AOGS 2005

Cosmic-ray Propagation and the Calculation of Cosmic-ray Doses to Air Crews

KERAN. O'BRIEN[1], ERNST FELSBERGER[2,3] and PETER KINDL[3]

[1]*Department of Physics and Astronomy, Northern Arizona Universit,P. O. Box 6010 Flagstaff, AZ 86011-6010, U. S. A.*

[2]*IASON Labormedizin GesmbH. & Co K, Feldkirchner Strasse 4, A-8054, Graz-Seiersberg, Austria*

[3]*Institut für Technische Physik, Technische Universität Graz, Petersgasse 16, A-8010, Graz, Austria*

Local interstellar cosmic-ray fluxes penetrate the solar wind, the earth's magnetic field and the atmosphere overhead to expose air crews to cosmic-ray radiation dose rates. We have calculated the propagation of cosmic radiation through the heliosphere, using numerical methods, from the outer boundary, taken as 100 AU, to the earth's orbit and show that the heliocentric approximation, the result of a steady-state solution to the diffusion equation of cosmic-rays through the solar wind, is an excellent representation of this solution at 1 AU. The counting rate of any high-latitude, ground-level neutron monitor can be used to determine this potential, which will return cosmic-ray spectra in real time. These spectra are routinely used to determine the radiation dose rate to which air crew are exposed during the precise hours of a flight, including the effects of quick decreases and Forbush decreases. Further, it has been used as part of the effort to calculate the radiation dose rate to air crew during an energetic solar particle event as the cosmicray background before the event must be determined. Agreement between calculation and measurement is routinely better than 10%.

Keywords: Cosmic rays; Aircrew radiation; Dosimetry; Heliosphere; Radiation dosimetry.