

## Galactic cosmic rays in the magnetospheres of terrestrial exoplanets

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### Abstract

Theoretical arguments indicate that close-in terrestrial exoplanets may have weak magnetic fields, especially in the case of planets more massive than Earth (“super-Earths”). Weak planetary magnetic fields, however, result in high particle fluxes to the top of the planetary atmosphere. For cosmic ray protons with particle energies of  $64 \text{ MeV} \leq E \leq 500 \text{ GeV}$ , we numerically analyze the propagation of the particles through planetary magnetospheres. We evaluate the planetary magnetic shielding efficiency as a function of the particle energy and of the planetary magnetic field strength. Implications of increased particle fluxes are discussed, including the generation of secondary muons, the modification of atmospheric chemistry, destruction of atmospheric biomarker molecules, and potential biological implications.