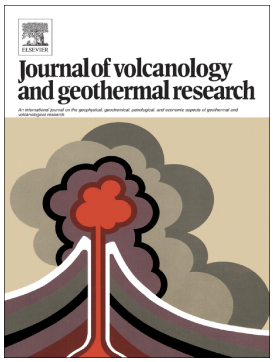

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PII: S0377-0273(18)30028-3
DOI: doi:10.1016/j.jvolgeores.2018.07.004
Reference: VOLGEO 6416

To appear in: *Journal of Volcanology and Geothermal Research*

Received date: 16 January 2018
Revised date: 12 June 2018
Accepted date: 17 July 2018

Please cite this article as: Vivien Navelot, Yves Géraud, Alexiane Favier, Marc Diraison, Michel Corsini, Jean-Marc Lardeaux, Chrystèle Verati, Jeanne Mercier de Lépinay, Lucie Legendre, Gildas Beauchamps , Petrophysical properties of volcanic rocks and impacts of hydrothermal alteration in the Guadeloupe Archipelago (West Indies). Volgeo (2018), doi:10.1016/j.jvolgeores.2018.07.004

Petrophysical Properties of Volcanic Rocks and Impacts of Hydrothermal Alteration in the Guadeloupe Archipelago (West Indies)

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Abstract

The results of the GEOTREF project presented here aim to develop high enthalpy geothermal energy in fractured reservoirs. They focus on active volcanic islands, especially the Basse-Terre Island (Guadeloupe Archipelago). As part of this project we measured several petrophysical properties to better understand how fluids flow in the hydrothermal system, provide a set of parameters to modelers and build datasets for future interpretation of well logs. The thermo-physical rock properties of bulk and grain density, porosity, permeability, compressional wave velocity, thermal conductivity and diffusivity, specific heat capacity of outcropping volcanic rocks from the Guadeloupe Archipelago (Lesser Antilles) were measured and a dataset was built. According to field observations, samples were grouped into three lithological classes and then separated by their degree of alteration according to macroscopic aspects and optical microscopy results. Geochemical data were obtained, and magnetic minerals identified by combining anisotropy of magnetic susceptibility and variation of magnetic susceptibility with temperature.

The lithotypes investigated were lava flows, debris flows and pyroclastics (gathering ash, pumice and scoria deposits). For lavas and debris flows, three degrees of alteration were defined; fresh, slightly to moderately altered and highly hydrothermalized. Only fresh pyroclastics were studied because the altered state was not outcropping.

Typically, samples are composed of andesite and belong to tholeiitic and calc-alkaline series. Lava porosity consists of high-density cooling joints and vesicles of different shapes, whereas pores in debris flows

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