EP 8: Sun and heliosphere III

Time: Wednesday 16:00–17:15 Location: ZEU/0160

Invited Talk EP 8.1 Wed 16:00 ZEU/0160

Precision measurements of cosmic ray fluxes from AMS-02 with a daily time resolution — •Stefan Schael — I. Physikalisches Institut, RWTH Aachen, Sommerfeldstr. 14, D-52074 Aachen

The Alpha Magnetic Spectrometer, AMS-02, is a general-purpose high-energy particle physics detector. It was installed on the International Space Station in May 2011 to conduct a unique long duration mission of fundamental physics research in space. In 11 years AMS-02 has continuously collected data from more than 200 billion cosmic rays. The AMS-02 precision measurements have revealed new and distinct information that change our understanding of the production, acceleration and propagation of charged cosmic rays. In this presentation the recent measurements of the proton, helium, electron and positron fluxes with a daily time resolution will be summarized. These new precision measurements provide unique inputs to the understanding of cosmic rays in the heliosphere.

EP 8.2 Wed 16:30 ZEU/0160

Studies of energetic particle transport in synthetic turbulence with intermittency features — •Frederic Effenberger, Jeremiah Lübke, Horst Fichtner, and Rainer Grauer — Ruhr-Universität Bochum, Theoretische Physik

The transport of fast charged particles in turbulent magnetic fields is a key research topic in space- and astrophysics. In particular, regimes of superdiffusive or subdiffusive propagation and interactions with large and small-scale coherent features are important to study in more detail. A common approach to investigate turbulence-particle interactions is based on full-orbit calculations of test-particle trajectories in artificially generated turbulence. These turbulence models have the advantage, when compared to an MHD approach, that they can potentially cover a wider dynamical range of turbulence scales. However, almost all synthetic turbulence models to this date only include second-order Gaussian statistics and thus fail to include coherent structures and intermittent features. Our new model is based on a continuous wavelet transform of a log-normal cascade process, which results in realistic intermittent scaling properties. We investigate the particle transport properties by solving a large number of particle orbits in these synthetic turbulence realisations and specifically look for non-diffusive regimes and non-standard energy dependences resulting from the intermittency of the generated fields. The implications for solar energetic particle and cosmic ray transport are discussed.

EP 8.3 Wed 16:45 ZEU/0160

Comparison of spatial diffusion tensors using an axisymmetric model of heliospheric modulation of cosmic rays — •Dustin Lee Schröder, Horst Fichtner, and Jens Kleimann — Ruhr-Universität Bochum, Bochum, Deutschland

A 3D partial differential equation solver is used to solve the steady state Parker transport equation for an axisymmetric model of the heliosphere in order to study the influence of spatial diffusion tensors on cosmic ray modulation. The diffusion tensor can either be specified as an analytical function or be used as a value calculated with a turbulence model.

EP 8.4 Wed 17:00 ZEU/0160

The effect of kinetic turbulence on particle transport — •Felix Spanier — Institut für Theoretische Astrophysik, Universität Heidelberg

The transport of energetic charged particles depends on the underlying turbulence. Commonly non-dispersive waves and associated turbulence models (Kolmogorov or in some cases Goldreich-Sridhar) are used in modeling transport parameters. For frequencies close to and beyond the ion-gyrofrequency these assumptions are not applicable anymore.

We have used MHD as well as Particle-in-Cell simulations to study the difference between transport of particles in non-dispersive fluid and dispersive kinetic models. We will focus specifically on the transport of particles moving perpendicular to the magnetic field. The results are specifically interesting for the diffusion of electrons and positrons which resonate with waves with frequencies beyond the ion gyrofrequency.