

Evaluation of primary solar proton spectra using balloon cosmic ray observations and Monte Carlo simulation results.

V.S. Makhmutov (1), L. Desorgher (2), G.A. Bazilevskaya (1), E. Flueckiger(2) and J.-P. Raulin (3)

(1) Lebedev Physical Institute RAS, Moscow, Russia, (2) Physikalisches Institut, University of Bern, Bern, Switzerland, (3) CRAAM/Universidade Presbiteriana Mackenzie, Sao Paulo, Brazil; (makhmutv@sci.lebedev.ru; Fax: +7-495-4854100)

We have developed a method to evaluate the spectrum of solar protons at the top of the Earth's atmosphere from our balloon cosmic ray data. By using the Geant4 based PLANETOCOSMICS code we compute the interaction of solar protons (10 MeV-20 GeV) with various power law spectra with the Earth's atmosphere. The simulations yield the integrated flux of secondaries (p, e-, e+, photons, muons) in function of atmospheric depth. By comparing the depth dependence of the particle flux to data obtained by a balloon experiment we can then deduce the parameters of the solar proton spectrum that best fits the observations. In this paper we discuss our solar proton spectrum estimation method, and we present results of its application to selected solar proton events from 2001 to 2005. The results are compared to the solar proton spectra deduced from satellite and neutron monitor data.