

Ar-37, Be-7 and Xe-133 in the Atmosphere

Natural Ar-37 in the atmosphere is produced by spallation of argon through $^{40}\text{Ar}(n,4n)^{37}\text{Ar}$ and by neutron capture, $^{36}\text{Ar}(n,\gamma)^{37}\text{Ar}$. The resulting equilibrium concentrations of Ar-37 in the stratosphere and troposphere are about 10 mBq/m³air and 0.5-1 mBq/m³air, respectively as deduced from direct measurements and theoretical calculations. Activity concentrations in atmospheric air measured in Bern over the past three decades range between 1- 10 mBq/m³air. In order to investigate long term activity levels of Ar-37 and potential fluctuations above background at other geographical locations samples were collected at the CTBTO IMS Radionuclide station located in Takasaki, Japan. Sampling at this particular location also allows for time correlated measurements of Ar-37, Be-7 and Xe-133 activity concentrations, for comparison and an identification of any potential common sources. For example, the correlation of elevated levels of Ar-37 with Be-7 may indicate a stratospheric influx of air masses to the ground, whereas correlation with Xe-133 may indicate the source is a civilian nuclear facility. The potential geographical source location of the air masses sampled in Japan, are determined by atmospheric transport modelling

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