results of recent time-depended numerical simulations and show that rarefaction acceleration is a plausible mechanism in gamma-ray burst outflows.

S2-7: Survival of Satellite Galaxies in Minor Mergers

C. Siopis (Universite Libre de Bruxelles)

We have studied the survivability of satellite galaxies in different orbits around a host galaxy. Assuming axisymmetry, we obtained deprojected (three-dimensional) mass density profiles from surface photometry of eight nearby satellite galaxies. We then placed them in the gravitational potential of several model host galaxies, built to span the range of elliptical galaxy types, and followed their dynamical evolution, especially in terms of mass loss due to dynamical friction and tidal stripping. We tried a number of satellite-to-primary mass ratios, initial separations, and orbital eccentricities. While most of the satellites survived under most initial conditions, some of them showed complete disruption for a significant fraction of the initial conditions. These simulations allow us to evaluate whether the observed satellites are newly-accreted members of the galaxy system in which they belong, and how susceptible they are to disruption. Even more importantly, however, they may help to constrain several proposed scenarios for galaxy evolution, including heating of disks, growth of bulges and halos, hierarchical growth of galaxies, formation of shells, generation of starbursts, bar and spiral structure, formation of globular clusters and the survival of the core fundamental plane parameters.

S2-8: PLUTO code for computational Astrophysics: News & Developments

P. Tzeferacos (University of Turin) & A. Mignone (University of Turin)

We present an overview on recent developments and functionalities available with the PLUTO code for astrophysical fluid dynamics. The recent extension of the code to a conservative finite difference formulation and high order spatial discretization of the compressible equations of magneto-hydrodynamics (MHD), complementary to its finite volume approach, allows for a highly accurate treatment of smooth flows, while avoiding loss of accuracy near smooth extrema and providing sharp non-oscillatory transitions at discontinuities. Among the novel features, we present alternative, fully explicit treatments to include non-ideal dissipative processes (namely viscosity, resistivity and anisotropic thermal conduction), that do not suffer from the usual timestep limitation of explicit time stepping. These methods, offsprings of the multistep Runge-Kutta family that use a Chebyshev polynomial recursion, are competitive substitutes of computationally expensive implicit schemes that involve sparse matrix inversion. Several multi-dimensional benchmarks and applications assess the potential of PLUTO to efficiently handle many astrophysical problems.

S2-9: Stellar luminosities and radio structures of radio sources

E. Vardoulaki (Centro de Astrofisica da Universidade do Porto)

We present a near-infrared (K-band) study of two independent radio-source samples, the > 100 mJy 151-MHz radio-selected TOO at z ~ 1.25 and the > 2 mJy 1.4-GHz radio-selected SXDS radio sources at z ~ 1.1, and compare them to other samples from literature. We find that nearly all radio-luminous sources are associated with massive galaxies (~ 4 L* with a Gaussian spread of ~ 2 L*). There is a subtle correlation between location in this spread and radio luminosity understandable in the context of models in which radio luminosity reflects energy input into lobes via jets powered by processes associated with black hole accretion, with Eddington-limited accretion rate, black hole spin and radio source environment as the key cosmically-varying parameters. At all z, there is an additional sub-population of radio sources associated with sub-L* (non-massive) galaxies. They have jets confined to their host galaxies, at least some of which are well known Seyferts. Sources with extended FRI radio structures can, rarely, exceed the radio luminosities associated with the FRI/FRII break.

S2-10: Classification of X-ray sources in the direction of M31

G. Vasilopoulos (University of Athens), D. Hatzidimitriou (UoA) & W. Pietsch (MPE/Garching)

M31 is our nearest spiral galaxy, at a distance of 780 kpc. Identification of X-ray sources in nearby galaxies is important for interpreting the properties of more distant ones, mainly because we can classify nearby sources using both X-ray and optical data, while more distant ones via X-rays alone. The XMM-Newton Large Project for M31 has produced an abundant sample of about 1900 X-ray sources in the direction of M31. Most of them remain elusive, giving us little signs of their origin. Our goal is to classify these sources using criteria based on properties of already identified ones. In particular we construct candidate lists of high mass X-ray binaries, low mass X-ray binaries, X-ray binaries correlated with globular clusters and AGN based on their X-ray emission and the properties of their optical counterparts, if any. Our main methodology consists of identifying particular loci of X-ray sources on X-ray hardness ratio diagrams and the color magnitude diagrams of their optical counterparts. Finally, we examined the X-ray luminosity function of the X-ray binaries populations.

S3: Dynamical Astronomy and Relativistic Astrophysics - Oral Presentations

Wednesday, 7th of September

Numerical Simulations in Relativistic Astrophysics (Inv. Talk)

N. Stergioulas (University of Thessaloniki)

We present an overview of recent numerical simulations in a number of different topics in Relativistic Astrophysics, including the equilibrium of compact stars with meridional circulation, the gravitational collapse of differentially rotating compact stars to Kerr black holes, the magneto-elastic oscillations of magnetars, the gravitational wave spectrum of binary compact object mergers and the equilibrium and stability of massive tori around black holes.

Formation and destruction of jets in X-ray binaries

N. Kylafis (University of Crete)

The so called Poynting-Robertson Cosmic Battery (PRCB) explains in a natural way the formation of magnetic fields in the accretion disks of AGN and X-ray binaries. These magnetic fields result in jet emission from these sources. It will be demonstrated that the PRCB can explain naturally all the observed phenomenology of jet formation and destruction in X-ray binaries. In particular, it will be explained why a jet is present when the sources are in the hard spectral state but not in the soft one.

Magnetic field structure of relativistic jets without current sheets

K. Gourgouliatos (Purdue University)

We present an analytical class of equilibrium solutions for the structure of relativistic sheared and rotating magnetized jets that contain no boundary current sheets. We demonstrate the overall dynamical stability of these solutions and, most importantly, a better numerical resistive stability than the commonly employed force-free structures which inevitably require a presence of dissipative surface currents. The jet is volumetrically confined by the external pressure, with no pressure gradient on the surface. We calculate their expected observed properties. Given the simplicity of these solutions they could be useful initial conditions for relativistic jet simulations.

