BIO-PROFILE (275 words)

Dr Donea is Senior Lecturer in Astrophysics and Applied Mathematics at Monash University, where she teaches Mathematical Modelling, Advanced Engineering Mathematics, Astrophysics, and Visualisation in Mathematics, as well as supervising PhD solar physics projects. She is the coordinator of the Machine Learning Data Application Group in Solar Physics in the School of Mathematics.

Dr Donea holds a BSc and MSc in Physics from Bucharest University (Romania), a PhD in Mathematics and Astronomy from the Astronomical Institute of the Romanian Academy and the Max Planck Institute of Radioastronomy (Germany), and a Graduate Certificate in High Education from Monash University (Australia). She is member of the International Astronomical Union and the Astronomical Society of Australia; Chair of the Australian Institute of Physics - Solar Terrestrial and Space Physics; and member of the Solar Physics Advisory Board. She is Associate Editor of Frontiers of Astronomy and Space Sciences.

Dr Donea's research focuses on helioseismology, wave mechanics, acoustics of solar spots, magnetic fields, solar quakes and solar flares. Her expertise is in helioseismic holography, a mathematical method applied to the investigation of "how loud" the Sun is, which allows her to detect solar quakes in satellite imagery. She has recently applied knowledge of helioseismic signatures to models of polarity distributions of the solar activity, as well as deep learning algorithms in solar (far and near side) imaging and space weather forecasting.

Dr Donea has published more than 60 peer-reviewed papers. She collaborates with teams at Stanford University, the High Altitude Observatory and North Western Research Associates in Colorado, and the New Jersey Institute of Technology. She has repeatedly been a member of Solar and Heliospheric Physics NASA Review Panels.

ANSWERS TO SPECIFIC QUESTIONS

Where do you work, and what is your occupation / position?

Monash University, School of Mathematics, Senior Lecturer in Applied Mathematics and Solar Physics.

What is the most exciting part of your job?

The most exciting part of my job is when I discover a new phenomenon in the data and share this with my students, and when we manage to simulate that observation. This is called modelling. We all become very excited and forget about anything else.

What do you enjoy most about your job?

Turning mathematical concepts into stories to tell enthusiastic students. Each equation has a physical meaning, and you can relate this to a life story. You are remembered [by students] for how you sticked skewers into onion shells to teach the flux of a vector field through a curved surface.

How did you become…

While at university, my Diploma (MSc) supervisor, Dr Rusu from the Faculty of Physics, an amazing and passionate lecturer in astrophysics, encouraged me to come up with my own research topic. I thus chose to work on the simulation of motions of photons and particles around black holes. After graduating, I followed a relatively standard career path: I sat for a competitive exam to be admitted to a research position with the Astronomical Institute of the Romanian Academy, where I worked on time and relativity, black holes, and magnetized plasma. Eventually, I started a PhD in Mathematics and Astronomy in Bonn, working on theoretical astrophysics and modelling of relativistic jet emissions from accretion discs, under Prof. Peter Biermann's supervision. Later I moved to Australia for a post-doc with Dr Protheroe at the University of Adelaide, working on ultrahigh energy cosmic rays accelerated by jets. There, I also had the opportunity to work with the solar physicist Dr Charlie Lindsey: we discovered seismic sources and solar quakes on the solar surface, and applied helioseismic techniques to a vast amount of solar data, achieving unprecedented high resolution. All this led to my present research, which applies helioseismology to big data and trains machine learning designed data

for space weather prediction. Shortly, I seek magnetic signatures of potentially flaring active regions hiding behind the Sun.

Any other interest

Family, religion and science, bread making and growing beans.