HYDROGEOCHEMICAL AND ISOTOPE GEOCHEMICAL FEATURES AND COMPARISON OF THE GROUNDWATERS OF THE EGIRDIR AND BURDUR LAKES AREA: AN UPDATE OF PRELIMINARY STUDIES

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1 INTRODUCTION

The groundwaters in the area between Egirdir and Burdur lakes in the study area (Fig. 1) represent an important potential of the drinking water for inhabitans in the lake district of SW Turkey. In order to protect the present groundwater potential and to control the drinking water quality we investigate (i) tectonic evolution of the both lakes of Burdur and Egirdir, (ii) inflow and outflow of both lakes and flow direction of groundwaters, (iii) hydrogeochemistry of these two lakes and groundwaters, (iv) the origin and age relationships of groundwaters and lake waters by stable isotopes and ^3H contents and (v) the ways of optimum use of these water potential.

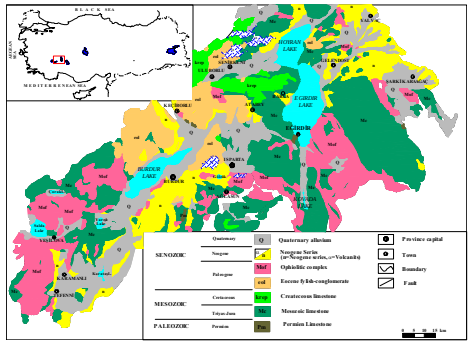

Fig. 1: Geological map between Burdur and Eğirdir Lakes and environs.

The area was studied in two summer campaigns of hydrogeological mapping, which includes in-situ measurements. In addition, 42 samples of groundwaters, thermal waters and lake waters were taken for analysis (Fig. 2 to 7).

Fig. 2: A view of Burdur Lake from the SE point.

Fig. 3: A view of Eğirdir Lake from the NW point. .

Fig. 4: Collection of water samples at Kayaağzı spring in NW part of the Eğirdir Lake.

Fig. 5: In-situ measurements of various parameters in the field.

Fig. 6: Angels of our team in the field of opium poppy at the sprıng season.

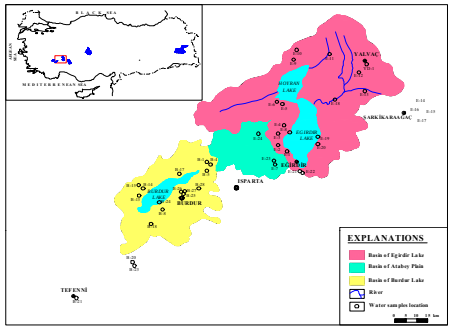

Fig. 7: Map of water samples between Burdur and Eğirdir Lakes and environs.

2 GEOLOGIC SETTING

The study area between Burdur and Egirdir lakes is located within the Isparta Angle, which has been developed in a rift tectonic regime related to the Burdur transform fault (Koçyiğit, 1981, 1983; Yağmurlu et al., 1997; Fig. 1). In the area, the autochthonous member of the Menteşe dolomites, the Alakilise, Davraz, Söbüdağ and Senirce limestones, the Kızılkırma and Kayıköy formations, the Gönen and Atabey conglomerates and the Gölcük volvcanics and the allochthonous member of the Isparta ophiolite-melange and the Ispartaçay formation were mapped in scale of 1:500.000 (Altınkale, 2001).

3 HYDROGEOLOGY

The Burdur and Eğirdir lakes, contained within the Isparta Angle, were developed within the rift tectonic features through accumulation of rainwater, since Burdur area forms a close watershed and Eğirdir area has only one outlet (Fig. 8). These lakes are also fed by groundwater.

In Eğirdir lake area, the rocks of Isparta ophiolite-melange, Neogene sediments and Tertiary (?) limestones form the impermeable lake basement, whereas the basement in the Burdur lake area consists of Neogene sediments and Tertiary (?) limestones (Fig. 1). In study area, the alluvial deposits, conglomerates and limestones can be considered as aquifers.

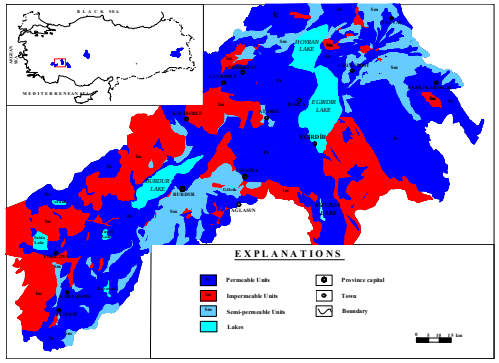

Fig. 8: Hydrogeological map of the area between Burdur and Eğirdir Lakes.

