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GROUNDWATER FLOW PROCESSES IN THE ACTIVE VOLCANIC SYSTEM OF ISCHIA ISLAND (ITALY)

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Abstract

The volcanic system of Ischia is characterized by an intense hydrothermal activity, documented since the early 16th century by the study of Iasolino (1588), which represents the first systematic analysis of the thermal springs of the island for therapeutic purposes. Later studies partially contributed to the enhancement of knowledge on the volcanic, hydrogeological and hydrothermal features of the island, highlighting the strong interaction between hydrothermal flowpaths and volcano- tectonic processes. The reconstruction of the interplay between hydrothermal and magmatic system becomes, therefore, a fundamental element for territorial planning, not only in terms of management of the huge water and geothermal resource, but also in a perspective of prevention and mitigation of volcanic risk. Thermal springs, fumaroles and mud deposits give beginning clues about deep hydrothermal conditions. Till now at Ischia, the local geochemical characterization of fluids and groundwater has been used for the definition of the origin and structure of the hydrothermal system as a whole, as the hydrogeological information is incomplete. However, volcanic hydrothermal systems, such as that characterizes the island of Ischia, are particularly difficult to analyze and outline, as the groundwater resources are the result of a complex and dynamic mixing among meteoric water, sea water and deep fluids. In such cases, the need for an interdisciplinary approach is evident, involving knowledge and research methods ranging from geology to volcanology, geophysics, geochemistry and hydrogeology. With particular reference to the functional and structural representation of the geothermal system of the Ischia island and the resulting correlations with the volcano-tectonic processes, the examination of previous information highlights the need to update and improve the knowledge on groundwater hydrodynamics and mineralization processes.
Therefore, the present study aims at a strongly interdisciplinary action that, starting from the design and implementation of a database on the existing geological/volcanological and hydrogeological information, will contribute to highlight the critical issues, define an operating scheme of the hydro-geo-thermal system of the island of Ischia, and upgrade its hydrogeological, geochemical and volcanic monitoring system. The preliminary results improved the definition of the hydrogeological complexes and advanced knowledge of the groundwater flow conditions.