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Mars Radiation Environment Modeling Consequent to Results of Orbiter Measurements

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This talk is devoted to the description of the model calculated predictions of radiation environment at Mars and discussions with the recent measurements in the Martian orbit along with the future intended measurements on the Martian surface. Understanding the distribution of the particle flux such as protons, alpha particles, and heavy ions in deep-space and on the surface of Mars for a known GCR (Galactic Cosmic Ray) environment and contributions from Solar Particle Events (SPE) are essential for future human exploration missions. The GCR spectra in Mars orbit were generated with the recently expanded HZETRN (High Z and Energy Transport) and QMSFRG (Quantum Multiple-Scattering theory of nuclear Fragmentation) model calculations. These model calculations are compared with the first two years of measured data from the MARIE (Martian Radiation Environment Experiment) instrument onboard the 2001 Mars Odyssey spacecraft that is currently in Martian orbit. The dose rates observed by the MARIE instrument are within 10% of the model calculated predictions and the heavy ion particle flux predictions are found to be within 5% of the measurements from the Cosmic Ray Isotope Spectrometer (CRIS) instrument on board the Advanced Composition Explorer (ACE). Measured GCR data from the other 2001 Mars Odyssey spacecraft instruments such as GRS, HEND, and NS, along with the topographical data from the Mars Global Surveyor (MOLA) spacecraft are being used in generating and depicting the current visualization of radiation environment on the Martian surface. Model predicted GCR particle spectra and corresponding visualization of the Martian radiation environment will be presented and discussed.