

Preliminary Geothermal Study of the Pajacuaran Fault in the Area of Periban Mich

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Abstract

The area of the Ciénega de Chapala is to the east of the rift Cítala that houses a geological system that gives rise to the regional hydrothermal activity, mainly the Ixtlan and Pajacuaran fault lines. The regional geothermal activity is composed of a superficial hydrothermalism consisting of springs and hot water wells with temperatures between 48 and 94 °C in Ixtlan de los Hervores and San Juan Cósala as well as mud volcanoes in Los Negritos. The waters and gases of these hydrothermal manifestations have physical and chemical characteristics that indicate the presence of geothermal fluids.

In the present work the Pajacuaran fault is studied locally in the population of Periban, Michoacán. The gas emanation temperature (SO₂) on the surface of the geothermal zone is 200 °C, geothermal resource that can be used in power generation.

Keywords: Geothermal Study; Michoacan; Periban

Introduction

The Michoacán zone of the Ciénega de Chapala is located to the east of the Citala rift that gives rise to the graben and Chapala lake. The graben is delimited by a couple of faults that allow the geothermal activity of the region: the Pajacuaran and Ixtlán faults [1].

Study Area

Regional Geology

The Ixtlan fault forms part of the north flank of the Chapala graben with a length of 30 km in NW-SE alignment along the course of the Duero river, the fault is visible by a series of superficial hydrothermal manifestations [2,3], while the Pajacuaran fault is part of the south edge of the graben with a length of 20 km in EW orientation [3,4]. The stratigraphy of the area is mainly composed of andesites and basalts from the Late Tertiary (Late Miocene) to the Quaternary (Late Pleistocene) periods that emerge in the southern part of the region interspersed with lake sediments, mainly limonites and Pliocene dolomites, which emerge in the center west and north of the area [2,3].

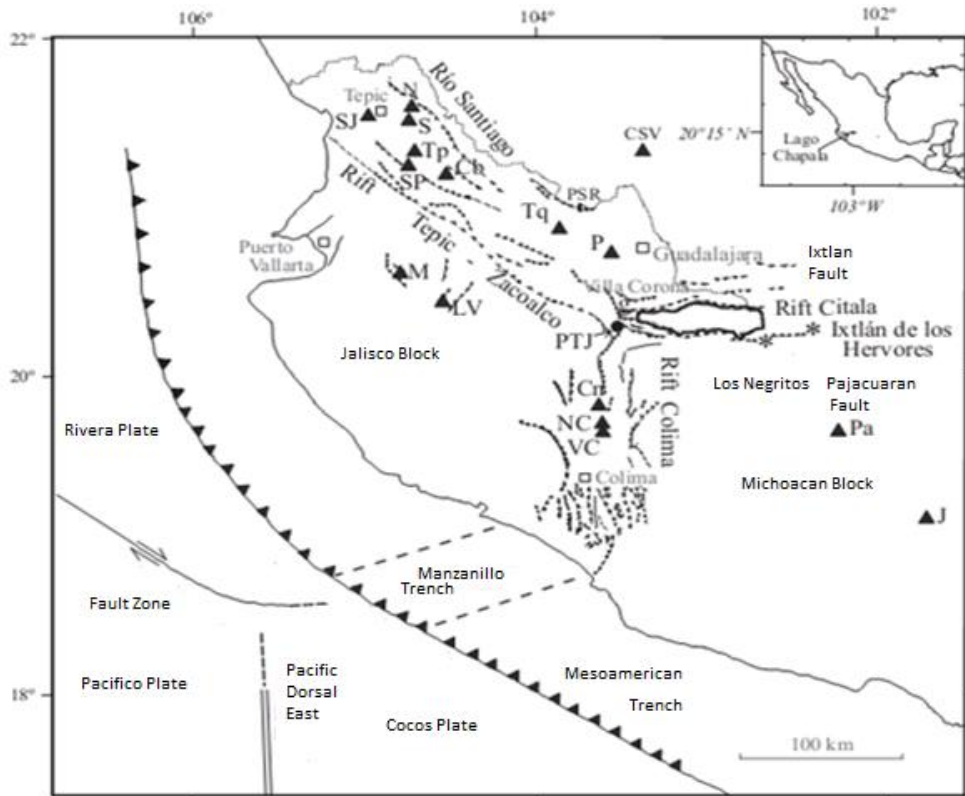
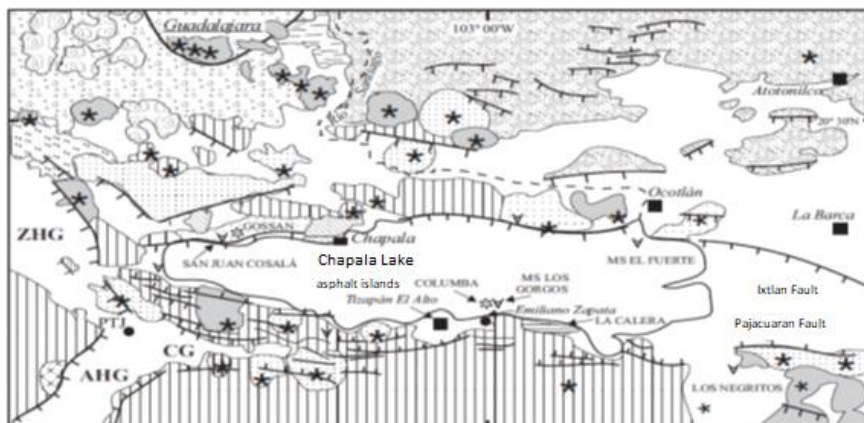


Figure 1: Regional Geology [5].

