EP 6: Postersession

Time: Wednesday 16:30–18:30 Location: ELP 6: Foyer

EP 6.1 Wed 16:30 ELP 6: Foyer

The Exo-Restart project — •Elena Vchkova Bebekovska[1], Vladimir Bozhilov[2], Desislava Antonova[2], Denitza Stoeva[2], Evelina Zaharieva[2], and Trifon Trifonov[2,3] — [1]Ss. Cyril and Methodius University in Skopje, Faculty of Natural Sciences and Mathematics-Skopje, Institute of Physics, Arhimedova 3, 1000 Skopje, North Macedonia — [2]Department of Astronomy, Sofia University "St Kliment Ohridski", 5 James Bourchier Blvd, BG-1164 Sofia, Bulgaria — [3]Max-Planck-Institut für Astronomie, Königstuhl 17, 69117 Heidelberg, Germany

We present the aims of the "EXOplanetary dynamics and stability: Reverse Engineering of STable multi-planetary ARchitecTures" (EXO-RESTART) project, grant KP-06-DV/5. The existing exoplanet-detection techniques often neglect planetary dynamics, leading to a notable bias in their characterization. For deeper insights into planet formation, it is essential to focus on the dynamical properties of these systems, particularly the osculating orbital parameters, as opposed to relying solely on the Keplerian best-fit parameters reported in the literature. Our primary goal is to conduct the first homogeneous dynamical modeling effort of high-precision Doppler and transit photometry data for multiple-planet systems and complement them with an extensive long-term stability analysis, unveiling the current dynamic architecture of exoplanet systems. The comprehensive analysis of statistical, dynamical, and physical properties within EXO-RESTART is anticipated to reveal the primordial planet-disk conditions essential for constructing the observed planetary architectures.

EP 6.2 Wed 16:30 ELP 6: Foyer

Magnetosphärische Induktion beim Planeten Merkur — •Daniel Heyner und Kristin Pump — TU Braunschweig

Merkur besitzt ein schwaches Dipolfeld und ist einem intensiven Sonnenwind ausgesetzt. Dies führt zur Ausbildung einer kleinen Magnetosphäre. Es gibt periodische Änderungen im Sonnenwind wie der 88 Tage-Rotation auf dem elliptischen Orbit um die Sonne, die zu Änderungen in der Magnetosphäre führen. Eine weitere Periodizität stammt von der Eigenrotation des Planeten. Diese Änderungen des externen Magnetfeldes induzieren Ströme im Planeteninneren und rufen damit ein induziertes, internes Magnetfeld (sekundär) hervor. Durch ein empirisches Modell der Magnetosphäre und einem 1D-Modell der elektrischen Leitfähigkeit lässt sich diese Situation modellieren und die zu erwartenden sekundären Magnetfelder darstellen.

EP 6.3 Wed 16:30 ELP 6: Foyer

Solar Flare-Induced Changes in the Ionospheric D-Region Plasmas: A Machine Learning Perspective — •Filip Arnaut, Aleksandra Kolarski, and Vladimir Srećković — Institute of physics Belgrade, University of Belgrade, Pregrevica 118, 11080, Belgrade, Republic of Serbia

We explored the feasibility of utilizing a multi-output machine learning algorithm to estimate ionospheric plasma parameters (sharpness and reflection height). The ionospheric plasma parameters are crucial for determining the properties of ionospheric plasma, such as electron density, rate coefficients, and cross sections for ionization/recombination processes. We examined the feasibility of employing two single-output algorithms, such as a combination of Random Forest (RF) and XGB, for the target variables. The findings revealed that during the in-sample testing phase, the multi-output model (XGB-XGB) consistently yielded the most favorable outcomes in terms of the RMSE. However, a close alternative was observed in the combination of RF and XGB models, where RF was employed for the sharpness parameter and the XGB algorithm was utilized for the reflection height parameter. During the out-of-sample validation, there was minimal variation observed among the four algorithm combinations. The most significant difference was observed between the RF-XGB and RF-RF combinations (7.6% decrease in RMSE). The utilization of different algorithms and combinations of algorithms may yield marginal improvements, suggesting that the most significant improvement can be achieved through the expansion of the database.

EP 6.4 Wed 16:30 ELP 6: Foyer

European Space Weather Activities on ISWI — •Daniela Banyś[1] and national ISWI coordinators[2] — [1]German Aerospace Center (DLR), Neustrelitz, Germany — [2]various institutions

The International Space Weather Initiative (ISWI) is an international space weather program inspired by the activities of the International Heliophysical Year 2007. Each country is invited to assign a national coordinator to strengthen international coordination and cooperation on space weather activities. Special emphasis is placed on the deployment of instruments and the exchange of data. It serves as a platform for developing operational analysis, modelling and forecasting methods, which are sought by communication and navigation industries and government agencies. Through annual workshops and schools, ISWI establishes scientific insight into space weather related topics and communicates these results to the public. This poster presents highlights on European space weather activities.

EP 6.5 Wed 16:30 ELP 6: Foyer

Mechanical Design of the CHerenkov Atmospheric Observation System (CHAOS) — •Jasper Mess, Hannes Ebeling, Ava Pohley, Pierre Bornfleth, Hannah Sophie Grimm, Janna Martens, Justus Mickausch, Clara Pittschellis, Nicolas Rohrbeck, and Tom Ruge — Christian-Albrechts-Universität, Kiel, Germany

The Earth is continuously exposed to high-energy charged particles, so-called Galactic Cosmic Rays (GCRs). When these particles hit the Earth's atmosphere, they create a cascade of secondary particles. CHAOS (CHerenkov Atmospheric Observation System) is a particle telescope that is developed at the Department of Extraterrestrial Physics at Kiel University by a team of students (CHAOS collaboration) to measure the different particle species of the primary GCRs. It consists of multiple solid-state detectors, a Cherenkov aerogel scintillator and a BGO scintillation calorimeter. It has been accepted to the BEXUS program (Balloon EXperiment for Univerity Students), so it will fly on a stratospheric balloon above the Regener-Pfotzer maximum in fall 2024. Through the nature of this experiment there are a few mechanical challenges that need to be met, like the g-forces after the cutoff from the balloon as well as the impact upon landing. A pressure housing is needed to avoid possible corona discharges due to the use of high voltages. On this poster we want to present how CHAOS faces the challenges through its design. More information on `www.bexus.org`.

