EP 7: Sun and heliosphere II

Time: Wednesday 14:15–15:45 Location: ZEU/0160

Invited Talk EP 7.1 Wed 14:15 ZEU/0160

Advances in energetic particle physics with Solar Orbiter & Parker Solar Probe — •Robert F. Wimmer-Schweingruber[1], Javier Rodriguez-Pacheco[2], George C. Ho[3], Robert A. Allen[3], Raul Gomez-Herrero[2], and and the Solar Orbiter EPD Team[4] — [1]Institute of Experiemental and Applied Physics, Kiel University, Kiel, Germany — [2]Universidad de Alcalá, Space Research Group, 28805 Alcalá de Henares, Spain — [3]Johns Hopkins University Applied Physics Laboratory, Laurel, MD, USA — [4]all over the world

Parker Solar Probe (PSP) and Solar Orbiter are investigating the inner heliosphere and approaching the Sun closer than any previous mission ever has. The state-of-the-art energetic particle instruments aboard the two spacecraft - together with other instruments on multiple spacecraft - present us with a wealth of data that are helping us to understand how the Sun shapes and controls the heliosphere.

Being so close to the Sun allows to disentangle transport effects from the original signatures of particle acceleration at the Sun. The sophisticated remote-sensing instrumentation provides crucial information about the solar source regions.

We will present new results from PSP and Solar Orbiter and provide an update on their current status.

EP 7.2 Wed 14:45 ZEU/0160

Anisotropies of solar energetic electrons in the MeV range measured with SolO/EPD/HET — •Sebastian Fleth[1], Patrick Kühl[1], Alexander Kollhoff[1], Robert F. Wimmer-Schweingruber[1], Bernd Heber[1], Javier Rodríguez-Pacheco[2], and Nina Dresing[3] — [1]Institute of Experimental & applied Physics, Kiel University, 24118 Kiel, Germany — [2]Space Research Group/Universidad de Alcalá, Madrid, Spain — [3]Department of Physics and Astronomy, University of Turku, Turku, Finland

Solar Orbiter is an ESA-led mission of international collaboration with NASA to investigate how the Sun creates and controls the heliosphere, and why solar activity changes with time. One of its top-level science questions is how solar eruptions produce energetic particle radiation that fills the heliosphere. With its four viewing directions the High-Energy telescope (HET) provides critical information about the sources and transport of high-energy particles. This study analyses relativistic electron measurements obtained by HET in the energy range from 200 keV to above 10 MeV. The purpose of this study is to analyse anisotropies of relativistic solar energetic electrons utilizing the different viewing directions of HET. Time periods with enhanced fluxes of relativistic electrons, have been identified. A list of these time periods including additional observations such as maximum energy and flux as well as the first order anistropy will be presented. This is the first time since the Helios mission that anisotropies of high energy electrons have been measured.

Invited Talk EP 7.3 Wed 15:00 ZEU/0160

New Insights in Simulations of SEP Events with the PARADISE+ICARUS Model — •Edin Husidic[1,2], Nicolas Wijsen[1,3,4], Tinatin Baratashvili[1], Stefaan Poedts[1,5], and Rami Vainio[2] — [1]KU Leuven, Belgium — [2]University of Turku, Finland — [3]NASA, Goddard Space Flight Center, Greenbelt, USA — [4]University of Maryland, USA — [5]University of Maria Curie-Skłodowska, Lublin, Poland

The study of solar energetic particle (SEP) events plays a particularly important role in space weather research. While propagating through interplanetary space, fast coronal mass ejections (CMEs) generate shock waves that can efficiently accelerate ions and protons to energies of deka-MeV and beyond, posing a significant threat to astronauts and spacecraft. It is thus of major concern to develop numerical simulations that can realistically model the acceleration and transport of SEPs. We present simulations of SEP events in the inner heliosphere with the novel PARADISE+ICARUS model. The MPI-AMRVAC-based ICARUS code generates realistic background solar wind configurations from 0.1 au onward that serve as input for PARADISE (PArticle Radiation Asset Directed at Interplanetary Space Exploration). By solving the focused transport equation in a stochastic manner, PARADISE obtains intensities of SEP distributions. Using ICARUS's ability of adaptive mesh refinement (AMR) allows us to increase the spatial resolution at interplanetary shock waves and investigate how simulation results are affected by it. Our results are compared to previous ones obtained by the AMR-lacking PARADISE+EUHFORIA model.

EP 7.4 Wed 15:30 ZEU/0160

Nonlinear diffusive shock acceleration in a spherical geometry* — •Dominik Walter, Horst Fichtner, and Frederic Effenberger — Ruhr-Universität-Bochum Tp4, Bochum, Germany

Based on previous investigations in a Cartesian geometry, we now discuss the influence of a self-consistent diffusion coefficient on the transport of energetic particles in a spherical geometry. The formulation of the diffusion coefficient is motivated by taking into account the diffusing particles' influence on the scattering centers in the background medium. The resulting single transport equation is nonlinear due to a dependence of the diffusion coefficient on the gradient of the particle distribution. After trying to predict, based on insights from linear theory, the behaviour of the solutions of the nonlinear equation in a shock acceleration model in spherical geometry, numerical methods are applied to the equation to explore the time evolution of the solutions and to investigate the features of the steady-state shock spectra. The results are dicussed in the context of Cosmix Ray modulation in the heliosphere.

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