Geothermal of the Zone

The regional geothermal system consists of a surface hydrothermal activity of springs and hot water wells with temperatures between 48 and 94°C in Ixtlán de los Hervores [3,6,7] as well as Mud volcanoes in the Negritos [5]. The waters of these hydrothermal manifestations are mainly of the sodium chloride type with a boron content that indicates the presence of geothermal fluids, in turn the gases of the same manifestations show a characteristic composition of geothermal gases. The geothermometers of both fluids result in geothermal reservoirs of medium temperature (125 to 225°C) for the area [3,8,9]. On the other hand, the isotopy of the waters shows an 18 (¹⁸O) oxygen enrichment typical of geothermal environments [3,9]. All the above characteristics together result in a possible geothermal reservoir of wide fracture (amplitude of fault greater than 100m) of low relief with a phreatic level of maximum 3m depth.



*Monogenetic volcanoes. V Geothermal manifestations

Figure 2: Geothermal Manifestations of the Ciénega de Chapala [5].

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The data was collected on the Periban hill, which is a small prominence located at the base of the Pajacuaran massif, Google Maps [10] locates it as: La Brecha, Álvaro Obregón, Pajacuarán, Michoacán. with the following coordinates:

Starting latitude: $20^{\circ} 7'39.5'' \text{N}$

Starting length: $-102^{\circ} 33'0.4'' \text{W}$

Latitude of arrival: $20^{\circ} 7'38,1'' \text{N}$

Length of arrival: $-102^{\circ} 32'56.0'' \text{W}$

Surface temperature data were obtained: 200 C (Thermograph Fluke Ti 32 If Fusion) of a gas flow of SO_2 (gas analyzer Bacharach PCA3) from the subsoil.

The next Georadar images:

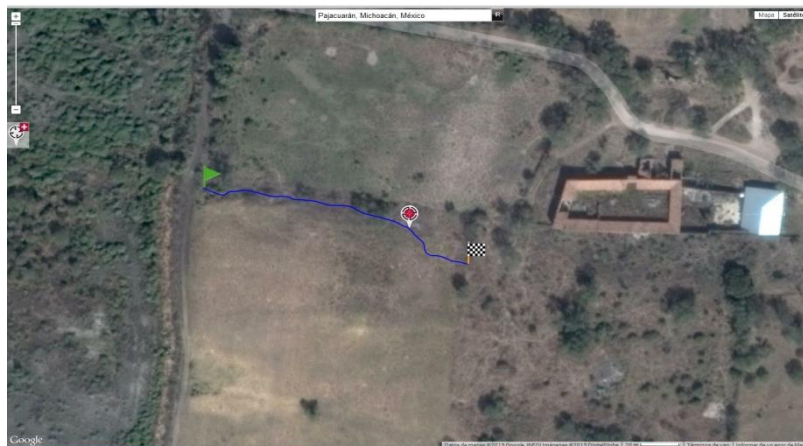


Figure 3: Pajacuaran Fault local trace and radargram site [10].

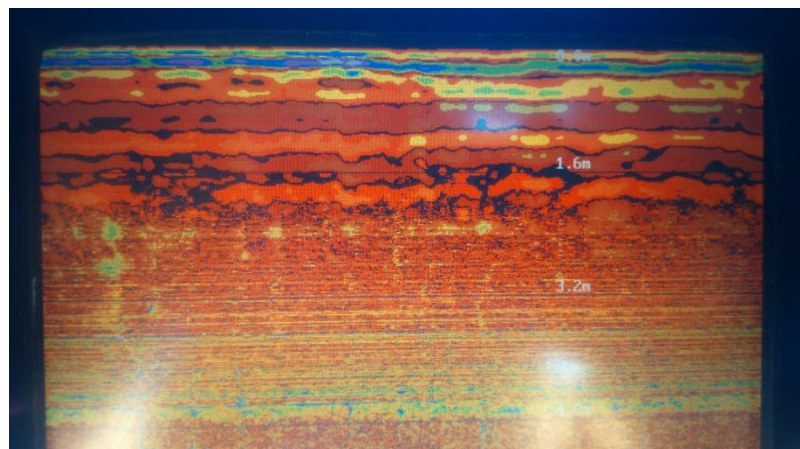


Figure 4: Local radargram of the Pajacuaran Fault).

were also obtained from the Pajacuaran fault (Approx 20 meters from South to North) in the following coordinates:

20° 7 '38.8 "N
-102° 32 '57.0 "W

The georadar equipment used is: GPR GSSI SIR2000 with 200MHz antenna
Dielectric variable: 4

Conclusion

In the present work the Pajacuaran fault is studied locally in the population of Periban, Michoacán. The gas emanation temperature (SO₂) on the surface of the geothermal zone is 200 C, geothermal resource that can be used in power generation.

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