Modelling the equatorial emission in the SS433 microquasar

T. Smponias (TEI of Western Macedonia)

The jets in the microquasar SS433 are modelled using a three-dimensional relativistic hydrocode, with the aim of investigating the appearance of equatorial radio emission. A dynamical mechanism is explored, including the presence of an extended disc, whose role proves to be important in producing the aforementioned emission.

Modeling the morphology of disk galaxies by means of orbital theory (Inv. Talk)

P. Patsis (RCAAM, Academy of Athens)

I will review the dynamical mechanisms that have been found to shape the observed structures of disk galaxies, such as the spirals and the bars. The morphological properties of the spiral arms will be described in association with different dynamical mechanisms that have been proposed to build them. Differences are expected due to the fact that the spirals can be reinforced by stars in regular or in chaotic motion. Also in bars chaos may contribute to the observed morphologies in percentages that vary from case to case. I will also discuss the vertical structure of disk galaxies and the possible contribution of chaotic orbits to their density profiles away from the equatorial plane.

Origin of the orbital distribution of main-belt asteroids

K. Tsinganis (University of Thessaloniki)

Apart from an intricate distribution in semi-major axis (i.e. Kirkwood gaps), main-belt asteroids are also characterized by a broad distribution of eccentricities (up to 0.3) and inclinations (up to 25 deg). So far, no dynamical evolution model that begins with an initially circular and co-planar distribution has been able to reproduce this observation. In this paper we describe a new model, referring to the early stages of evolution of our system, when a massive gaseous disc was still present. The planetary system is assumed to be composed of the giant planets, which resided on a set of multi-resonant orbits (similar to the Galilean satellites, as predicted by modern formation models) as well as a ~5 Jupiter mass gaseous disc, interior to the orbit of Jupiter. As the gas disc evaporates, a series of previously unknown secular resonances "sweeps" through the inner solar system; these "new" resonances only become active because of the multi-resonant planetary orbits, which lead to very different precession frequencies than the current ones. Resonance sweeping excites and mixed the eccentricities and inclinations of the asteroids, leading to a final distribution that is very similar to the currently observed one. Very little mass is lost from the belt during the same time, which implies that it need not have been much more massive in the past, as previous models have suggested. Finally, as resonance sweeping is halted near 1.2 AU from the Sun, an inner edge is formed in the inner disc of solids, a fact which is crucial for terrestrial planet formation models, in order to explain the anomalously small value of Mars's mass.

Periodic orbits and chaos in the restricted three-body problem with oblate primary

N. Caranicolas (University of Thessaloniki)

We consider the circular restricted three-body problem including the effect of the larger primaryís oblateness and study periodic and chaotic motions of the third body. The grid research technique is applied to obtain a global solution in the space of initial conditions, which consists of symmetric periodic orbits up to a certain multiplicity, as well as escape and collision orbits. Standard differential correction procedures are then applied in order to compute some family characteristics accurately. To study the chaotic motion we use the Poincare surface of section technique and we extend to three-dimensions by appropriately perturbing the initial conditions of an orbit on the surface of section. The regular or chaotic nature of a 3D orbit is found by computing the maximum Lyapunov characteristic exponent. An application for the Saturn-Titan system is also made.

Evidence for extreme gravitational quadrupole moment variations of PSR J2051-0827

K. Lazaridis (MPIfR, Bonn)

We have conducted radio timing observations of the eclipsing millisecond binary pulsar PSR J2051-0827 with the European Pulsar Timing Array network of telescopes and the Parkes radio telescope, spanning over 13 yr. The increased data span allows significant measurements of the orbital eccentricity and composite proper motion. Our timing observations have revealed secular variations of the projected semimajor axis of the pulsar orbit which are much more extreme than those previously published and of the orbital period of the system. Investigations of the physical mechanisms producing such variations confirm that the variations of the semimajor axis are most probably caused by classical spinñorbit coupling in the binary system, while the variations in orbital period are most likely caused by tidal dissipation leading to changes in the gravitational quadrupole moment of the companion.

Strong-field gravity tests with binary pulsars

J. Antoniadis (MPIfR, Bonn)

In view of concepts like dark matter and dark energy, one of the fundamental questions of science is whether general relativity is a complete description of the gravitational interaction among bodies at macroscopic scales. Some of the best experiments supporting this hypothesis come from high precision timing of radio pulsars. In this talk we will present recent advances in the field, focusing on the study of PSR J1738+0333, a millisecond pulsar - white dwarf binary whose exceptional characteristics allow for a precise measurement of the orbital decay due to the emission of gravitational radiation. In combination with optical studies of the white dwarf companion, the timing measurements set generic limits on the emission of dipolar gravitational radiation that provide the best constrains for scalar-tensor theories of gravity and possibly a wide range of relativistic formulations of Modified-Newtonian-Dynamics. In closing, we will discuss advances in all fronts, from instrumentation to the discovery and study of new highly constraining systems.

The influence of strong field vacuum polarization on gravitational-electromagnetic wave interaction

D. Papadopoulos (University of Thessaloniki)

The interaction between gravitational and electromagnetic waves in the presence of a static magnetic field is studied. The field strength of the static field is allowed to surpass the Schwinger critical field, such that the quantum electrodynamical (QED) effects of vacuum polarization and magnetization are significant. Equations governing the interaction are derived and analyzed. It turns out that the energy conversion from gravitational to electromagnetic waves can be significantly altered due to the QED effects. The consequences of our results are discussed.

Magnetar Dynamics and Gravitational Waves

K. Kokkotas (University of Tuebingen & University of Thessaloniki)

We will present our recent work on the dynamics of magnetars and the possibility of emission of gravitational waves.

S3: Dynamical Astronomy and Relativistic Astrophysics - Poster Presentations

S3-1: Order and chaos in a triaxial galaxy model with a dark halo component

N. Caranicolas (University of Thessaloniki) & E. E. Zotos (University of Thessaloniki)

We study the regular or chaotic nature of orbits in a 3D potential describing a triaxial galaxy surrounded by a spherical dark halo component. Our numerical calculations show that the percentage of chaotic orbits decreases exponentially as the mass of the dark halo increases. A linear increase of the percentage of chaotic orbits was observed as the scale length of the halo component increases. In order to distinguish between the regular and chaotic character of orbits, we use the total angular momentum Ltot, as a new indicator. Comparison of this new dynamical parameter, with other, previously used, chaos indicators, shows that the Ltot

S3-2: The dependence of the stability of hierarchical triple systems on the orbital inclination: preliminary results

N. Georgakarakos (ATEI of Western Macedonia)

We study the effect of the orbital inclination on the stability of hierarchical triple systems by means of numerical simulations. The aim of this work is to investigate the possibility that the stability boundary may be independent of the orbital inclination for certain mass ratios and initial orbital configurations. We start with hierarchical triple systems which are on initially circular orbits.

