

Simulation of particle fluxes and cosmogenic nuclide production in the earth's atmosphere revisited

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Since the publication of our first paper Masarik and Beer [1999], new developments in cosmic ray physics and nuclear parameters applied in our simulations have evolved. Several papers devoted to the cosmogenic nuclide production in the atmosphere were published and some of them put in questions the reliability of our simulations from the point of view of latest developments in the field. Therefore, we revised fluxes of particles in the atmosphere and based on experimental or evaluated cross sections they were used to calculate the production rates of ^3H , ^7Be , ^{10}Be , ^{14}C , and ^{36}Cl . The dependencies of these production rates on solar activity and geomagnetic field intensity were investigated in detail. The obtained production rates agree well with most published experimental and theoretical values and do not differ substantially from previously published ones. This shows that the production rates are not sensitive to some parameters suggested as important in various papers.

The good agreement of calculations with modern measured values shows that our model can be used to obtain reliable production rates of terrestrial cosmogenic nuclides and that our model should be good for samples from very large depths in extraterrestrial objects including those with an atmosphere and magnetic field. These results provide the basis for a quantitative reconstruction of the history of the solar activity and the geomagnetic field intensity using records of cosmogenic isotopes in natural archives such as sediments and ice cores

References:

Masarik, J., and J. Beer, Simulation of Particle Fluxes and Cosmogenic Nuclides Production in The Earth's Atmosphere, J. Geophys. Res., 104, 12 099-12 112 1999.