S30. Monitoring the Earth for Hazards: Integrating Geology, Geophysics, and Risk Assessment

Radon monitoring in groundwater within the framework of the Euratom funded ArtEmis project: selection of sites in the Abruzzo aquifers (central Italy)

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Radon is progressively emerging as an effective geogas tracer for geodynamic processes and a potential earthquake precursor (Joint Research Centre of European Commission, 2024; Stoulos et al., 2024, and references therein). The Euratom-funded ArtEmis project (http://www.artemisproject.eu/) plans to build a European network of low-cost, multiparametric sensors to monitor radon concentrations in groundwater with high spatial and temporal resolution, on three key areas in Europe. One of these is the Abruzzo region, in central Italy, which has been selected for its significant seismicity and peculiar seismotectonic and hydrogeological features. One of the ArtEmis objectives is to address the long-standing question of whether radon monitoring in groundwater can provide reliable short-term precursors for destructive earthquakes (JRC EU). Moreover, ArtEmis aims to establish an optimized model for environmental and natural hazard monitoring, leveraging low-cost multisensor networks, data processing powered by machine and deep learning algorithms, and active municipalities engagement to improve scientific dissemination and population preparedness.

Consequently, particular attention in ArtEmis has been given to the selection of radon monitoring sites in the monitored areas. As radon concentrations in groundwater are believed to be less susceptible to the shallow phenomena than measurements in soil gas, radon monitoring will be carried out only within carefully selected

high-discharge springs. Site selection prioritized hydrosensitive to seismicity locations, considering source rock properties, hydrogeological and seismotectonic settings and seismic activity, viewed as main factors affecting radon release.

This work is focused on the selection process of the hydrosensitive to seismicity sites in Abruzzo, where sensors will be installed. Source rock properties, hydrogeological conditions, seismotectonic setting, and seismic activity were all considered in site selection due to their influence on radon release into groundwater. Sites were chosen within carbonate aquifers, intermontane plains, and spa areas due to the presence of major seismogenic faults, high-discharge springs and the noticeable upwelling of geogas such as CO_2 as potential carrier for radon.

The chosen sites are primarily high-discharge springs. These springs tap into a significant volume of carbonate aquifer intersected by seismogenic faults, reflecting deep processes, such as the radon upwelling, unaffected by surface ones or significant seasonal variations in the water cycle.

Radon monitoring has started in Abruzzo, currently deploying three sensor prototypes within the Gran Sasso carbonate aquifer and the Sulmona plain.

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hydrosensitive to seismicity sites, radon monitoring, carbonate aquifer.

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