Mars Exploration (3)
Mars Exploration (1) (1)

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BENCHMARKING STUDY OF A MONTE CARLO BASED METHODOLOGY FOR THE EVALUATION OF SHIELDING EFFICIENCY AGAINST GCR AND SPE IN DEEP SPACE.

Abstract

The radiation environment in space poses a substantial risk to the astronauts' health. For long duration deep space missions outside the Earth's magnetosphere, ionising radiation is recognised as a key factor through its impact on the crew's health and performance. The optimisation of passive shielding against Galactic Cosmic Radiation (GCR) and Solar Particle Events (SPE), the two most important primary sources of radiation in terms of dose contribution, is therefore crucial. Simulation codes provide a mean to estimate the expected doses to the astronauts, but also allow to model the effect of shielding in space. A possible method to evaluate the latter entails the use of a Monte Carlo code for the particle transport in combination with models of the complex radiation environment. In this work, the Monte Carlo code PHITS was used to assess the reliability of this methodology by benchmarking the simulated results against a published GEANT4-based study for GCR, and against ESA's SPENVIS simulation tool for SPE. In both cases, aluminium was selected as shielding material (0.3 to 40 g/cm). Confidence was gained in this methodology following the satisfactory benchmark results. Future work consists of applying this methodology for the optimisation of passive shielding by using light materials due to their superior shielding characteristics.