(16°C) and the warm season water temperature does not exceed c. 25°C. At 12.5-12.0 Ma. The seasonality pattern is breaking down and is replaced by successions of dry years with irregular precipitation events. The amplitude of seasonal temperature range is decreasing to 5-8°C. No clear cooling trend can be postulated for that time as the winter season water temperatures range from in Central Europe instead of a simple temperature decline scenario.

Hydrochemistry and isotope composition of spring waters in Aydincik, Mersin (Turkey)

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The increasing population, agricultural areas and summer houses increase water demands in Aydincik area and Soğuksu Spring is the major source for providing drinking, domestic and irrigation water needs in Aydıncık and its vicinity. However a detailed hydrogeological investigation has not been done up to the present. In order to establish a sustainable water management plan it is required to characterize hydrogeologic structure and to determine of the conceptual hydrogeologic model. For this purpose hydrochemistry, stable isotopes (^{18}O, ^{2}H), and tritium isotope (^{3}H) were used for assessing groundwater recharge sources, flow paths, and residence times of Soguksu Spring and other small springs in Aydincik area. The study area is situated between 33˚25'N and 33˚37'N latitudes and 36˚12'E and 36˚26'E longitudes in Aydıncık district of the Mersin Province and it covers approximately 120 km^2. This area comprises a rough hillside area that is bounded by the Mediterranean Sea to the south and the Taurus Mountains to the north. Rough structure is formed depending on both tectonic features and rock type. The topographic elevation changes from 0 m to 1000 m. This area has a complicated tectonic structure and geological units deposited during the Infra-Cambrian (Precambrian) to recent. These units includes calcshist, cloritshist, limestone and metaconglomerate, quarzite, dolomitic limestone, shale basal conglomerate and sandstone. Average discharge of Soguksu Spring is 1.8 m^3/s between 1999 and 2009. Its max discharge is reached 13.5 m^3/s in 2007 and minimum discharge is 0.1 m^3/s in 2006. Other small springs also supply water needs in rural areas. The occurrence of groundwater is mainly associated with fracture and joint systems in this area. Due to major joints associated with the Alpin Orogeny, the formations of the area have been fractured, making these formations good aquifers as a result of secondary permeability. Hydrochemical evaluations on this study are based on field and laboratory data collected from 11 springs from May 2009 to March 2010 in four periods. According to in-situ measurements spring waters temperature, pH and specific electrical conductivity are found to range between 12.7-19.8º C, 6.16-7.27 and 331-829 mS/cm, respectively. These field parameters of the samples show a narrow change interval in four periods. Low temperature and specific electrical conductivity reveal that groundwater water–rock interactions at limited level. The groundwater compositions fall into two groups based on the major cation and anion. These are: Ca-HCO_3, which is prevalent in most of the spring waters, and Ca-Mg-HCO_3. The formation of these groups is basically a consequence of the dissolution of carbonate and dolomite minerals. Oxygen-18, deuterium and tritium analyses are performed for May 2009 samples. The stable isotope compositions for this period range between –5.73 and –7.02 ‰ V-SMOW for oxygen-18 and between –27.92 and –34.90 ‰ V-SMOW for deuterium. The stable isotopes show the predominance of low elevation precipitation. Tritium concentrations between 2.87 and 4.25 TU suggest recent recharge. Local recharge indicates potential groundwater susceptibility to surface contamination. However, only one sample has greater nitrate concentration than EPA Drinking Water Limits and maximum level of nitrate is 16 mg/l.