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Effects of the Extreme Cosmic Ray Ground Level Enhancement on January 20, 2005, at Aircraft Altitude

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The Ground Level Enhancement (GLE) recorded on January 20, 2005, by the worldwide network of neutron monitors (NM) is ranked among the largest in fifty years with giant count rate increases at the NM stations McMurdo (almost 3000%) and South Pole (more than 5000%). From the recordings of the worldwide network of NMs we determined both the appropriate galactic cosmic ray spectrum and the characteristics of the solar particle flux near Earth. For this task we used the Geant4 code PLANETOCOSMICS to simulate first the transport of charged particles through the Earth's magnetosphere, and to determine cutoff rigidities and asymptotic directions of cosmic ray particles for the time of the event. We then used the same program to evaluate, for a 5 by 5 degree grid in geographic coordinates, and in dependence of altitude, the flux of different secondary particle species in the atmosphere and the ionization produced by these particles. The results obtained for the solar particles were then compared to the corresponding values referring to galactic cosmic rays. In the paper we discuss the method of analysis and present results with emphasis on aircraft altitude.