

## HYDROGEOCHEMICAL CHARACTERISTICS OF THE AYGIR GEDIĐI SPRING, BOZKIR/KONYA, SOUTHERN TURKEY

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### ABSTRACT

The Aygır Gediđi spring is located in the southern Turkey, 144 km to Konya province. In the study area, the units are of belonging to Hadim Napi and Sinatdagi Nap (Ekinlik Formation). At the top, there is Quaternary alluvium. The water source is discharged from the Lower-Middle Triassic Ekinlik Formation, which are highly fractured, cracked and karstic dolomitic limestone and sandstone and shale alternations. The spring is a typical karstic one, which is characterized by a temperature of 13 °C, a flow rate of 2,2 m<sup>3</sup>/sec, a pH of 7.74-7.90 and an electrical conductivity of 155-467 µmho/cm. Feeding and discharge periods of the source range from January to April, and April to October, respectively. The flow rates are between 2-5 m<sup>3</sup>/sec and 0,063-0,095 m<sup>3</sup>/sec during the feeding period and discharge period, respectively. The dominant ions in the spring water are calcium, magnesium and bicarbonate, and can be classified as calcium, magnesium, sodium, chlorinated water based on the AIH classification (Association of International Hydrogeology). According to the Schoeller diagram, water in the study area is of the same origin and the order of ions is rMg> rCa> rNa> K, rHCO<sub>3</sub>> rCl> rSO<sub>4</sub>.

