

Gas Fluxes in the Subsurface and Sampling: From Science to Technology

Following underground nuclear explosions, migration of radioactive gases to the atmosphere takes many forms depending on the pressure and temperature evolution in the cavity and the properties of the geological media. This results in a diversity of gas fluxes at the geosphere-atmosphere interface that must be understood for proper detection of nuclear events both through the IMS and from OSI. In addition, numerous gaseous species are naturally present in the subsurface and their distributions in space and time are highly variable, due to biogeochemical reactions and water movements. Naturally occurring gaseous species are shown to be a good proxy of the migration capability of the radioactive gases of interest in a given environment, the major species O₂ and CO₂ locally controlling advection. Therefore, it is important to monitor many gas species either by on-line analysis or through bag sampling. Improvements of the conventional devices (tarps and boreholes) for subsurface gas sampling and analysis will be presented before considering optimization by means of numerical simulations. The new Controlled and Reliable SubSurface Air (CoRSSAir) sampler recently developed by CEA will be presented. It allows reliable sampling and guarantees sample integrity even under the harshest conditions in the field.

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