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Production of cosmogenic radionuclides Be-7, Be-10, C-14, Na-22 and Cl-36 in the Earth's atmosphere: altitudinal profiles and yield functions

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Relation between cosmic rays and production of cosmogenic radionuclides is important for many reasons and, particularly, is crucial for several widely used approaches in cosmic ray, heliospheric and atmospheric studies. We present new consistent precise computations of the production of five cosmogenic radionuclides Be-7, Be-10, C-14, Na-22 and Cl-36 in the Earth's atmosphere. For the first time a detailed set of the altitude profiles of their production is provided, which makes it possible to use the results directly as input for atmospheric transport models. Good agreement with the most of earlier published works for columnar and global isotropic production rates is shown. The knowledge of altitude profiles of production is important for many applications of cosmogenic nuclides, such as studies of past solar particle events, precise reconstruction of solar activity on the long-term scale, tracing air-mass dynamics, etc. As an example, computations of the Be-10 depositional flux in the polar region are shown for the last decades and also for a period around 775 AD, and confronted with actual measurements in ice cores from Greenland and Antarctica.

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