

Geant4 simulation of geomagnetic field

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Modern experimental techniques, such as Accelerator Mass Spectrometry (AMS), allow us to analyze environmental samples with high sensitivity and resolution. The concentration of cosmogenic nuclides in these samples is the result of the interplay between three processes: production, transport, and deposition. The knowledge of involved processes and their simulations allowed us to obtain production rates of various cosmogenic nuclides. The Monte-Carlo method is a very helpful method to understand and simulate such processes. Our model of extraterrestrial production of cosmogenic nuclide was described in [1]. This model could be used also for simulation of cosmic rays' irradiation of extraterrestrial and also terrestrial objects. Cosmic rays impacting at the Earth highly depends on modulation with a geomagnetic field. The field simulation is not included in our model yet.

This presentation will be dedicated to the description of improved modelling of geomagnetic field effects in our model. Geant4 toolkit is suited to simulation of simple magnetic field. On the other hand, the geomagnetic field is highly non-uniform. Modeling non-uniform field is possible by definition of many small uniform fields in Geant4. The global field will be modeled using Geant4 routines. The results will be compared with existing published works and existing experimental data. The extension of our model allows the investigation of Earth samples.

[1] Čechvala, P., Breier, R. & Masarik, J. Production rates of cosmogenic nuclides in extraterrestrial material using GEANT4 software. *J Radioanal Nucl Chem* **332**, 4403–4411 (2023). <https://doi.org/10.1007/s10967-023-09135-5>