S3-3: Complex-plane strategy: application to astrophysical problems

V. Geroyannis (University of Patras)

This is a review of the so-called “complex-plane strategy” (abbreviated 'CPS') and its application to astrophysical problems. CPS is an efficient alternative for problems obeying differential equations with terms that become undefined on the real axis when the independent variable r becomes greater than a particular value R (the radius, say). If so, then the decisive alternative proposed by CPS is to integrate the differential equations of the problem in the complex plane and, particularly, on a complex path. Such a complex path can be, for instance, a straight line parallel to the real axis and at a small imaginary distance from it. One may wonder why to continue numerical integrations beyond R; the reason is simply that, in this case, we can compute accurately all the dependent functions of the problem over a sufficiently extended interval of the independent variable r (up to r=2R, say). Then, to compute critical physical and geometrical characteristics of the model under consideration, we can interpolate in such extended function tables, instead of extrapolating in the othewise reduced function tables (terminating at r=R). In numerical analysis, interpolation is a safe and accurate procedure; while extrapolation suffers from large errors and, in most cases, becomes unreliable. CPS has been applied to astrophysical problems, in which the well-known polytropic equation of state is involved, or other equations of state with similar mathematical characteristics. Such problems are: the classical stellar polytropic models, the white dwarf models obeying Chandrasekhar's equation of state, the solar and the jovian systems, and the general-relativistic polytropic models simulating neutron stars. Finally, a new software package for accurately integrating in the complex plane along general complex paths is described and proposed, and some comparisons with existing packages are presented.

S3-4:On the dynamics of a small body in a post Newtonian potential field created by a regular polygon formation of N bodies

T. Kalvouridis & D. Fakis (National Technical University of Athens)

The N-body problem is one of the most important issues in Celestial Mechanics. In the relevant literature there are many particular cases one of which is based upon the so called restricted (N+1)-body regular polygon model where N=v+1 of the bodies-members of the system are spherical, homogeneous with equal masses m, and are located at the vertices of an imaginary regular v-gon, while the Nth body has different mass m0 and is located at the center of mass of the system. This formation rotates around the center of mass with constant angular velocity so that all the primaries are in relative equilibrium. A small body, natural or artificial, moves in the neighborhood of the system under the action of all the primaries. The original version was based on the assumption that all big bodies create Newtonian force fields. Here we present a particular case where we assume that the central body creates a post-Newtonian Manev-type potential. The problem is characterized by three parameters, namely the number v of the peripheral primaries, the mass parameter $\beta=m0/m$ and the coefficiente which measures the contribution of the non-Newtonian term of the potential of the central primary. Under these assumptions, we study some aspects of the dynamics of the small body and we expose some of the results obtained so far.

S3-5: Families of Periodic Orbits in the Sun - Jupiter - Trojan Asteroid System

K. Papadakis (University of Patras)

We study, numerically, families of simple non-symmetric periodic orbits of the restricted four-body problem where the three primary bodies lie at the apices of an equilateral triangle while a fourth massless body is moving under the Newtonian gravitational attraction of the primaries. More precisely, the primary bodies Sun, Jupiter and a Trojan Asteroid are set in the stable Lagrangian equilateral triangle configuration and as a massless fourth body we consider a spacecraft. The problem admits eight non-collinear equilibrium points. Four of them are close to Asteroid, two are stable and two are unstable. The network of the families of the simple periodic solutions using their characteristic curves in the (x, C) plane is presented. The linear stability of each periodic solution is also studied. Special generating planar horizontal and vertical critical periodic orbits of each family are calculated. We found a large number of various types of orbits and two families which consist of stable (horizontally and vertically) retrograde non-symmetric periodic orbits around Jupiter (the first family) and the Trojan Asteroid (the second one) with obvious practical interest.

S4: Stars, Our Galaxy and the Local Group - Oral Presentations

Monday, 5th of September

Low mass star-formation: new insights from Herschel

O. Dionatos (STARPLAN & NBI)

Recent results from the Herschel/DIGIT GT-KP on star formation will be presented. In particular, the interpretation of the highly excited gas observed will be discussed in conjunction with observations ranging from the infrared to sub-millimeter wavelengths as well as numerical models. The presentation will conclude focusing on the necessity and limitations of high angular resolution (interferometric) observations and the expected contribution of ALMA in star formation studies.

Filaments in Orion: A first look of the Integral Shaped Filament with Herschel

D. Polychroni (INAF-IFSI)

We present here the first maps of the Integral Shaped Filament in Orion A Molecular Cloud as mapped by the Herschel guaranteed time key program Gould Belt. The two tiles, mapped in parallel mode (PACS/SPIRE), are located just below the L1641N star forming region in the southern most regions of the Integral Shaped Filament. In this first study of the region we focus on the abundant filamentary structure apparent in the tiles. We have detected over 400 compact sources and derived their temperature distribution and the Core Mass Function (Msolar =~0.1~10s). We find that the spatial distribution of the identified sources follows closely the pattern of the filaments, strengthening arguments where filaments are the preferred location of star formation in molecular clouds. We have identified such filaments in the maps and derived their physical properties (i.e. column densities etc.). We will discuss here the relation between the physical properties of the sources and their parent filament.

