Environmental and Health Risk Assessment of exposure to elevated Radon levels in highly NaCl / $CaCO_3$ mineralized karst mixed waters: the Case-Study of the Capodifiume Springs Group in the National Park of the Cilento and Vallo di Diano-European Geopark (Southern Italy)

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Abstract

This paper investigates the behaviour of radon (^{222}Rn) within a complex system involving interactions between groundwater and surface water bodies, and examines its potential environmental and health impacts. The study focuses on the Capodifiume karst spring group—characterized by high NaCl and $CaCO_3$ mineralization - located in the Cilento and Vallo di Diano European Geopark in southern Italy. This site is a Geosite of Primary Relevance and lies near the archaeological area of Poseidon-Paestum, in the plain of the Campania region.

While radon is commonly studied in the context of indoor air pollution, its presence and behaviour in natural aquatic environments, such as lakes and springs, also require close attention. This is due to the complex interactions between groundwater and surface waters, as well as the influence of the local hydrogeological framework. Understanding these dynamic processes is essential for accurately assessing radon-related environmental risks and for implementing effective risk management strategies in natural water settings.

To support this analysis, the study includes the determination of radionuclide activity concentrations in soil and plant samples collected from the Capodifiume spring area. These measurements were conducted using high-resolution gamma spectrometry. Additionally, the environmental risk was assessed using the ERICA (Environmental Risk from Ionizing Contaminants: Assessment and Management) tool.