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Galactic Cosmic Ray Spectra During Solar Cycle 23 and 24 - Measurement Capabilities of the Electron Proton Helium Instrument on board SOHO

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The solar modulation of galactic cosmic rays (GCR) can be studied in detail by long term variations of the GCR energy spectrum (e.g. on the scales of a solar cycle). With almost 20 years of data, the Electron Proton Helium INstrument (EPHIN) aboard SOHO is well suited for these kind of investigations.

Although the design of the instrument is optimized to measure proton and helium isotope spectra up to 50 MeV/nucleon the capability exist that allow to determine energy spectra above 800 MeV/nucleon. Therefore we developed a sophisticated inversion method to calculate such proton spectra. The method relies on a GEANT4 Monte Carlo simulation of the instrument and a simplified spacecraft model that calculates the energy response function of EPHIN for electrons, protons and heavier ions. In order to determine the energy spectra the resulting inversion problem is solved numerically. As a result we present galactic cosmic ray spectra from 1995 to 2015. For validation, the derived spectra are compared to PAMELA data from 2006-2009. Furthermore we discuss the spectra with respect to the solar modulation.

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539

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