EP 6.6 Wed 16:30 ELP 6: Foyer

Measurements of cosmic rays by a mini neutron monitor aboard the German research vessel Polarstern — •B. Heber[1], S. Burmeister[1], H. Giese[1], K. Herbst[1], L. Romaneehsen[1], C. Gnebner[2], R.D. Strauss[3], and M. Walter[2] — [1]Christian Albrechts Universität, Kiel, Germany — [2]Deutsches Elektronen-Synchrotron DESY in Zeuthen, Germany — [3]Center for Space Research, North-West University, Potchefstroom 2520, South Africa

Neutron monitors are ground-based devices that measure the secondary particle population, i.e., neutrons produced by, e.g., galactic cosmic rays (GCRs). Due to their functionality, they are integral counters whose flux is proportional to the variation of the input spectrum. However, the measured flux also depends on the geomagnetic position and the static pressure at the monitor's location. To better understand the instrument response, the Christian-Albrechts-Universität zu Kiel, DESY Zeuthen, and the North-West University in Potchefstroom, South Africa, agreed on regular monitoring of the GCR intensity as a function of latitude, by installing a portable device aboard the German research vessel Polarstern in 2012. The vessel is ideally suited for this research campaign because it covers extensive geomagnetic latitudes at least once per year. In this contribution we give an update of our measurements over a full 11 year solar cycle.

The Kiel team received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 870405. The team would like to thank the crew of the Polarstern and the AWI for supporting our research campaign.

EP 6.7 Wed 16:30 ELP 6: Foyer

Detection of protons and helium >50 MeV/nuc on Chandra/EPHIN — •Janna Martens — Christian-Albrechts-Universität zu Kiel

This study presents an in-depth examination of cosmic rays, focusing on protons and helium nuclei, utilizing data from the Electron Proton Helium INstrument (EPHIN) aboard the Chandra X-ray Observatory. The research delves into the energy spectra of these particles, paying particular attention to the influence of solar modulation on their behavior.

The analysis process includes various techniques employed to enhance data resolution. The study also addresses the challenges encountered, such as interference from satellite transits through Earth's radiation belts and issues related to instrument malfunctions, which significantly impact the volume of data suitable for analysis.

In exploring the energy spectra of cosmic rays, the study critically evaluates the force field approach, a prevalent method in cosmic ray propagation research, discussing its limitations. Additionally, the cosmic ray spectrum for the year 2005 is computed, and the integral channel of Chandra/EPHIN is analyzed. This serves as a bridge between its channels for stopping particles and the data collected by the Payload for Antimatter Matter Exploration and Light nuclei Astrophysics detector (PAMELA).

The findings of this research offer valuable insights into the nature of cosmic rays and the functionality of EPHIN, laying a solid foundation for future investigations in this domain.

EP 6.8 Wed 16:30 ELP 6: Foyer

Time-Domain Spectroscopy for Space Exploration — •Yookyung Ha[1,2], Jonas Woeste[2,1], Dominic Azih[2,1], Oliver Gueckstock[3], Georgios Kourkafas[4], Jovana Petrovic[6], Mihailo Rabasovic[5], Aleksandar Krmpot[5], Tom S. Seifert[3,7], Andrea Denker[4], Tobias Kampfrath[3,7], Nikola Stojanovic[1], and Michael Gensch[1,2] — [1]DLR Institute of Optical Sensor Systems, Berlin, Germany — [2]Technical University of Berlin, Berlin, Germany — [3]Free University of Berlin, Berlin, Germany — [4]Helmholtz-Zentrum Berlin, Berlin, Germany — [5]Institute of Physics Belgrade, University of Belgrade, Belgrade, Serbia — [6]Vinca Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia — [7]TeraSpinTec GmbH, Berlin Germany

Recently, space-qualified femtosecond laser systems have become available [1,2]. Time-domain spectroscopy techniques, which revolutionised spectroscopy in laboratory environments, are now hence becoming true alternatives as modern spectroscopic sensors for space exploration. Bulky opto-mechanical components can thereby be replaced with compact electro-optic photonic components. Here, we show our progress enroute to time-domain spectroscopy instrumentation that is able to detect Raman- or infrared-active resonances in matter with a bandwidth of 30THz (1000 cm-1) and a resolution of 100GHz (3.3 cm-1). [1]. J. Lee, K. Lee, Y. Jang, et al. Scientific Reports, vol. 4, pp. 5134, (2014). [2]. M. Lezius, T. Wilken, C. Deutsch, et al., Optica 3, 1381 (2016).

EP 6.9 Wed 16:30 ELP 6: Foyer

The Liquid Metallic Hydrogen Model of the Sun — •Alexander Unzicker — Pestalozzi-Gymnasium München

Instead of being interpreted within the paradigm of the standard solar model based on a gaseous plasma, a considerable amount of experimental evidence may also be explained by assuming a real, liquid surface of the sun, as proposed by Robitaille (Progress in physics vol.3, 2011). The differences and respective problems of both models are discussed.