4 HYDROGEOCHEMISTRY

The groundwaters in the study area have a drinking quality and, hydrogeochemically, they can be considered as Ca-HCO_3 type exchange water (Fig. 9). The water of Eğirdir lake has a good quality as drinking water, since it contains very low ion concentrations of up to 630 mg/l. This water can be considered as Mg-Ca-HCO_3 type exchange water. In contrast, the water in Burdur lake are not suitable for drinking, since its dissolved ion concentrations are very high due to high evaporation rate. This water can be considered as Na-Mg-(Cl)-(SO_4)-HCO_3 type exchange water.

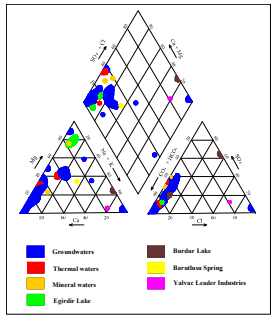

Fig. 9: Groundwaters, mineral waters, thermal waters and surface waters of the study area on a PIPER diagram.

5 ISOTOPE GEOCHEMISTRY

The ratio of δD and $\delta^{18}O$ usually follows the continental meteoric water line in the study area. However, the lake waters of Eğirdir and Burdur deviate from that meteoric water line (Fig. 10; Özgür, 2001). In the Burdur lake, the shift is in the right side of SMOW which indicates very low inflow, very high and speed evaporation rate. This interpretation was corroborated by ^3H data. In contrast, the Eğirdir lake waters indicate high inflow rate and high outflow. Therefore, the evaporation rate of the Eğirdir lake is lower than the Burdur lake and higher than the groundwaters in the area. The ^3H values of groundwaters range from 1.0 (TU) in Senir to 18.0 (TU) in Kumdanlı near Yalvaç. This means the groundwater may be considered as relatively young. The water of Burdur and Eğirdir lakes have value of 16,4 (TU) and values ranging from 6,7 to 7,2 (TU) which correspond to the groundwaters in the study area.

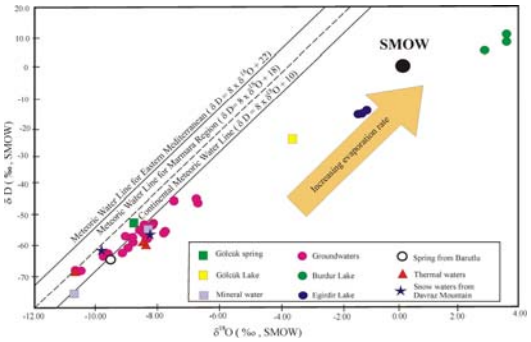

Fig. 10: Plot of δD versus $\delta^{18}O$ of groundwaters, mineral waters, thermal waters, rainwater and lake waters of the study area.

6 CONCLUSIONS

The lakes of Eğirdir and Burdur are connected to the Burdur transform fault and were developed within a rift tectonic regime of the Isparta Angle (Koçyiğit, 1981, 1983; Yağmurlu et al., 1997) in which the groundwaters form the lakes within their closed or semi-closed drainage area.

The groundwater in the area can be considered as Ca-HCO_3 type. In comparison, the water of Eğirdir lake as Mg-Ca-HCO_3 type and water of Burdur lake as Na-Mg-(Cl)-(SO4)-HCO_3 type. The groundwater and Eğirdir lake waters are in a drinkable quality, they contain low ion concentrations. In contrast, the water of Burdur lake contains very high dissolved ion concentrations, hence undrinkable..

The ratio of δD and $\delta^{18}O$ indicates that the groundwater quality follows the meteoric water line, whereas the both lake waters of Burdur and Eğirdir deviate from the meteoric water line. The deviation of $\delta^{18}O$ can be attributed to high evaporation rate. The deviation of δD might be linked to mixing of different waters. In Burdur lake, the shift is in the right side of SMOW which indicates very low inflow, very high and speed evaporation rate. This conclusion was corroborated by ^3H data. The ^3H data of up to 18.0 (TU) indicate that there are very young groundwaters in the both lakes and their environs.

In the area of Atabey plain, impermeable ultrabasic rocks are located in a large area which depict a barrier between the both lakes of Burdur and Eğirdir (Irlayıcı, 1998). High concentrations of Na^+, Cl^- and SO_4^{2-} in the lake waters of Burdur seem to be related with the Gölcük volcanism and the sediments containing gypsum intercalations. Therefore, the both lakes differ from each other strongly with recpect to hydrogeochemical and isotope geochemical aspects.

7 ACKNOWLEDGEMENTS

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