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The cosmic ray ground level enhancements on January 20, 2005, and December 13, 2006

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The solar cosmic ray 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%). The GLE recorded on December 13, 2006, is among the largest in solar cycle 23, with count rate increases up to $\sim$90% (Oulu, Apatity). Although the increases in the neutron monitor counting rates at Jungfraujoch (effective vertical cutoff rigidity: 4.5 GV) were similar in amplitude (about 10%), the characteristics of the two GLEs near solar activity minimum were significantly different. From the recordings of the worldwide network of NMs we determined for the two events the characteristics of the solar particle flux near Earth. For this task we used the Geant4 code PLANETOCOSMICS to simulate 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 events. In the paper we discuss the method of analysis and present results with emphasis on the main phase of the events.