INTERACTION OF COSMIC RADIATION WITH THE SURFACE OF THE EARTH

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The Institute of Radiation Protection is part of the German Helmholtz Center for Environmental Health. Among other goals, the center aims at investigation of environmental parameters that affect human health. Because the field of ionising particles produced by interaction of primary cosmic radiation with the molecules of the atmosphere does have the potential to be carcinogenic to humans, much effort is being made to quantify the radiation dose to cockpit and cabin crew. These efforts include calculations (e.g. we are developing and using the EPCARD code to calculate air crew doses) and measurements (e.g. we are running two Bonner Sphere Spectrometers, one at the Environmental Research Station Schneefernerhaus on the Zugspitze mountain at 2650 m above sea level, Germany, the other in Ny-Alesund on Spitsbergen, close to the magnetic North Pole, at sea level). While these measurements basically aim at experimental validation of calculated doses to air crew at flight altitudes, the interaction of cosmic radiation with the surface of the Earth turns out to complicate the situation.

In the present paper, it is demonstrated how the atmosphere–lithosphere interface influences the secondary field of cosmic radiation. Special emphasis is placed on secondary neutrons from cosmic radiation (which add significantly to total dose from cosmic radiation). It is shown that changes in neutron intensity may be due to changes in solar activity (Forbush decreases), but also due to changes in environmental parameters (neutron fluence oscillations). Methods are discussed that allow discrimination between both sources of neutron intensity changes. As an example, the period in September 2005 is discussed that includes the most recent large Forbush decrease.

Keywords: cosmic radiation, surface of the Earth