Geophysical Research Abstracts
Vol. 21, EGU2019-8305, 2019
EGU General Assembly 2019

ICMEs Propagating Towards Mars Observed in Heliospheric Imagers and their Associated Forbush Decreases at MSL/RAD

Johan von Forstner (1), Jingnan Guo (1), Robert F. Wimmer-Schweingruber (1), Manuela Temmer (2), Mateja Dumbović (2), Astrid Veronig (2), Christian Möstl (3), Donald M. Hassler (4), Cary J. Zeitlin (5), and Bent Ehresmann (4)

(1) University of Kiel, Kiel, Germany (forstner@physik.uni-kiel.de), (2) Institute of Physics, University of Graz, Austria, (3) Space Research Institute, Austrian Academy of Sciences, Graz, Austria, (4) Southwest Research Institute, Boulder, CO, USA, (5) Leidos, Houston, TX, USA

The Radiation Assessment Detector (RAD) onboard the Mars Science Laboratory (MSL) mission's Curiosity rover has been measuring galactic cosmic rays (GCR) as well as solar energetic particles (SEP) on the surface of Mars for more than 6 years since its landing in August 2012 and in interplanetary space during its 8-month cruise to Mars between 2011 and 2012. The observations include a large number of Forbush decreases (FD) caused by interplanetary coronal mass ejections (ICMEs) and their associated shocks passing MSL.

Our previous work (Freiherr von Forstner et al. 2018, JGR: Space Physics) studied 15 ICME events close to oppositions of Mars as seen from Earth or the STEREO A and B spacecraft, where in situ Forbush decrease observations at both locations could be used to derive the propagation time of the ICME from 1 AU to Mars. We found that on average, ICMEs in our sample continued to decelerate beyond 1 AU.

We now investigate a different constellation where MSL/RAD Forbush decrease measurements are combined with remote tracking of ICMEs using the STEREO Heliospheric Imager (HI) telescopes. A large catalog of such remote observations was created by the HELCATS project (Möstl et al. 2017, Space Weather), not only including ICMEs propagating towards Earth, but also some that passed Mars.

This allows to enlarge our sample for a statistical study of ICMEs at Mars. We associate STEREO-HI observations from the catalog with corresponding FDs at MSL/RAD and study the accuracy when predicting the arrival of an ICME at Mars using common models applied to HI data.

Based on the catalogue of events built using this method, we also investigate the properties of the corresponding Forbush decreases at RAD, such as their magnitude, steepness and duration. We find both correlations between the parameters themselves as well as possible relations to the ICME properties (derived from HI data). These data are also compared to findings from previous studies using Earth-based observations.