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Dissolved gas geochemistry for geothermal exploration in Gran Canaria, Canary Islands

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Exploration geothermal methods include a broad range of disciplines. Among the geochemical techniques for geothermal exploration, particularly useful in the early stages of research, the study of the chemical and isotopic composition of the gases dissolved in groundwaters can provide indications of the rise of hydrothermal fluids, since (i) volcanic aquifers commonly trap in a certain proportion the components of fluids exsolved from active hydrothermal systems and (ii) in up-flow zones of geothermal systems, ascending boiled or un-boiled water may mix with shallow ground waters. This type of studies are particulary useful when it is not possible to collect free gases, fumarolic and/or bubbling gases, as in the case of Gran Canaria island. Gran Canaria, a nearly circular island, is located at the centre of the Canarian archipelago. It is the third largest island by surface area (1532 km2). After a preliminary evaluation of Gran Canaria's groundwater hydrochemistry for geothermal exploration purposes, groundwater samples from 40 different wells had been selected to analyze their chemical and isotopic composition of the dissolved gases in the groundwaters. Particular attention is addressed to highly mobile and/or non-reactive gases such as H2 and He. Helium has unique characteristics as a geochemical tracer: it is chemically inert, radioactively stable and non-biogenic; H2 is one of the most abundant trace species in volcano-hydrothermal systems and a key participant in many redox reactions occurring in the hydrothermal reservoir gas. The results of this study will help to identify the possible existence of permeable portions of deep-seated actively degassing geothermal reservoirs, particularly where the interpretation and application of geophysical data is difficult.