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Modeling of Los Humeros geothermal field: preliminary results

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The Los Humeros geothermal field is located in the eastern portion of the Mexican Volcanic Belt, approximately 200 km from Mexico City at an elevation of approximately 2800 m. The first deep well was drilled in 1981, and the commercial exploitation of the resource began in 1990. In spite of being actively exploited and studied since then, many unclear features make this geothermal field an interesting study area. This work, which is part of the ongoing EU-Mexico joint collaboration project GEMex, will provide further insight on these characteristics based on analyses of well data and other geophysical and geochemical data.
Absence of correlation between the litho-stratigraphic units and the production zones suggest that the permeability properties of the system are controlled by fractures and related damage zones. The geology of the entire caldera complex is being revisited currently within GEMex using integrated geoscientific methods, but we can already describe it roughly as characterized by a nearly vertical fracture system due to regional faults and the collapse of the caldera, and by sub-horizontal damage zones, which are generally classified as shallow and deep reservoirs. The latter simplification may not hold entirely, but it corresponds to what has been reported in the literature during the past decades.
The faults surrounding these productive areas may provide pathways for meteoric water circulating in the shallow carbonates. This way the rainfall inside the caldera could provide recharge into the geothermal system at depth. .
In general, the well data suggests that the reservoirs are in the liquid phase. However, data from the deepest reservoir also indicate boiling in some areas. These boiling areas might have developed as a consequence of exploitation and may be linked to the presence of intrusions which are in direct contact with the circulating fluids. The contrast between the highest temperatures and the average temperature of the deep reservoir suggest that we are close to the source of the geothermal system. Well logs and a recent MT study clearly indicate granites and syenites having intruded the limestone basement. These intrusions correspond to the hottest zones of the reservoir. The acidic Boron rich fluid component evidenced by many geochemical studies also suggest that, in addition to surficial recharge, a deep fluid input provides both fluid and heat to the system.
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