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T3.1-P01. 13C content as a monitoring tool for subsurface gas sampling methodology in an OSI

The detection of anomalous concentration of noble-gas (NG) radionuclides in the subsurface gases during an on-site inspection (OSI) is a strong indicator of a suspicious underground nuclear explosion. This implies that the sampling methodology ensure the collection of a reliable representative subsurface gaseous sample, avoiding the mixing with atmospheric gases. Sampling NG in shallow layers can provide reliable results for desert areas (like in the last IFE14 in Jordan), but different local geological features could result in more complex migration of subsurface gases to the very near superficial layers limiting the representativeness of the sample. We propose to use the measurement of CO2 and CH4 isotopic composition to investigate the saturated/unsaturated transition area, by the implementation of an experimental protocol that implies the detection of conventional subsurface gases (i.e methane and carbon dioxide), which propagation could be triggered by the explosion. Portable isotopic analyzers (that measures the δC-13 in CH4 and CO2) could be used to exclude the infiltration from atmospheric gases and to localize the faults and fracturing that could lead to a seeping of the subsurface gases. Therefore this technique could be proposed as an auxiliary equipment for the subsurface sampling gases field activity in the OSI.

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