

Hydrogeochemical Characterizations of Pamukkale-Karahayit Geothermal Fields (Denizli, Turkey)

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The study area is located in intersection of Buyuk Menderes and Gediz grabens in Western Anatolia. The basement rocks in the study area are Paleozoic Menderes metamorphics which are characterized by alternations of marble, calcschist, quartzite, schist and gneiss. The basement rocks are generally overlain by a thick sequence of Pliocene and Quaternary rocks. The Pliocene rocks include conglomerate, sandstone, clay stone and clayey limestone. Quaternary is represented by travertine deposits. The reservoir rocks of the geothermal systems are Paleozoic karstic marble and Mesozoic limestone. Paleozoic schist and quartzite are secondary reservoir in the study area. The impermeable clayey sediments of Pliocene form the cap rocks in the region. The geothermal fluid ascends to surface through the major faults. Average outlet temperatures in the study area vary between 50 and 56°C. Na-HCO₃ type is the dominant water type in the geothermal field. Cold waters are mainly dominated by the HCO₃ and SO₄ anions and Na, Ca, and Mg cations. All the waters are of meteoric origin and have a circulation least 50 years old according to the ¹⁸O, ²H and ³H contents. Scaling risk in production wells and surface equipments in the study area are the most important problem. Mineral saturations at measured sampling temperature of thermal waters generally indicate calcite, aragonite, dolomite and amorphous silica scaling. Carbonate minerals are under the risk of scaling at all temperatures above 50°C. Re-injection temperature must be above 80°C in order to prevent silica scaling.