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Geothermics 34 (2005) 495–517

GEOTHERMICS

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Chemical and isotope characteristics of the Chachimbiro geothermal fluids (Ecuador)

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Received 16 December 2002; accepted 22 April 2005

Available online 27 June 2005

Abstract

The parent geothermal water proposed for the Chachimbiro geothermal area has calculated values of 2250 mg/L Cl and approximately 5 bar P_{CO_2} . It comes from a reservoir having an estimated temperature of 225–235 °C, although temperatures somewhat higher than 260 °C may be present at the roots of the system. The geothermal reservoir at Chachimbiro is recharged mainly by meteoric water (about 92%) and secondarily by arc-type magmatic water. Carbon and sulfur isotope data support a magmatic origin for the C and S species entering the geothermal system from below, consistent with indications provided by He isotopes.

The thermal springs of Na–Cl to Na–Cl–HCO₃ type located in the Chachimbiro area originate through dilution of the parent geothermal water and have reached different degrees of re-equilibration with country rocks at lower temperatures.

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Keywords: Isotopes; Geochemistry; Thermal springs; Chachimbiro; Ecuador

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1. Introduction

The Chachimbiro geothermal area is located in the Western Andean Range (Cordillera Occidental), about 70 km NNE of Quito and 17 km NE of Ibarra (Fig. 1a). The center of the area of interest is at 0°25'N and 78°17'W, at an average elevation of 2560 m above sea level (m asl). The rough topography is dominated by the Cotocachi (4944 m asl) and Yanahurcu de Piñan (4535 m asl) stratovolcanoes (Fig. 1b).

Previous geochemical investigations at Chachimbiro to assess the geothermal potential of the area were carried out within the framework of **OLADE-INECEL** (unpublished report), **OLADE-AQUATER** (unpublished report) and **IAEA-INECEL** (Almeida et al., 1992) projects. Some 20 samples of thermal and cold waters were collected and analysed for major chemical components, δD and $\delta^{18}O$ values, and tritium activity. Based on these data, the area appeared to be of considerable geothermal interest and worthy of further investigation (Almeida et al., 1992). This paper discusses the results of the geochemical and isotopic investigations conducted in June 1999 and July 2001, as well as the results from previous studies, and also presents an updated conceptual geochemical model of the Chachimbiro geothermal area.

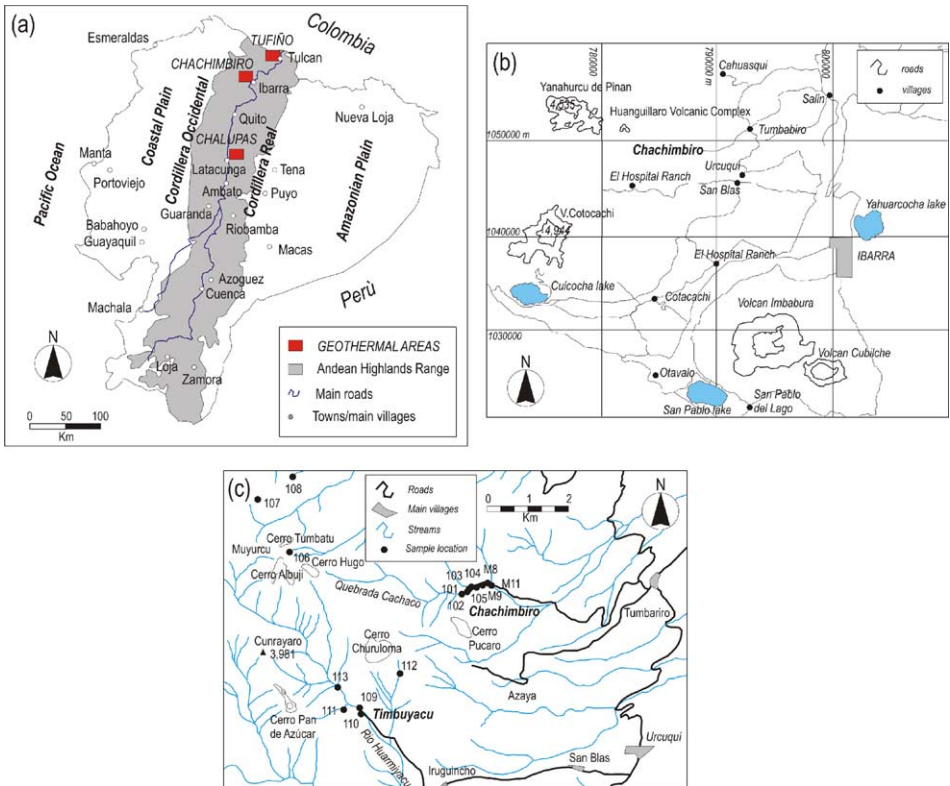


Fig. 1. Map of the Chachimbiro geothermal area showing the location of sampled springs.

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