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-37 variability in the low troposphere

Argon-37 is produced in the high troposphere by spallation of argon through 40Ar(n,4n)37Ar and by neutron capture, 36Ar(n,γ) 37Ar. The resulting natural equilibrium concentration of Ar-37 in the mixed troposphere is about 0.5-1 mBq/m3air. This value may define the background level for the use of Ar-37 for search area reduction by means of atmospheric Ar-37 measurements in downwind direction of a potential test area in the course of an OSI. In order to investigate long term atmospheric activity levels of Ar-37, bulk air samples were collected close to the CTBTO IMS Radionuclide station located in Takasaki, Japan. In the years 2016-2018 in total 105 air samples were taken and analyzed for their Ar-37 activity concentrations with no value exceeding 10 mBq/m3air. Slight variations are most likely caused by neutron activation of stable argon in facilities such as nuclear power plants and research reactors, venting of soil gas where Ar-37 is produced by neutron activation of Calcium or less likely Stratosphere to Troposphere (STT) transport. In this study the potential geographical source location of the air masses sampled in Japan, are determined by atmospheric transport modelling.

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