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Rapid determination of cutoff rigidities and asymptotic directions using predetermined parameters in a database

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The investigation of solar cosmic ray events based on neutron monitor measurements requires detailed knowledge about the trajectories of charged particles in the Earth's magnetic field. This information is needed with a high time resolution and for the current level of disturbance of the geomagnetic field. The determination of cutoff rigidities and asymptotic directions by the standard technique of trajectory computation is a time-consuming process. Furthermore, the magnetic field controlling the transport of charged particles near Earth is dynamic and exhibits variations on different time scales ranging from minutes to millenia. Today's space weather applications request computations in near real-time. Therefore it is reasonable to compute trajectories of cosmic ray particles in the magnetic field of the Earth in advance and to stack parameters to describe cutoff rigidities and asymptotic directions at the locations of the neutron monitors of the worldwide network into a database for quick computation.

In this work we investigate the possibility to rapidly describe the cutoff rigidity and the asymptotic directions of neutron monitor locations for specific times and geomagnetic activity by a quick procedure based on a limited number of parameters archived in a database.

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