Multiple and simultaneous investigations to a better approach for the accurate identification of radon natural radioactivity in terms of potential health risks

ANDREA GASPARINI¹, NUNZIA VOLTATTORNI² AND GIANFRANCO GALLI¹

¹Istituto Nazionale di Geofisica e Vulcanologia ²Istituto Nazionale Di Geofisica e Vulcanologia, Roma, Italia Presenting Author: andrea.gasparini@ingv.it

Radon (²²²Rn) is the second most common cause of lung cancer after smoking. As radon poses a significant risk to human health, radon-affected areas should be identified to ensure people's awareness of risk and remediation. The presence of ²²²Rn in indoor air can be due to the presence of fissures in walls or any other conduits that can facilitate the diffusion of the gas from the ground to closed spaces and to the building material. It is very important to know the levels of radon in soil gas, the indoor environment, and water to keep people safe from excessive exposure to radon and, consequently, reduce the lung cancer risk.

The primary goal of this research was to investigate the local natural radioactivity because of the presence of tuff outcrops (from middle–lower Pleistocene volcanic activity) that naturally produce radioactive gas radon at Cerveteri (Rome, Central Italy). A detailed radon survey with in-soil, indoor, and in-water ²²²Rn measurements (figure 1) was conducted in the Cerveteri area, within a densely populated area, to identify the radon source and the main causes influencing the distribution of this gas.

Three different sampling methods were used to conduct the investigation. Detailed radon gas surveys were carried out during the dry season (from June to September 2017), within an area of about 3 km², with a sampling density of about 20 samples/km². Soil gas radon (²²²Rn) concentrations were measured with a portable RAD7 Durridge® certified alpha spectrometer. Measurements of indoor radon concentrations were performed in selected private and public dwellings using activated charcoal canisters (ACCs). To measure dissolved ²²²Rn concentrations, water from two private wells was analyzed.

The multiple and simultaneous investigations conducted in this work proved to be a better approach for the accurate identification of radon natural radioactivity in terms of potential health risks due to exposure to this dangerous gas. The obtained results show that the presence of degassing soils and building materials strongly contribute to the indoor Rn distribution, which should be determined for hazard estimation and land use planning.



Figure 1: Figure 1 Geological sketch map of the Cerveteri study area (Rome, Central Italy) and radon investigations. Soil gas 222Rn and 220Rn, indoor radon, and dissolved radon in water are represented by green, red, and blue symbols, respectively