Geophysical Research Abstracts
Vol. 12, EGU2010-3257-4, 2010
EGU General Assembly 2010

An example of geothermal systems: Hıdırlar Geothermal Field, Biga Peninsula, NW Turkey

Özkan ATEŞ (1), Salih Zeki TUTKUN (1), Alper BABA (2), Heiko WOITH (3), and Süha ÖZDEN (1)

(1) Department of Geological Engineering, Çanakkale Onsekiz Mart University, 17020, Çanakkale, Turkey (ozkanates@comu.edu.tr, atesozkan@yahoo.com), (2) İzmir Institute of Technology, Engineering Faculty, Department of Civil Engineering, Urla/İzmir-Turkey, (3) GeoForschungs Zentrum, Potsdam-Germany

Biga Peninsula located at northwestern Anatolia on southern segment on the dextral North Anatolian Fault and has many important geothermal potential areas. There are known 14 geothermal system namely Tuzla, Kestanbol, Hıdırlar, Kırkgeçit, Kocabaşlar, Bardakçılar, Palamutoba, Akçakeçili, Küçükçetmi, Külcüler, Tepeköy, Çan, Topaklar and Etili. Among them, an important field is the Hıdırlar geothermal field, situated at the southeast of the Biga Peninsula. This field is in a tectonosedimentary basin and controlled by different trending faults. It has a potential usage about 87,7°C surface discharge temperature. Three thermal springs sampled in the Hıdırlar geothermal field. They have named as Spring, Drill and Uyuz. Their surface temperatures are Spring=77,5°C, Drill=57,7°C and Uyuz=53,6°C. According to the result of hydro-geochemical analysis and diagrams, thermal waters are generally Na-SO4 and Na-SO4-HCO3 water types. Assessments of chemical geothermometers applied to the thermal waters, suggest that reservoir temperatures are 90°C-163°C for Spring, 81°C-149°C for Drill and 83°C-161°C for Uyuz. Around Hıdırlar geothermal field, have been determined five different geological units. Lower-Middle Triassic aged Nilüfer Unit of Karakaya Complex is the basement unit. Late Oligocene aged Çakıroba granodiorite and Çan volcanic rocks overlie the basement metamorphic rocks with an unconformity. Neogene aged Örencik Formation, Quaternary aged slope washes and alluvium cover all older units with angular unconformity. Main structural trends have ENE-trending normal faults and they have been cutting by youngest NE-trending normal faults with a dextral strike-slip component. All thermal water springs are arranged on the NE-trending youngest faults. Both fault-slip data and joint measurements, mainly in granodiorites, show an active local extensional tectonic regime on southern segment of North Anatolian Fault. This local tectonic regime determined as the compressional (maximum stress axis, sigma 1) direction (N192±82°E) in center as vertical, NNE-trending extensional (minimum stress axis, sigma 3) direction (N21±23°E) and WNW-trending intermediate stress axis (sigma 2) direction (N114±9°E) in horizontal plane. Joints and faults which develop under these stress directions allow surface cold water's going underground. Depending to geothermic gradien these waters get warmer at the depth of crust and reach to surface again by these normal faults and joint system in Hıdırlar geothermal system. According to these results, this geothermal system can suggest for Hıdırlar geothermal field. Because of basement rocks exposure wide areas and around thermal water springs, metamorphic rocks cannot create a close system. Therefore these rocks don't have reservoir rock property. Granodiorites can be an important reservoir rock, because hot fluid can circulate inside and even get warmer. This geothermal field is fed by only meteoric water. Heater of this system is both geothermic gradient and granidiorites. Cap rock of this system can suggest as Neogene aged Örencik Formation.