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Cosmogenic nuclide production by radiation from supernovae

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Introduction: Nearby supernova explosions may cause isotope anomalies via several processes, one of which is cosmic-ray spallation in the earth's atmosphere. We estimate the direct production rates of cosmogenic nuclides, showing the dependence on the supernova distance. This is not a new idea: in fact we started our studies a few years ago, however due to some inconsistencies it took longer to come with some reliable results.

Calculations: We have performed a set of calculations to determine the expected ^{10}Be contribution from a SN explosion. We have assumed a power law for the differential GCR flux (with exponent -2.48) and we have taken only nitrogen, oxygen and argon for the composition of atmosphere.

For reactions induced by cosmic radiation, production rates were calculated with the GEANT 4 [1] code system. Besides direct production of ^{10}Be also the secondary neutron fluxes were calculated. Production of neutrons by photons should be calculated with respect of high flux of impacting photons. Having calculated the neutron fluxes, the production rates of ^{10}Be were calculated following the approach described in [2].

Conclusions: Calculated production rates were compared with experimental data from ice samples. Conclusions about possibility to find in data nuclides produced by SN explosions were made.

References:

- [1] S. Agostinelli et al., NIM A, vol. 506, no. 3 (2003) 250-303.
- [2] Masarik J and J. Beer,(1999) JGR, A104. 12,099-12,111.

Submitted on behalf of a Collaboration?

No

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