HUMAN EXPLORATION OF THE SOLAR SYSTEM SYMPOSIUM (A5)
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COMPARISONS OF OBSERVED LET AND SIMULATED HETC-HEDS, PHITS, AND HZETRN LET FOR THE CRATER INSTRUMENT

Abstract

The Cosmic Ray Telescope for the Effects of Radiation (CRATER) is an instrument on the Lunar Reconnaissance Orbiter (LRO) spacecaft, which directly measures the energy transferred to material as an ionizing particle travels through it. This property of radiation, linear energy transfer (LET), is a widely used quantity to determine biological and electronic effects of ionizing radiation. A major component of the lunar radiation environment particle fluence is high energy protons from solar particle events (SPEs). Another major component of importance, because of their very high LET values, are galactic cosmic rays (GCRs). These high LET particles have the capability of fragmenting target materials and/or themselves. This causes large energy depositions which are biologically damaging. HETC-HEDS (High Energy Transport Code – Human Exploration and Development in Space) and HZETRN (high-charge-and-energy transport) are two radiation codes that can be used to estimate these LET values. In past simulations, comparisons of HETC-HEDS and HZETRN redictions with the observed CRaTER data displayed differences in energy depositions due to escaping delta rays. In this work, an updated computation model for primary and secondary energy deposition and a delta ray correction for primary particle contribution from proton and alpha particles is unvestigated. This work will also present first simulation results comparisons from the use of the PHITS (Proton Heavy Ion Transport System) tool to HZETRN and HETC-HEDS results.