Tectonolectric potential and electromagnetic anomalies originated by active faults; the Geyve Fault Zone
Ilyas Caglar and Hidir Aygul
Istanbul Technical University, Faculty of Mines, Istanbul-Turkey. Email:caglar@itu.edu.tr

Abstract
In order to investigate the tectonically active faults the measurements of tectonolectric potentials (self potential) were carried out to the area between Mideke and Sarigazi along the southern branch of the North Anatolian Fault Zone (NAFZ). Two faults dipped with angles ~45 degree and ~60 degree were located along two profiles over the area where the geophysical anomalies with high amplitudes (~ 100-400 nT) originated by tectonic activity. The results of the Alternative Field Magnetometer (AFMAG) measurements taken at the line-A area that is located in Bolu region, reflect a steep zone due to faulting on NAFZ.

Introduction
The North Anatolian Fault Zone (NAFZ) is one of the World’s most important active strike-slip faults. The NAFZ is a narrow seismically active fault and transforms into two major strands, northern and southern strands towards the west at around the source region of the 1976 Magnitude 7.2 Mudurnu earthquake in Central Anatolia, Turkey. The southern strand runs westward through Ankara, Konya and Aksaray (Fig. 1). Its southern strand runs westward through Geyve basin, lake İznilk, and is named to be the Geyve Fault Zone (GFZ).

Theoretical aspects
In a predicted collisional area tectonically active the fractured zones usually developed along fault planes and underground water easily flows in these highly permeated zones. The underground fluid movement produce measurable self-potential currents (tectonolectric currents) with electrokinetic origin and induced magnetic fields (Mizutani et al., 1976; Murakami et al., 1984, 1985). The conductive zones in the subsurface correspondences to a fault plane along or near surface. The tectonolectric phenomena were investigated using the measurements of Magnetic and Electric Fields. The results of self potential, magnetic, and alternative field magnetometer (AFMAG) measurements carried out for detecting the positions of the possible tectonically active faults are represented.

The tectonolectric potential anomalies are interpreted using the modelling technique based on theoretical concept of electric potential caused by an inclined electrokinetic source where the underground water flows due to tectonic activity.

Fig.1 Geophysical signatures of the faults along line-A is; (a) Geoelectrical structure model, (b) electric potential data and modeling result, (c) Geoelectrical structure model, (d) Geoelectrical structure model.

Fig.2 (a) Topography and the regional location of Geyve and Yozgut area. (b) Geological map of the southern part of the Geyve Basin, showing the different faults; 1=Menderes Thrust, 2=Sanliurfa Thrust, 3=Groundwater, 4=Fault, 7= Af-Denizli fault, 10=Geyve Fault, 11=Uludağ Fault, 12=Karamurat Fault, 13=Çanakkale Fault, 14=Izmit Fault. (c) Line-A traverse and (d) Line-B traverse.

Geyve Fault Zone
The Geyve basin is in an approximately west-east direction and is occupied by the meander plain of the Sakarya River (Fig. 2a). The Geyve area (Fig. 2b) is section of GFZ comprises a number of short to long fault segments. Easily recognizable faults within this area are the Karamurat, Askale, Kocakaya, Karamurat, Unova and Sarigazi faults (Fig. 2b). The locations of the surveyed lines are shown in Fig. 2a.

Data, interpretation methodology and results
The water level configuration contained a digital ultrasonic and the electrodes of EM (El-Koleti and Chengel model). Self-potential anomalies were obtained relatively to a reference point that was selected at the outside of both areas (Figs 3-5).

Acknowledgments
This paper represents the results of the project supported by Istanbul Teknik University A rahfafoz grant ITU-727.

References