The Herschel view of nebulae around evolved massive stars

C. Vamvatira-Nakou (University of Liege), P. Royer (Katholieke Universiteit Leuven, Belgium) D. Hutsemekers (Universite de Liege, Belgium) Y. Naze (Universite de Liege, Belgium), G. Rauw (Universite de Liege, Belgium), K. Exter (Katholieke Universiteit Leuven, Belgium), C. Waelkens (Katholieke Universiteit Leuven, Belgium), & M. Groenewegen (Royal Observatory of Belgium)

The detailed study of the nebulae ejected from Luminous Blue Variables and the circumstellar bubbles around Wolf-Rayet stars, which radiate strongly in the IR due to the heating of dust, is crucial for understanding the massive stars evolution. With Herschel, the largest telescope ever flown in space, we are able to study the gas and the dust in these circumstellar environments in the full far-infrared waveband. In the context of 'Mass-loss of Evolved StarS' Herschel guaranteed time key programme, we have obtained imaging and spectroscopic observations of nebulae associated with Luminous Blue Variable and Wolf-Rayet stars using PACS, one of the three instruments onboard Herschel. A description of these observations and first results of the data analysis are presented.

The first comprehensive photometric study of the overcontact binary TY Boo

E. Christopoulou (University of Patras)

New precision BVRI light curves of the overcontact binary TY Boo have been obtained using the 35.5 cm Schmidt-Cassegrain telescope at the University of Patras, Observatory equipped with an SBIG ST-10XME CCD made during 2010 and 2011. The complete light curves are analyzed with the Wilson-Devinney code (PHOEBE) and new geometric and photometric elements are derived. A period investigation based on all available data spanning 85 years, shows that there exists a cyclic variation overlaying a secular period decrease. The presence of a third body is investigated but also spotted models as resulting from magnetic activity.

On the path to strong gravity through timing accreting compact objects (Inv. Talk)

T. Belloni (INAF - Osservatorio Astronomico di Brera)

The X-ray emission from accreting black holes and neutron stars features strong variability on sub-second time scales, with very complex and broad phenomenology and strongly linked to spectral variations. From high-frequency quasi-periodic oscillations to rapidly changing X-ray burst oscillations to millisecond pulsations, these are weak signals immersed in strong noise and their study is pushing instrument capabilities to their limit. The scientific significance of fast time variability studies are both astronomical (properties of accretion flows, nature and evolution of sources) and physical (effects of General Relativity, equation of state of degenerate matter). I will review the main observational properties and discuss the future prospects and observational needs, introducing the proposed Large Observatory For x-ray Timing (LOFT) mission.

Hall equilibria and stability of magnetic field structure in neutron star crusts

K. Gourgouliatos (Purdue University)

We consider the Hall dynamics of the magnetic fields in the electron plasma of solid neutron star crusts. Stationary configurations satisfy a Grad-Shafranov type equation for magnetic flux surfaces, where the poloidal electrical current is a function of magnetic flux. The non-vanishing Lorentz force is balanced by gravity, pressure and tensile stresses. We present the general separable solution for the linear approximation. We investigate their stability and we find that although purely poloidal magnetic field configuration is stable to internal modes it is not if the perturbation does not vanish on the boundaries and energy is exchanged between the crust and the magnetosphere.

Connecting the young accreting binary population of the Magellanic Clouds with their star-formation history

V. Antoniou (Iowa State University), A. Zezas (University of Crete, CfA),
D. Hatzidimitriou (University of Athens), & V. Kalogera Vicky (Northwestern University)

In this work, we study the properties of the overall accreting binary population of the Magellanic Clouds and the connection between star-formation (SF) activity and X-ray binary (XRB) formation and evolution. Understanding of the populations of compact objects and their connection with SF will allow us to investigate channels of XRB formation in a variety of environments and therefore help in studies of the X-ray source populations of star-forming galaxies outside our Local Group, and even enable their use as a SF diagnostic. By using surveys carried out with space-based X-ray and infrared observatories and ground-based telescopes, we address the demographics of the most common type of young XRBs in the two nearest star-forming galaxies. Our program makes use of multiwavelength data sets in order to provide better understanding of the physical parameters which influence the XRB formation rate and evolution, such as the metallicity and the age of the parent stellar populations. In the SMC, the dominant Be-XRB population appears to be linked to the increased SF activity at ~25-60 Myr ago, while in the Large Magellanic Cloud this activity is shifted to earlier ages (at only ~10-50 Myr). 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.

Optical spectroscopy of Be-XRBs in the SMC

G. Maravelias (University of Crete)

The Small Magellanic Cloud (SMC) is a well known laboratory to study High-Mass X-ray Binaries (HMXBs), as it harbors an unexpectedly high number of HMXBs. The complementary study of the optical counterparts of the HMXBs detected in X-ray observations reveal the nature of the donor stars and consequently the binaries' properties. Thus, we obtained optical spectra for a number of HMXBs identified in previous Chandra and XMM-Newton surveys of the SMC, using the 2dF spectrograph at the Anglo-Australian Telescope, in order to determine the spectral types of the optical counterparts. We identify at least 17 Be/X-ray binaries Be-XRBs) and an excellent case of a Supergiant B[e]. We present the spectral types of these sources and we discuss them in the context of the general populations of BeXRBs in the Galaxy and the Magellanic Clouds.

Fundamental Parameters of Four Massive Eclipsing Binaries in Westerlund 1

A. Bonanos & E. Koumpia (National Observatory of Athens/IAA)

We present fundamental parameters of four massive eclipsing binaries in the young massive cluster Westerlund 1. The goal is to measure accurate masses and radii of their component stars, which provide much needed constraints for evolutionary models of massive stars. Accurate parameters can further be used to determine a dynamical lower limit for the magnetar progenitor and to obtain an independent distance to the cluster. Our results confirm and extend the evidence for a high mass for the progenitor of the magnetar.

Close Binaries with delta Scuti components: New discoveries, analysis techniques and recent results

A. Liakos (University of Athens), P. Niarchos (University of Athens), & K. Gazeas (ESA, ESTEC)

The results from a four-year systematic observational sky survey of eclipsing binaries, candidates for containing a delta Scuti component, are presented. More than a hundred systems were tested for a possible oscillating behavior, 17 out of which were found to show evidence of pulsating component and 8 more being ambiguous cases for further research. Data analysis and modelling methods are described step-by-step, and as an example the case of BO Her is presented in detail. Using the observational results of all known close binaries with a delta Scuti component collected from the literature and our own study, a total of 73 such systems is gathered. Correlations among their physical parameters (e.g. pulsation and orbital periods, evolutionary status) are also derived, extending significantly our knowledge of these systems.

