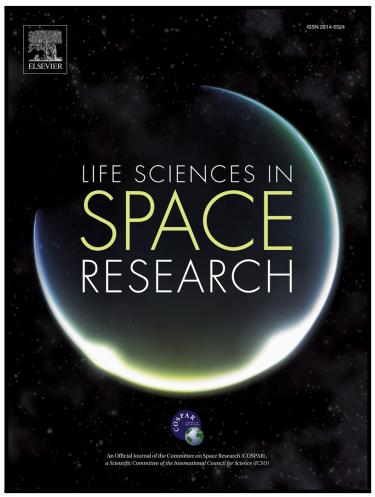

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Cosmic-ray interaction data for designing biological experiments in space

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Abstract: There is growing interest in flying biological experiments beyond low-Earth orbit (LEO) to measure biological responses potentially relevant to those expected during a human mission to Mars. Such experiments could be payloads onboard precursor missions, including unmanned private-public partnerships, as well as small low-cost spacecraft (satellites) designed specifically for "biosentinel" type missions. It is the purpose of this paper to provide physical cosmic-ray interaction data and related information useful to biologists who may be planning such experiments. It is not the objective here to actually design such experiments or provide radiobiological response functions, which would be specific for each experiment and biological endpoint. Nuclide-specific flux and dose rates were calculated using OLTARIS and these results were used to determine particle traversal rates and doses in hypothetical biological targets. Comparisons are provided between GCR in interplanetary space and inside the ISS. Calculated probabilistic estimates of dose from solar particle events are also presented. Although the focus here is on biological experiments, the information provided may be useful for designing other payloads as well if the space radiation environment is a factor to be considered.

Key Words: biosentinel, galactic cosmic rays, GCR, solar energetic particle events, SEP, SPE, nuclide-specific dose rates, nuclide-specific flux, particle track traversal rates, cell nucleus, track structure, International Space Station, ISS, interplanetary space, Mars, LEO