

# **Simulation of the interaction of GCR and SCR with the Earth's atmosphere**

**L. Desorgher** and E. O. Flückiger

Physikalisches Institut, University of Bern (desorgher@phim.unibe.ch)

Below 50 km altitude galactic cosmic rays are the main source of ionisation in the Earth's atmosphere. Solar energetic particles are the cause of sporadic loss of ozone in the upper atmosphere. Cosmogenic nuclides are produced in the atmosphere by the interaction of secondary cosmic ray protons and neutrons with atmospheric nuclei. To quantify the different effects it is important to know the flux of cosmic ray shower particles (neutrons, electrons, gammas, protons, muons,...) in function of geographic position, atmospheric depth, and geomagnetic activity level, as well as the energy deposited by these particles in the atmosphere. For this purpose we have developed a code based on Geant4, called PLANETOCOSMICS, which allows to simulate the interaction of galactic and solar cosmic rays ( $<1\text{TeV}$ ) with the Earth's magnetosphere, atmosphere, and soil. In the paper we will describe briefly the PLANETOCOSMICS code. We will compare selected simulation results with radiation measurements in the Earth's atmosphere. Finally we will present an evaluation of the variation of the atmospheric ionisation during the January 20, 2005, Ground Level Enhancement, obtained with PLANETOCOSMICS for a 5 by 5 degree grid in geographic coordinates.