

Surface geothermal exploration in the Canary Islands by means of soil CO₂ degassing surveys

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With the exception of the Teide fumaroles, there is not any evidence of hydrothermal fluid discharges in the surficial environment of the Canary Islands, the only Spanish territory with potential high enthalpy geothermal resources. Here we show the results of several diffuse CO₂ degassing surveys carried out at five mining licenses in Tenerife and Gran Canaria with the aim of sorting the possible geothermal potential of these five mining licenses. The primary objective of the study was to reduce the uncertainty inherent to the selection of the areas with highest geothermal potential for future exploration works. The yardstick used to classify the different areas was the contribution of volcano-hydrothermal CO₂ in the diffuse CO₂ degassing at each study area. Several hundreds of measurements of diffuse CO₂ emission, soil CO₂ concentration and isotopic composition were performed at each mining license. Based in three different endmembers (biogenic, atmospheric and deep-seated CO₂) with different CO₂ concentrations (100, 0.04 and 100%, respectively) and isotopic compositions (-24, -8 and -3 per mil vs. VPDB respectively) a mass balance to distinguish the different contribution of each endmember in the soil CO₂ at each sampling site was made. The percentage of the volcano-hydrothermal contribution in the current diffuse CO₂ degassing was in the range 0-19%. The Abeque mining license, that comprises part of the north-west volcanic rift of Tenerife, seemed to show the highest geothermal potential, with an average of 19% of CO₂ being released from deep sources, followed by Atidama (south east of Gran Canaria) and Garehagua (southern volcanic rift of Tenerife), with 17% and 12% respectively.