Towards an Automated Processing of Gaia Eclipsing Binaries

C. Siopis (Universite Libre de Bruxelles)

Gaia is a Cornerstone ESA mission which, in the course of its lifetime, is expected to produce multicolor photometry time series for more than 10^9 stars. Radial velocity time series of moderate accuracy will also be available for many of these stars. A large number of eclipsing binary systems (on the order of 10^6) are expected to be detected in this sample, and the Gaia data reduction pipeline has been tasked to identify and characterize them, with the aim of extracting as much physical information as possible for each object (masses, radii, temperatures, orbital parameters, ...). Given the large number of objects, the processing will have to be fully automated. I will present some of the challenges, and progress made towards achieving these goals. I will also provide a brief overview of the Gaia mission and of the efforts currently underway for the scientific exploitation of the expected large quantities of data.

Distance mapping and the 3D structure of BD +30 3639

S. Akras (Instituto de Astronomia, UNAM)

BD +30 3639 is a member of the rare group of PN with Wolf—Rayet type central star and expansion velocities higher in [O III] than in [N II]. Observation images and high resolution spectra from literature are used to produce a 3-D model of the nebula using the code SHAPE. We find that two different velocity laws are needed. Hence, the internal velocity field of BD +30 3639 decreases with the distance from the central star. In addition, we present a new kinematic analysis technique called “distance mapping”. It uses the observed proper motion vectors and the 3D velocity field to determine the distance. From this information we generate distance maps that can be used as a constraint to morpho-kinematic modeling SHAPE. It is applied to BD +30 3639 and the distance is determined at 1.4 kpc. From the criss-cross mapping technique, we also find that the kinematic center of the nebula is located 0.5 arcsec from the central star.

Extreme refractive lensing in the interstellar medium

K. Zagkouris (University of Oxford), A. Karastergiou (University of Oxford) &
M. Walker (Manly Astrophysics)

In 1987, Fielder et al discovered dramatic and sudden changes in the flux density of a compact radio source during a monitoring campaign of a population of quasars. This was explained as an Extreme Scattering Event (ESE), caused by a strong refractive lens, a few astronomical units in radius, crossing the line of sight to the quasar. A Galactic population of dense and ionized clouds, the exact properties of which remain uncertain, have been proposed to explain these ESEs. These lenses have the potential to affect point-like radio sources, not only quasars but also pulsars. In this work we describe the process of refraction that takes place during an ESE by using two lens models to derive the possible effects on the observed flux density of the background source. We also show how we can use pulsar observations to detect the presence of such lensing objects and therefore further constrain their population estimates and the model that describes them.

Testing photometric metallicities with Milky Way dwarf spheroidal companions

S. Lianou (University of Heidelberg), E.K. Grebel (ARI, University of Heidelberg), &
A. Koch (LSW, University of Heidelberg)

Metallicity distribution functions provide important information on the star formation and chemical enrichment histories of galaxies. One way to derive metallicities of evolved stellar populations in nearby galaxies is through spectroscopic measurements of individual red giant stars. In more distant galaxies, individual red giants are not accessible for spectroscopic observations due to their faintness and crowding. An alternative way to derive metallicities is photometrically through their resolved red giant stars. One basic, simplifying assumption these photometric methods rely on is that the studied galaxy population is of the same old age. These methods have been widely used to derive metallicities in dwarf spheroidals and in galaxy haloes consisting of stars believed to be largely intrinsically old. We show results on the effects of extended star formation histories on deriving photometric metallicities by comparing them with spectroscopic metallicities of Milky Way dwarf spheroidal companions.

S4: Stars, Our Galaxy and the Local Group - Poster Presentations

S4-1: 3-D Modeling of the collimated outflows of M1-32 and M 2-42

S. Akras (Instituto de Astronomia, UNAM)

We present high resolution long-slit spectra from San Pedro Martir catalogue (Lopez et al. in prep.) of M1-32 & M2-42 planetary nebulae and their modeled PV diagrams using the 3D morpho-kinematic code SHAPE. We find high-speed collimated outflows, surrounded by a thick dusty torus/ring. The same SHAPE model is able to fit both planetary nebulae assuming one cylindrical velocity field for the outflows and one Hubble-law for the dusty torus/ring concluding that they may be akin objects which just appear at different projections.

S4-2: Deep optical observations and study of the VRO supernova remnant

P. Boumis (National Observatory of Athens/IAA), I. Alikakos (National Observatory of Athens/IAA),
& F. Mavromatakis (Technological Education Institute of Crete)

We present the first CCD images of the VRO (G 166.0+4.3) supernova remnant in HI+[N II], [O III] 5007 and [S II] at a moderate angular resolution. Low and high-dispersion spectroscopy was also performed at selected areas around this extended remnant. Diagnostic diagrams of the line intensities from the present spectra and the new kinematical observations both confirm the supernova origin. Taking into account our results (i.e. shock velocities, morphological characteristics etc.) together with observations in other wavelengths (i.e. radio), we provide significant information of the interaction between this SNR and the surrounding ISM.

S4-4: Observation of transient high frequency optical oscillations on three week flares of the red dwarf EV Lac

M.E. Contadakis (University of Thessaloniki)

Thorough investigations on the red dwarf EV Lac indicate that transient high frequency oscillations occur during the flare event and during the quiet-star phase as well. The postulation that transient high frequency oscillations occur during the weak flares and during the quite state of this active red dwarf is a very important task. In this paper we present the results of the analysis of the B-lightcurves of three weak flares of the red dwarf EV Lac, which were observed on October of 2001, withthe help of the 30-inch Cassegrain telescope of the Stephanion Observatory. The combined use of Fractal analysis and DFT-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 pre-flare state as well (2) The Observed frequencies range between 0.003Hz (period 36 s) and 0.278Hz (period 3.5 s) not rigorously bounded. This result is very similar with the results of the observation of transient optical oscillation on strong and medium flares.

