



3D preliminary geological models of Los Humeros and Acoculco (Mexico) – H2020 GEMex project

Philippe Calcagno (1), Gwladys Evanno (1), Eugenio Trumpy (2), Luis Carlos Gutiérrez-Negrín (3), José Luis Macías Vásquez (4), Gerardo Carrasco (4), Domenico Liotta (5), and the GEMex T3.1 team

(1) BRGM, Orléans, France (p.calcagno@brgm.fr), (2) CNR-IGG, Italy, (3) CeMIEGeo, Mexico, (4) UNAM, Mexico, (5) UNIBA, Italy

GEMex is an H2020 project (2016-2019), gathering 24 European partners in collaboration with a nine partners Mexican consortium. It aims at developing Enhanced Geothermal Systems (EGS) and SuperHot Geothermal Systems (SHGS). Studies are conducted in Los Humeros and Acoculco, located East of Mexico City. Both areas belong to the Trans-Mexican Volcanic Belt, running across central Mexico, favourable for active geothermal fields.

In Los Humeros, geothermal energy is exploited since the 80's by CFE (Comisión Federal de Electricidad) where dozens of wells have been drilled. The goal is to better understand the geothermal field under exploitation and to aim expected super-hot fluids to be exploited. The geothermal target is mainly located in the basamental, pre-calderic rocks.

Acoculco is far less known. Only two exploratory boreholes have been drilled, showing high temperature but a lack of fluid. Here, the expectation is to develop the field using EGS techniques. According to existing studies, the geothermal target is probably located in the basement composed of calcareous, granitic and metamorphic rocks.

The GEMex project intends to integrate the contributions from the various disciplines involved in the geothermal exploration together in cooperative 3D GeoModels (Calcagno, 2015). To initiate the process, preliminary geological models are built using the knowledge available at the beginning of the project. Collaborative European/Mexican teams are established to develop the characteristics of the modelling in a "Knowledge and Data Sharing - Modelling - Validation" cycle. The 3D geological models are constructed using a potential field interpolation method (Lajaunie et al., 1997) combined with geological rules (Calcagno et al., 2008).

Two preliminary models are presented for Los Humeros. A regional model (56 km x 36 km, down to 7 km b.s.l.) describes the faults system geometry and four geological groups: basement, pre-caldera, caldera, and post-caldera rocks. A local model (9.5 km x 12.5 km, down to 7 km b.s.l.), focusing on the exploited field, presents nine units and the associated faults. Both are based on the interpretation from Carrasco-Núñez et al. (2017), Norini et al. (2015), and Hernández (1995). Models are constrained with the data from 16 wells provided by CFE.

A preliminary regional model is developed in Acoculco (56 km x 36 km, down to 7 km b.s.l.). It combines the work from Avellan et al. (2017), a preliminary analysis on the existing faults, and the data provided by CFE in the two existing wells. Five groups of geological formations are modelled: undifferentiated basement, granite, skarns, limestones, and volcanites, along with the regional faults system.

The preliminary geological models serve as geometrical framework for computations within GEMex, such as heat transport and fluid flow simulations. They will also be updated and refined along the course of the project, using new data and interpretations from the forthcoming field works such as geology, geophysics, and geochemistry.

References

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