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Water Quality in Buyuk Menderes Graben, Turkey

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Abstract : Buyuk Menderes Graben is located in the Western Anatolia (Turkey). The graben has become the largest industrial and agricultural area with a total population exceeding 3.000.000. There are two big cities within the study areas from west to east as Aydın and Denizli. The study area is very rich with regard to cold ground waters and thermal waters. Electrical production using geothermal potential has become very popular in the last decades in this area. Buyuk Menderes Graben is a tectonically active extensional region and is undergoing a north–south extensional tectonic regime which commenced at the latest during Early Middle Miocene period. The basement of the study area consists of Menderes massif rocks that are made up of high-to low-grade metamorphics and they are aquifer for both cold ground waters and thermal waters depending on the location. Neogene terrestrial sediments, which are mainly composed by alluvium fan deposits unconformably cover the basement rocks in different facies have very low permeability and locally may act as cap rocks for the geothermal systems. The youngest unit is Quaternary alluvium which is the shallow regional aquifer consists of Holocene alluvial deposits in the study area. All the waters are of meteoric origin and reflect shallow or deep circulation according to the 8O, 2H and 3H contents. Meteoric waters move to deep zones by fractured system and rise to the surface along the faults. Water samples (drilling well, spring and surface waters) and local seawater were collected between 2010 and 2012 years. Geochemical modeling was calculated distribution of the aqueous species and exchange processes by using PHREEQCi speciation code. Geochemical analyses show that cold ground water types are evolving from Ca–Mg–HCO3 to Na–Cl–SO4 and geothermal aquifer waters reflect the water types of Na-Cl-HCO3 in Aydın. Water types of Denizli are Ca-Mg-HCO3 and Ca-Mg-HCO3-SO4. Thermal water types reflect generally Na-HCO3-SO4. The B versus Cl rates increase from east to west with the proportion of seawater introduced into the fresh water aquifers and geothermal reservoirs. Concentrations of some elements (As, B, Fe and Ni) are higher than the tolerance limit of the drinking water standard of Turkey (TS 266) and international drinking water standards (WHO, FAO etc).

Keywords : Buyuk Menderes, isotope chemistry, geochemical modelling, water quality
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