S4-5: Transient high frequency optical oscillations on a week flare of the red dwarf UV Cet

M.E. Contadakis (University of Thessaloniki)

Thorough investigations on the red dwarf EV Lac, YZ CMin and AD Leo 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 dwarfs is a very important task. In the frame of this consideration we present in this paper the results of the analysis of the B-light

curve for a rather weak flare of the red dwarf UV Cet, which were observed on October of 2001, with the help of the 30-inch Cassegrain telescope of the Stephanion Observatory. The combined use of Fractal analysis and DFT-analysis enable us to estimate the proper random noise and detect possible weak transient optical oscillations. In accordance to the results of past studies the results of the present study indicate that: (1) Transient high frequency oscillations occur during the flare event and during the pre-flare state as well (2) The Observed frequencies range between 0.0093 Hz (period 108 s) and 0.231Hz (period 4.3 s) not rigorously bounded. This result is in accordance

S4-6: Towards a Realistic Pulsar Magnetosphere

I. Contopoulos (RCAAM, Academy of Athens)

The acceleration of particles and the production of high-energy radiation in pulsar magnetospheres is the result of electric field components parallel to the magnetic field. The production of pulsar radiation, therefore, implies that the ideal MHD condition E*B = 0 is not satisfied at least in parts of the magnetosphere. In this paper, we present the magnetic and electric field structures as well as the currents and charge densities associated with pulsar magnetospheres where the ideal MHD condition is replaced by a variety of prescriptions concerning the values of the electric field component parallel to the magnetic field. The association of pulsar high energy observations to models for the production of high-energy radiation from non-ideal MHD pulsar magnetospheres will delineate the main physical parameters of the system.

S4-8: First Images from the Aristarchos Telescope

C. Goudis, P. Boumis, E. Xilouris, A. Katsiyannis, P. Hantzios, J. Alikakos, D. Abartzi, A. Maroussis (National Observatory of Athens/IAA)

We present new B, V, R, Halpha and [O III] images of galactic and extragalactic objects taken with the Aristarchos telescope during 2010 and 2011. The telescope is in full functional mode, currently with the imaging CCD cameras (LN 1kx1k, 2kx2k), the ATS low/medium resolution spectrometer and the RISE2 exoplanet fast imager, while the commissioning of more instruments (VEC 4kx4k CCD, MES-AT echelle spectrometer) is in progress.

S4-9: Planetary existence around M type main sequence stars

P. Ioannidis (University of Thessaloniki), D. Mislis (University of Cambridge) & C. Avdellidou (Aristotle University of Thessaloniki)

We present the results of an exoplanet formation statistical analysis using data from the CoRoT space mission. Our sample contains 1372 M type main sequence stars from the LRa02 and LRc01 CoRoT fields. Each light curve (LC) was de-trended by CoRoT Detrend Algorithm (CDA). The planetary detection procedure found zero transiting signals in our sample. Using Monte Carlo simulations, transit probabilities and CoRoT's mission statistical results, we found that the expected number of exoplanets around M dwarf stars is significant bigger than the detected number.

S4-10: Survey for variable stars and exoplanet transits from Holomon Astronomical Station

P. Ioannidis (Aristotle University of Thessaloniki), V. Karamanavis (Aristotle University of Thessaloniki), C. Avdellidou (Aristotle University of Thessaloniki), D. Mislis (University of Cambridge), J. Antoniadis (Max Planck Institut fur Radioastronomie, Bonn, Germany), & J. Seiradakis (Aristotle University of Thessaloniki)

We report on the current status of the Holomon Variable Star and Exoplanets Survey. Two northern (Lacerta and Andromeda) FOVs approximately 3.5 x 2.5 deg were observed in July 2009 (trial session) and August 2010. Based on simulations on the basis of the Tycho catalogue both fields have a better than 75% probability for detection of at least one transiting hot Jupiter. The observations were analyzed with an upgraded version of ThReT pipeline,using new cutting edge algorithms for de-trending and detection. We present the basic parameters of thirty six new (lacking bibliographic reference) variable stars.

S4-11: The contact system DF Hya revisited

I. Kamenidis, A. Liakos, & P. Niarchos (University of Athens)

New BVRI CCD photometric observations of the contact system DF Hya have been obtained. The light curves were analyzed with the Wilson-Devinney code and new geometric and photometric elements were derived. Moreover, the light curve solution, with the assumption of a third light in the system, revealed the existence of a tertiary component around the eclipsing pair. The present results are compared with those of other recent studies.

S4-13: Statistical properties of exoplanets: an update from recent results

A. Petropoulou & P. G. Niarchos (University of Athens)

The most recent data for extra-solar planets are used in order to examine the diagrams correlating several of their basic parameters, e.g. mass, period, semi-major axis, orbital eccentricity and metallicity. Interesting conclusions are emerging such as the lack of light planets (M_pl < 0.15 M_jup) with semi-major axis of their orbit greater than 1.5 A.U. Monte Carlo simulations are used in order to reproduce the same results.

S4-14: Time scale variation of MgI I resonance lines of HD 41335 in UV region

I. Nikolaou (University of Athens)

It is known that hot emission stars (Be and Oe) present peculiar and very complex spectral line profiles. Due to these perplexed lines that appear, it is difficult to actually fit a classical distribution to those physical profiles. Therefore many physical parameters of the regions, where these lines are created, can not be determined. In this paper, we study the Ultraviolet (UV) MgII (λλ 2795.523, 2802.698 A) resonance lines of the HD 41335 star, at three different periods. Considering that these profiles consist of a number of independent Discrete or Satellite Absorption Components (DACs, SACs), we use the Gauss-Rotation model (GR-model). From this analysis we can estimate the values of a group of physical parameters, such as the apparent rotational and radial velocities, the random velocities of the thermal motions of the ions, as well as the Full Width at Half Maximum (FWHM), the column density and the absorbed energy of the independent regions of matter, which produce the main and the satellite components of the studied spectral lines. Eventually, we calculate the time scale variations of the above physical parameters.

S4-15: CCD photometric study of the misclassified binary system V380 Cas

A. Papageorgiou (University of Patras) & E. Christopoulou (University of Patras)

A photometric study of the eclipsing binary V380 Cas is presented for the first time with the 35.5cm Schmidt-Cassegrain telescope at the University of Patras, Observatory from June 2009 to July 2010. The BVRI light curves were observed and 7 new minima were calculated. No secondary minimum has been detected, indicating that its original period was wrong. The complete light curves are analyzed with the Wilson-Devinney code (PHOEBE) and the first photometric solution is derived. The system is probably a detached one with equal components and double period, contrary to its previous classification as Algol type. The first O-C analysis of the system based on all timings of minima is presented and the first precision ephemeris is estimated. Also the probability of third light is examined from both O-C and photometric solution.

