



## 5th Hel.A.S Summer School

“MHD in Astrophysics”

16-20 September 2024

Department of Physics, University of Ioannina

<https://helas.gr/school/2024/>

### Programme

Day-1 Monday 16-09-2024

**8:40-9:00** Welcome-Short Addresses (Vasilis Archontis, Despina Hatzidimitriou, Georgios Floudas, Leandros Perivoralopoulos, Alexander Nindos, Spiros Patsourakos)

**9:00-10:15** The Universe is Made of Plasma and Magnetic Field, Costas Alissandrakis

**10:15-11:30** MHD in Astrophysics: Introduction and highlights, Kanaris Tsiganos

**11:30-12:00** Coffee Break

**12:00-13:00** MHD with Physics Informed Neural Networks (PINNs), Ioannis Contopoulos

**13:00-14:30** Lunch Break

**14:30-17:30** Practical Work Session 1: Solution of a Simple Physics Problem with Physics Informed Neural Networks (PINNs), Ioannis Dimitropoulos, Ioannis Contopoulos

## **Day-2 Tuesday 17-09-2024**

**9:00-10:00** MHD Instabilities, Nektarios Vlahakis

**10:00-11:00** MHD in extreme Astrophysical Environments, Konstantinos Gourgouliatos

**11:00-11:30** Coffee Break

**11:30-12:30** MHD Turbulence and Particle Energisation, Loukas Vlahos

**12:30-13:00** Discussion

**13:00-14:30** Lunch Break

**14:30-17:30** Practical Work Session 2: Problem Solving in MHD, Alexander Nindos, Nektarios Vlahakis

## **Day-3 Wednesday 18-09-2024**

**9:00-10:00** MHD, Solar and Stellar Activity, Vasilis Archontis

**10:00-11:00** Magnetic Helicity: Applications in Solar Physics, Alexander Nindos

**11:00-11:30** Coffee Break

**11:30-12:30** Theory and Applications of Magnetic Field-Line Helicity in Solar Physics, Kostas Moraitis

**12:30-13:30** MHD as the Backbone for Space Weather Prediction, Anastasios Anastasiadis

**13:30-15:00** Lunch Break

**15:00-18:00** Practical Work Session 3: Numerical Methods for MHD -Force-free equilibria via relaxation methods.-Time-dependent problems: upwind schemes - flux limiters, Konstantinos Gourgouliatos

#### **Day-4 Thursday 19-09-2024**

**9:00-10:00** MHD of the Interstellar Medium, Kostas Tassis

**10:00-11:00** Heating of Solar and Stellar Coronae, Juxhin Zhuleku

**11:00-11:30** Coffee Break

**11:30-12:30** MHD of Laboratory Plasmas: Crossovers with Astrophysics, Georgios Throumoulopoulos

**12:30-13:00** Discussion

**13:00-14:30** Lunch Break

**14:30-17:30** Practical Work Session 4: Visualization and Analysis of MHD simulation output, Kostas Moraitis, Juxhin Zhuleku, V. Agalianou, A. Giannis

## **Day-5 Friday 20-09-2024**

**09:00-13:00** Student presentations

The feedback of protostellar ejections on planetary formation, Nathan Maindon

Neutron star magnetospheres with classical and modern methods, Petros Stefanou

Effects of Twist Parameter Variations on the Emergence of Magnetic Flux Tubes, Vera Agalianou

Plasmoid jets in 3D flux emergence simulations, Angelos Giannis

Solar Energetic Particle Transport in eruptive events: case study on GLE73, Eleni Lavasa

Solution of a Simple Physics Problem with Physics Informed Neural Networks (PINNs) (project 1), Alexander Stork, Konstantinos-Xanthos Argyropoulos, Maria Vergi, Pelagia Flotsiou, Stefania Athanasakis

A review on the Kippenhahn-Schlüter prominence Model (project 2), Agianoglou Emmanouil, Dalamagka Ioanna, Kouzis Marios, Koukouraki Chryssi, Mavromati Anastasia

Numerical Solution of Burger's Equation The Minmod Flux Limiter (project 3), Angelos Michailidis, Vangelis Karantanis, Maria Grigoriou, Nikolas Ignatiadis, Charalampos Trifyllis

Visualization & Analysis of MHD simulation output (project 4), Myrto Falalaki, Vasiliki Michalaki, Maria Oikonomou, Dionysis Tsoukalas, Konstantinos Xyloportas

**13:00-13:10** Concluding remarks, Spiros Patsourakos