

# Solar Energetic Particles and Galactic Cosmic Rays

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## Abstract

Ionizing radiation is harmful for biological organisms and technological systems. In space, this radiation can have both solar and galactic origin. Solar energetic particles (SEPs) include protons, electrons, and HZE ions. HZE stands for High (H), atomic number (Z), and Energy (E). HZE ions are also components of the Galactic Cosmic Rays (GCRs) and are the most harmful type of radiation that astronauts face. The goal of this project is to study the number density of each component of the SEPs and GCRs during different phases of the solar cycle. In other words, what are the fluxes of electrons and HZE ions at different energy ranges and how do they vary from solar minimum to solar maximum? At the end of the project, we will discuss how scientists and engineers are trying to keep astronauts safe from high speed, energetic particles.

Our methodologies include MATLAB, models at the NASA CCMC modeling center and SPENVIS.

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## Key Words

protons, electrons, HZE, SEP, GCR, space radiation, energetic particles, solar physics, space physics