S4-16: Time scale variations of the physical parameters of the Si IV resonance lines in the case of the Be star HD 50138

D. Stathopoulos (University of Athens)

As it is well known many lines in the spectra of hot emission stars (Be and Oe) present peculiar and very complex profiles. As a result, we cannot find a classical theoretical distribution in order to fit these profiles. Because of this, we are not able to calculate the physical parameters of the regions were these lines are created. In this paper, using the Gauss-Rotation model (GR-model Danezis et al), that proposed the idea that these complex profiles consist of a number of independent Discrete or Satellite Absorption Components (DACs, SACs), we study the UV Si IV (λλ 1393.755, 1402.77 A) resonance lines of the Be star HD 50138 in three different periods. From this analysis we can calculate the values of a group of physical parameters. The parameters are the apparent rotational and radial velocities, the random velocities of the thermal motions of the ions, as well as the Full Width at Half Maximum (FWHM) an the absorbed energy of the independent regions of matter which produce the main and the satellite components of the studied spectral line. Finally we calculate the time scale variations of the above physical parameters.

S4-17: Time scale variation of NV resonance line profiles of HD203064

A. Strantzalis (University of Athens)

Hot emission star, such as Be and Oe, present many spectral lines with very complex and peculiar profiles. Therefore, we cannot find a classical distribution to fit theoretically those physical line profiles. So, many physical parameters of the regions, where spectral lines are created, are difficult to estimate. Here, in this poster paper we study the UV NV (λλ 1238.821, 1242.804 A) resonance lines of the Be star HD203064 at three different dates. We using the Gauss-Rotation model, that proposed the idea that these complex profiles consist of a number of independent Discrete or

Satellite Absorption Components (DACs, SACs). Our purpose is to calculate the values of a group of physical parameters as the apparent rotational, radial, and random velocities of the thermal motions of the ions. Also the Full Width at Half Maximum (FWHM) and the column density, as well as the absorbed energy of the independent regions of matter, which produce the main and the satellite components of the studied spectral lines. In addition, we determine the time scale variations of the above physical parameters.

S4-18: Time scale variations of the CIV resonance lines in HD 24534

A. Tsatsi (University of Athens)

Many lines in the spectra of hot emission stars (Be and Oe) present peculiar and very complex profiles. As a result we can not find a classical theoretical distribution to fit these physical profiles; hence many physical parameters of the regions where these lines are created are difficult to be determined. In this paper, we adopt the Gauss-Rotation model (GR-model), that proposed the idea that these complex profiles consist of a number of independent Discrete or Satellite Absorption Components (DACs, SACs). The model is applied for CIV (λλ 1548.187, 1550.772 A) resonance lines in the spectra of HD 24534 (X Persei), taken by I.U.E. at three different periods. From this analysis we can calculate the values of a group of physical parameters, such as the apparent rotational and radial velocities, the random velocities of the thermal motions of the ions, as well as the Full Width at Half Maximum (FWHM) and the absorbed energy of the independent regions of matter which produce the main and the satellite components of the studied spectral lines. Finally, we calculate the time scale variation of the above physical parameters.

S5: Education in Astronomy - Oral Presentations

Wednesday, 7th of September

Astronomy Education in U.S. Secondary Schools: Current Status and Concerns vs. the Broadness and Effectiveness of Best Practices (Inv. Talk)

C. E. Walker (NOAO)

In the next year, Greece's Ministry of Education is planning a reformation of the secondary education (for the Lyceum) and the way that students will enter universities. This will affect the subjects taught in school, including the subject of astronomy. Why should astronomy be taught (at the high school level)? What can we do to retain or increase the numbers of astronomy courses given across the country? In principle, a course must have the support of the administration, the fulfillment of science standards, the dedication of teachers and the interest of students to make it happen (successfully). As a means of comparison, we will examine the current status and concerns of astronomy courses at the high school level in the U.S. and discuss solutions for retaining or increasing the number of high school astronomy courses. As a particular example, Astronomy Research Experiences in Science Education epitomizes best practices as a teacher enhancement program designed to bring active astronomical research into the classroom. A more secure foundation for the teachers translates into a better education in astronomy for students and a more enjoyable learning experience for all. We will discuss its effectiveness and show how the model of this program is suitable to broad applications in other countries.

Space Sciences in the classroom: Educational activities of the European Space Agency (Iv. Talk)

R. Korakitis, (Natioanal Technical University of Athens)

Education is among the basic, mandatory activities of the European Space Agency (ESA) and aims at all educational levels, from primary school to post-graduate. The primary objective of the ESA educational activities is to enhance the literacy of young people in science and technology and to stimulate interest in STEM (Science – Technology – Engineering – Mathematics) studies and careers, using Space as a theme. The activities mostly follow the IBSE paradigm (Inquiry-Based Science Education) and also aim at the Continuous Professional Development (CPD) for teachers. The backbone supporting all educational activities is the enormous expertise of ESA in the various aspects of Space Science and Technology, like Earth Observation, Space Science (including Astronomy & Astrophysics), Human Spaceflight and Space Technology (launchers, navigation, telecommunications etc.). All educational activities, which are coordinated by the ESA Education Office, are designed for specific age groups, strive to keep the educational community informed and to provide inspirational materials for teachers and students. They can be subdivided in categories, like: Hands-on-projects, opportunities for students, support to teachers, international cooperation activities and outreach initiatives. In addition, ESA develops a variety of educational materials to

support teachers in the classroom, both in classic form or on-line, through a network of dedicated websites.

Design, Implementation and Evaluation of a Teaching and Learning Sequence concerning Apparent Movement of the Moon

I. Starakis & K. Halkia (University of Athens)

The present study focuses on the design, implementation and evaluation of a Teaching and Learning Sequence for the Apparent Movement of the Moon and it is part of a broader research regarding apparent movements of Sun-Earth-Moon system from an educational point of view. The Teaching and Learning Sequence was designed as a means of 'constructing' the scientific information that the Moon revolves around the Earth at a period of a synodic month. Dealing with students' alternative idea that the Moon appears every day at the sky with a 24hours delay, seems to be the most crucial point of the Sequence. This alternative idea, as bibliography shows, is subjected from the widespread erroneous belief that the Moon is always visible at night. The research was carried out in six (6) primary schools of Athens with a sample of forty (40), 5th grade students.

