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## Preliminary data on the structure and potential of the Tocomar geothermal field (Puna plateau, Argentina)

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### Abstract

This study presents new stratigraphic, structural and hydrogeological data on the Tocomar geothermal volcanic area (Puna plateau, Central Andes, NW Argentina), together with preliminary geochemical and magnetotelluric data.

The main geothermal reservoir is located within the fractured Pre-Palaeozoic–Ordovician units. The reservoir is recharged by meteoric waters. Geothermal fluids upwell where main regional structures intersect secondary structures associated with the development of the Tocomar basin. Preliminary data indicate a reservoir temperature of ~ 200 °C and a local geothermal gradient of ~ 130°C/km associated with the Quaternary volcanic activity in the Tocomar area.

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**Keywords:** geothermal exploration; structural control; fluid circulation

### 1 Introduction

The exploration of geothermal systems in Andean regions is a very important issue, for the presence of significant thermal anomalies at accessible depths, associated with recent volcanism and widespread evidence of current and past geothermal activity. Exploration for these resources needs comprehensive multidisciplinary (geological, hydrological, geochemical and geophysical) surveys through the use of traditional methods and innovative

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techniques for the geothermal potential assessment. The Tocomar geothermal volcanic area, approximately 160 km east of the main volcanic arc, on the Calama Olacapato Toro lineament (COT; [1]), has a high geothermal potential. This area shows evidence of several geothermal manifestations, including active and fossil hot-springs and travertine deposits. Previous works presented only a general conceptual model for the Tocomar geothermal system [2, 3, 4]. The future development of the Tocomar geothermal system requires a deepening in the knowledge of its conceptual model. This paper presents preliminary results of a multidisciplinary work which aims at: a) Defining the geometry and kinematics of the structural system at regional and local scale as well as identifying the structures that confine the reservoir; b) Mapping all the stratigraphic units, structural features and superficial manifestations at regional and local scale; c) Redefining the stratigraphy of the Tocomar volcanic center (TVC); d) defining the physical-chemical conditions into the reservoir by hydrogeochemical studies; e) Applying geophysical methods to determine the depth and geometry of the potential reservoir; f) Petrophysical characterization of the units that are involved in the geothermal system; g) Proposing a conceptual model to evaluate the geothermal potential.

## 2 Geological Framework

The Puna (NW Argentina), located in the back-arc of the Central Andes, is an internally drained plateau with an average elevation of 3.8 km. The Puna is bordered to the west by the active magmatic arc (Western Cordillera) and to the east by the Eastern Cordillera and the Subandean Ranges (Fig. 1). Since the Eocene–Oligocene, the Puna Plateau formed by crustal shortening and thickening, with both orogen-parallel thrusting and orogen-oblique strike-slip faulting plus magmatic addition, delamination of the thickened lower crust and mantle lithosphere, and, subordinately, gravity-driven crustal channel flow ([5] and references therein). The Puna plateau basement is represented by the Puncoviscana Formation (Late Neoproterozoic), composed mainly of deformed meta-sedimentary rocks, and by the Mesón Group (Cambrian), made of siliciclastic sediments ([6] and references therein) (Fig. 1).

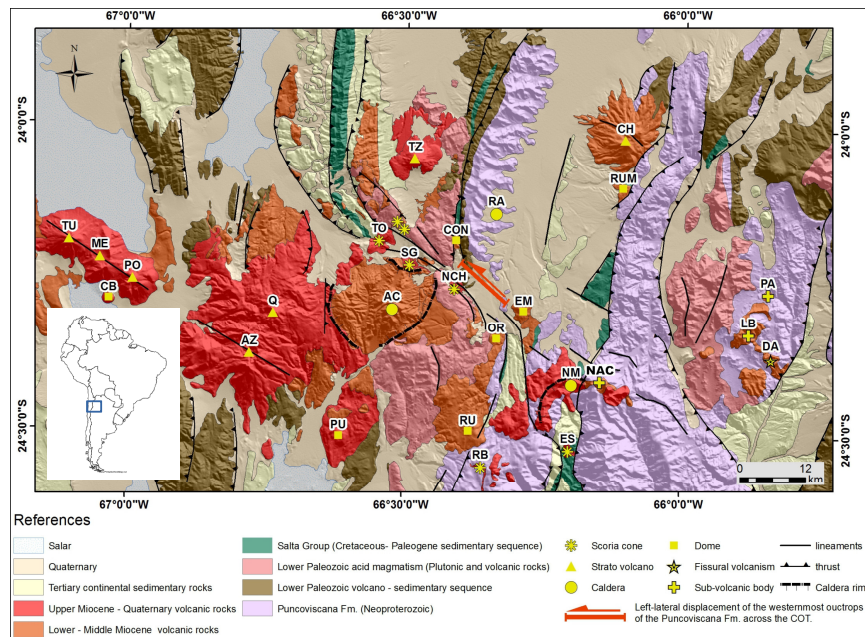


Fig. 1 Regional structural framework of the Tocomar area (from [5]).

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