Geophysical Research Abstracts
Vol. 15, EGU2013-3040-2, 2013
EGU General Assembly 2013

High energy particles at Mars and Venus: Phobos-2, Mars Express and Venus Express observations and their interpretation by hybrid model simulations

Susan McKenna-Lawlor (1), Esa Kallio (2), Rudy A. Fram (3), Markku Alho (2), Riku Jarvinen (2), Sergey Dyadechkin (2), Cyril Simon Wedlund (2), Tielong Zhang (4), Glyn A. Collinson (5), and Yoshifumi Futaana (6)

(1) Space Technology Ireland, Ltd. NUI Maynooth,Co. Kildare Ireland (stil@nuim.ie), (2) Finnish Meterological Institute, Helsinki, Finland, (3) Soutwest Research Institute, San Antonio, Texas, USA, (4) Space Research Institute, Austrian Academy of Sciences, Graz, Austria, (5) NASA Goddard Space Flight Centre, Greenbelt, Maryland, USA, (6) Swedish Institute of Space Physics, Box 812, Kiruna SE-98128,Sweden

Mars and Venus can both be reached by Solar Energetic Particles (SEPs). Such high energy particles (protons, multiply charged heavy ions, electrons) penetrate the upper atmospheres of Mars and Venus because, in contrast to Earth, these bodies do not have a significant, global, intrinsic magnetic field to exclude them.
One especially well documented, complex and prolonged SEP took in place in early 1989 (Solar Cycle 23) when the Phobos-2 spacecraft was orbiting Mars. This spacecraft had a dedicated high energy particle instrument onboard (SLED), which measured particles with energies in the keV range up to a few tens of MeV. There was in addition a magnetometer as well as solar wind plasma detectors onboard which together provided complementary data to support contemporaneous studies of the background SEP environment.
Currently, while the Sun is displaying maximum activity (Solar Cycle 24), Mars and Venus are being individually monitored by instrumentation flown onboard the Mars Express (MEX) and Venus Express (VEX) spacecraft. Neither of these spacecraft carry a high energy particle instrument but their Analyzer of Space Plasmas and Energetic Atoms (ASPERA) experiments (ASPERA-3 on MEX and ASPERA-4 on VEX), can be used to study SEPs integrated over E $\geq \sim$30 MeV which penetrate the instrument hardware and form background counts in the plasma data.
In the present work we present SEP events measured at Mars and Venus based on Phobos-2, 1989 data and on, more recent, MEX and VEX (identified from particle background) observations. We further introduce numerical global SEP simulations of the measured events based on 3-D self-consistent hybrid models (HYB-Mars and HYB-Venus). Through comparing the in situ SEP observations with these simulations, new insights are provided into the properties of the measured SEPs as well as into how their individual planetary bow shocks and magnetospheres affect the characteristics of their ambient Martian and Venusian SEP environments.