Learning about the Galaxy by constructing a Galactic Garden at school

M. Metaxa & E. Pavlidou (Philekpaideutiki Etaireia)

Most bright stars in our Milky Way Galaxy reside in a disk. Since our Sun also resides in this disk, these stars appear to us as a diffuse band that circles the sky. The above panorama of a northern band of the Milky Way's disk covers 90 degrees.Visible are many bright stars, dark dust lanes, red emission nebulae, blue reflection nebulae, and clusters of stars. In addition to all this matter that we can see, astronomers suspect there exists even more dark matter that we cannot see. All the above and more can easily be explained and tought to students by creating a galactic garden at school, with them. The aim, the means and the results are discussed in this paper.

Centaur Chiron's Calendar in our era

S. Spanos (Laboratory Education Centre of Magnesia)

Centaur Chiron's Calendar is an educational activity incorporated in environmental education which combines the principles of inter-scientific approach with fundamental astronomy conception. It is performed in school as a yearly environmental project. The famous centaur was teaching the hero Jason (and others) navigation based on stellar observation and medicine based on Pelion herbs collected at the right time of the year. Students are guided to discover his method of determination of the right time. The project evolves the creation of a photographic calendar based on collected pictures from the sunset during the various seasons of the year. It is developed in the same region that Chiron lived (Mount Pelion) according to mythology but it can be modified for use in other regions. Sunset positions are recorded daily or weekly and plotted on a wide-angle picture of the western hill crest. Students are then called to predict the date of a given sunset position. Students also record sunset time and duration of the day in order to relate it with the photographic calendar. The activity combines knowledge from various scientific fields such as history, geography and astronomy. Development of practical skills such as accurate observation, photography techniques and digital image processing is a welcomed side effect of this educational activity.

S5: Education in Astronomy - Poster Presentations

S5-1: The Discovery of Neptune as a Case Against Strong Popperian Falcificationism

T. Dallas (University of Thessaly)

The discovery of Neptune has been used as an example of the Strong Popperian Falcificationism. We present historical evidence that the circumstances of the discovery are not truly a decisive experiment for the confirmation of Newtonian gravity.

S5-2: A method for conducting dark sky surveys and light pollution monitoring with the contribution of amateur astronomers and students

A. Papalambrou (University of Patras / Orion)

This work presents a methodology for conducting dark sky surveys using easily available and inexpensive equipment in place of sophisticated instruments for photometry and spectrometry which can be expensive and not always mobile. The instrument is a portable photometer called Sky

Quality Meter. It is endorsed by the International Dark sky Association and has been used in similar surveys around the world. Small scale dark sky surveys were conducted by the author in the region of Achaia and mount Hymettus in Attica using the Sky Quality Meter in order to test its efficiency and usability. It was concluded that this instrument is suitable for dark sky surveys and accurate enough for serious work in light pollution monitoring. Moreover, based on the measured data and gathered experience, a model is proposed on how this instrument can be used to conduct a country-wide dark sky survey with the participation of Tertiary and Secondary education institutes as well as amateur astronomers.

S5-3: Aristotle University Astronomical Station at Mt.Holomon

C. Avdellidou, I. Panagiotis, K. Kouroubatzakis, A. Nitsos, J. Vakoulis &
J. H. Seiradakis (Aristotle University of Thessaloniki)

The Aristotle University Astronomical Station was established seven years ago in order to fulfill the educational needs of its students. Astronomical observations are undertaken using three fully equipped small telescopes. Some interesting results are presented below, including the study of asteroids and flare stars, the detection of optical emission from supernovae remnants and follow up observations in extra solar planets.

S5-4: Astronomical activities for students

A. Mathaiou, Arsakeio Lykeio Patron, Philekpaideutiki Etaireia

S5-5: Teaching frontline astronomy in upper secondary education

T. Pierratos, 2nd Lykeio Exedorou

S5-6: Έλεγχος του πλήθους των μαθητών που επιλέγουν την Αστρονομία στη Β' Λυκείου

Μ. Δογραματζίδης, Γυμνάσιο -Λ.Τ. Νικηφόρου Δράμας

Η παρουσίαση αυτή στηρίζεται σε στοιχεία που μας παραχώρησε το Υπουργείο Παιδείας από τη βάση δεδομένων του και αφορούν την κατανομή των μαθητών της Β Γενικού Λυκείου στα μαθήματα επιλογής. Συγκεκριμένα μελετάται η διακύμανση σε Πανελλαδικό επίπεδο του ποσοστού των μαθητών σε κάθε μάθημα επιλογής κατά το χρονικό διάστημα από το σχολικό έτος 2004-2005 έως και το έτος 2009-2010. Ακόμη υπολογίζεται το ποσοστό των μαθητών που επιλέγουν τα Στοιχεία Αστρονομίας και Διαστημικής σε κάθε νομό και αναδεικνύονται οι διαφορές που παρουσιάζονται μεταξύ γειτονικών νομών.

S5-7: Απόψεις και προτάσεις μαθητών για θέματα που αφορούν τη διδασκαλία της Αστρονομίας

Μ. Δογραματζίδης, Γυμνάσιο -Λ.Τ. Νικηφόρου Δράμας

Στην παρουσίαση αυτή προσπαθούμε να πληροφορηθούμε τις απόψεις των μαθητών της Β Λυκείου που επιλέγουν το μάθημα στοιχεία Αστρονομίας και Διαστημικής, τα προβλήματα που συναντά η διδασκαλία του μαθήματος και τις προοπτικές βελτίωσής της. Το στατιστικό δείγμα που χρησιμοποιήσαμε περιελάμβανε το σύνολο σχεδόν των μαθητών των νομών Δράμας και Καβάλας που επέλεξαν την Αστρονομία κατά το σχολικό έτος 2010 -2011 και αριθμούσε περί τους 150 μαθητές.