

1.3-O4. Ar-37 IN ATMOSPHERIC AND SUB-SOIL GASES

For on-site inspection the radioactive noble gas isotope ^{37}Ar is a definitive and unambiguous indicator of an underground nuclear explosion. In order to distinguish between natural and artificially elevated ^{37}Ar the location-specific activity range in soils, rocks and the atmosphere were identified. Periodic atmospheric air measurements collected worldwide revealed a background level in the order of 1-5 mBq/m³air in agreement with former findings and theoretical calculations. Those calculations also indicated that the intrusion of stratospheric air masses may lead to elevated tropospheric ^{37}Ar concentrations up to 8-10 mBq/m³air. From CARBIC flights, a passenger aircraft with a special air freight container filled with scientific equipment in the cargo compartment, tropospheric air samples were analyzed for ^{37}Ar and ^{85}Kr . Selected samples taken up to now in the vicinity of nuclear power plants revealed no significant deviation from the natural background. The natural ^{37}Ar production in soils and the rock basement underlying the alluvium is investigated by means of insitu measurements of different isotopes, theoretical calculations and irradiation experiments on selected rock samples. This will help to resolve the temporal evolution and/or constancy of the natural ^{37}Ar background and allow for an interpretation in terms of the identification of clandestine nuclear explosions.

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