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The Sun-Earth environment between the 24th and 25th solar cycles: observations and results from the High-Energy Particle Detector (HEPD-01) onboard the CSES-01 satellite

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Galactic cosmic rays, as well as particles, accelerated to high energies either at the solar surface, corona, or in the interplanetary medium, are subject to various phenomena that can modify their energy distribution, intensity, and composition over different time scales. These effects are greater in the low-energy portion of the spectrum, and it is crucial to have instruments that can monitor energy intervals as low as possible and for a prolonged time. The China Seismo-Electromagnetic Satellite (CSES-01) mission –in particular the High-Energy Particle Detector (HEPD-01) –successfully continued studies of previous space-borne missions (ACE, AMS-02, EPHIN, ERNE, PAMELA) well into the 25th solar cycle. HEPD-01, launched in February 2018, is a light and compact payload suitable for measuring electrons (3-100 MeV), protons (30-250 MeV), and light nuclei (up to a few hundred MeV per nucleon) with a high energy resolution and a wide angular acceptance. The very good capabilities in particle detection and identification, together with the Sun-synchronous orbit, make this instrument very well suited for low-energy studies; moreover, being HEPD-01 just the first of a network of similar detectors that will be launched in the forthcoming years (HEPD-02 is set to launch this year), the evolution of particles inside the Sun-Earth environment is going to be fully investigated under many aspects. The latest results on the long-term solar modulation of protons and helium nuclei, the 27-day periodicity related to Corotating Interaction Regions, and impulsive phenomena like Solar Energetic Particle (SEP) events, geomagnetic storms, and Forbush decreases, will be presented.

Collaboration(s)

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