SIMULATION OF SOLAR NEUTRON FLUX IN THE EARTH'S ATMOSPHERE

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We performed simulations of the solar neutron (n_s) flux in the Earth's atmosphere associated with three significant flares (X17 of september 07, 2005, X1.3 and M3.9 of september 07, 2017). The input of the simulations was calculated on the basis of n_s signals detected at ground level by the Solar Neutron Telescope of Sierra Negra (SNT-SN), in Mexico, and by the FIB scintillator of the Space Environment Data Acquisition-Attached Payload on board of the International Space Station. Since n_s can produce Extensive Air Showers (EAS) in the Earth's atmosphere, we used the CORSIKA code and FLUKA subroutines to simulate the particle fluxes associated with the X17, X1.3 and M3.9 flares. We studied the average longitudinal variations of particle flux and energy loss through the atmosphere to estimate the impinging n_s in the SNT-SN. The results of the particle interactions and multiplicities, as a function of particle energy, suggested that 11-13% of the n_s, released by the X17 flare, could overcome atmospheric attenuation and propagate from the top of the atmosphere to the STN-SN (4500 m a.s.l.) without producing EAS. On the other hand, n_s associated with the X1.3 and M3.9 flares were lost due to atmospheric attenuation and the production of new particles; therefore, they were not detected at ground level by the SNT-SN.

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