**Keywords:** Aygır Gediđi, spring, karst, flow rate, ion

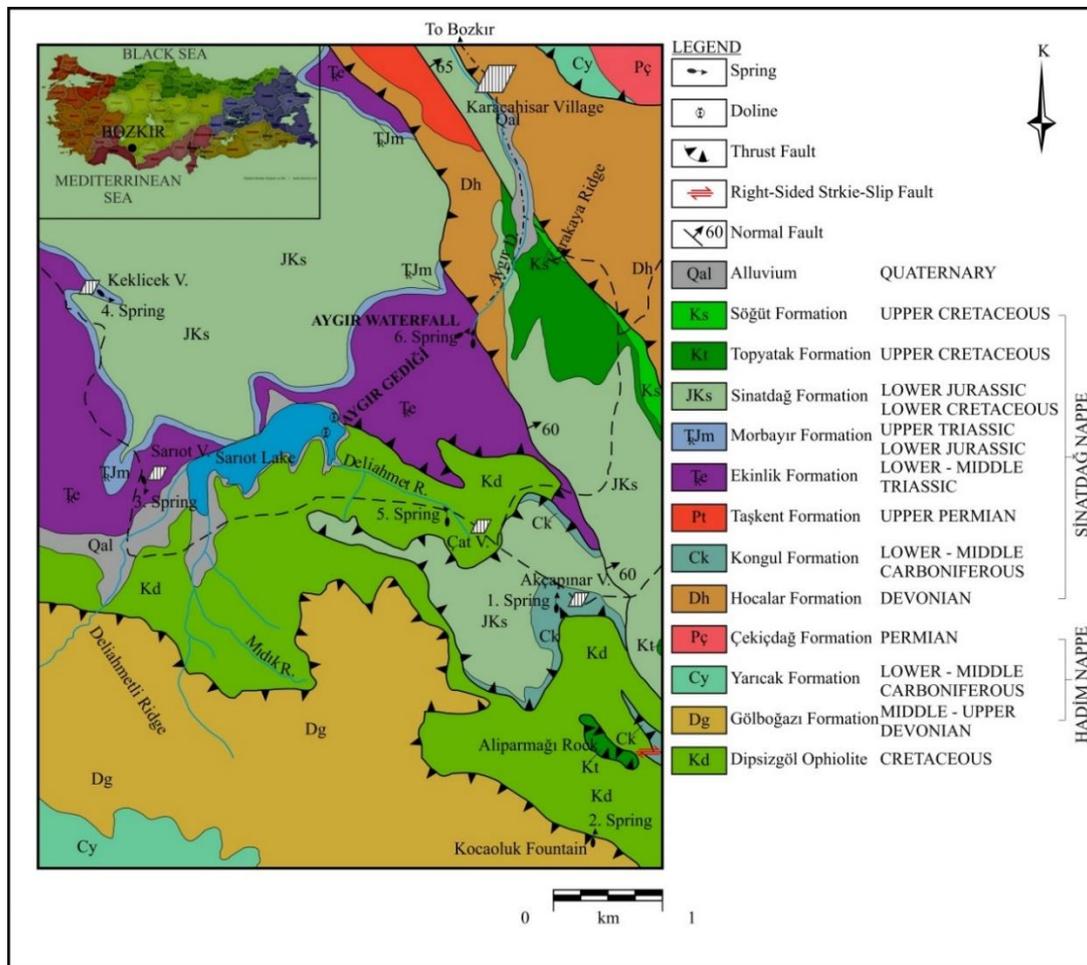
### INTRODUCTION

The study area is located in the southern Turkey, ~ 164 km to Konya. The Aygır Gediđi spring has been used for drinking and utility water, and picnic area by the local people, as well as domestic tourism for trekking. Though several studies have been performed on general geology and mineralogy of the region [1, 2, 3, 4, 5, 6]. No studies have been performed on hydrogeological characteristics of the region. The region is located in the transition zone between the continental and Mediterranean climates. The average monthly rainfall in 2018 was 42.9 mm, and the average monthly temperature was 12.9 °C.

Units of Hadim Nappe and the Sinatdađı Nap crop out in the study area, all of which is covered unconformably by Quaternary alluvium. The aquifer rock is represented by Carboniferous fractured and cracked limestones. The spring in the region is characterised by existence of multiple outlets. As expected, the discharge from the source gradually increases during the feeding period, and decreases during the discharge period. The discharge makes two of the spring outlets dry out in the summer months. The surrounding area is used as promenade area by the local people.

## GEOLOGY & HYDROGEOCHEMISTRY

The Hadim Nappe and the Sinatdağı Nappe are crop out in the region, where the Quaternary alluvium is found at the top (Figure 1). The Late Cretaceous ophiolites and detritics of Dipsizgöl Ophiolitic mélangé are the oldest units in the area. The sequence continues with the obduction of Golbogazı formation with dolomitic limestone and sandstone alternations, limestones of Yarıcak formation, and Çekiçdağ formation, all of which are belong to the Hadim Napp. The Sinatdağı Napp overlies all units, contains Hocalar formation, with dolomitic limestone, quartzite and slates [4]. The sequence continues concordantly with Early-Middle Carboniferous Kongul Formation including limestones and shales, and Late Permian Taşkent Formation with limestones, all of which are overlain unconformably by Middle Triassic neritic limestones of Ekinlik Formation, and Late Triassic-Early Jurassic Morbayır Formation with red-colored sandstone and conglomerates. The Cretaceous Sinatdağı Formation overlies concordantly the Morbayır formation, and is overlain unconformably by Topyatak and Söğüt formations. Slope debris and alluviums, the youngest in the area, covers all units unconformably [4].



**Figure 6.** Location map and geological map of the study area [4].

The Aygır Gediği spring, a karstic source, has a temperature of 13 °C, a flow rate of 2,2 m<sup>3</sup>/sec, pH of 7,74-7,9 and an electrical conductivity of 155-467 µmho / cm. The feeding period of the spring ranges from January to April while discharge period is between April and October [7].

During the feeding period, the flow rate is between 2-5 m<sup>3</sup>/sec and the discharge period is between 0.063-0.095 m<sup>3</sup>/sec. Aygır Gediği spring is fed by precipitation, and hence low precipitation causes flow rate to decrease. In the spring water, the dominant ion is calcium, magnesium and bicarbonate. Calcium and bicarbonate ions are likely to be originated from limestones, magnesium dolomitic limestones while potassium and sulphate ions are from quartzite and shales, respectively [7].

The water source is calcium, magnesium, sodium, chlorinated water according to the AIH classification [8]. According to the Schoeller diagram, water in the study area is of the same origin and the order of ions are rMg> rCa> rNa> K, rHCO<sub>3</sub>> rCl> rSO<sub>4</sub> [9]. According to the Piper diagram, waters are in the 5th zone (carbonate hardness> non-carbonate hardness). Water is classified as CaCO<sub>3</sub> and MgCO<sub>3</sub> with a carbonate hardness of more than 50% [10]. According to the Wilcox diagram, it is in the class of good usable waters.

## DISCUSSION&CONCLUSIONS

Aygır Gediği source has a karst feature, and hosted by highly fractured, cracked and karstic limestones. The limestone was undergone karstification process, which increase and/or intensify the secondary porosity and permeability, hence signifying its aquifer characteristic. The source is fed by rain water, therefore its flow rate decreases due to the decrease in precipitation. The dominant ion in the source water is Mg, Ca and HCO<sub>3</sub>. According to the Piper diagram, the water can be classified as CaCO<sub>3</sub> and MgCO<sub>3</sub>, with a carbonate hardness of more than 50%. In the vicinity of the resources, protection areas should be identified and necessary precautions should be taken for all kind of pollution.

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