Geophysical Research Abstracts
Vol. 14, EGU2012-4742, 2012
EGU General Assembly 2012

Research of Stability Problems on Ankara-Konya High Speed Railway Line (Turkey) using Ground Penetrating Radar and Petrographical Methods

S. Kadioglu (1,3) and Y. K. Kadioglu (2,3)

(1) Ankara University, Faculty of Engineering, Geophysical Engineering Department, Ankara, Turkey (kadioglu@ankara.edu.tr), (2) Ankara University, Faculty of Engineering, Geological Engineering Department, Ankara, Turkey (kadi@ankara.edu.tr), (3) Ankara University, Earth Sciences Application and Research Center (YEBIM), Ankara, Turkey

The aim of the study is to research the stability problems according to rock properties and their discontinuities such as fractures, faults and karstic cavities on the new high-speed railway line between the capital city Ankara and the largest city Konya in Turkey. The Ankara-Konya high speed railway including a tunnel managed from The Turkish State Railways (TCDD). Geological surveys, polarizing microscope and confocal Raman spectrometry studies were used to determine rock properties. Ground penetrating radar (GPR) method was used to determine faults, fractures and karstic cavities.

The railway line has been mainly constructed on inner Tauride Ocean suture of the Central Anatolia. The basement unit of the railway line mainly has been composed of ophiolitic complex of the inner Tauride Ocean. The main lithology of this ophiolitic complex has been formed by radiolarite, pelagic sediments, dolarite, gabbro, serpentinized peridotite and limestone blocks. The Jurassic alloctonous limestone which has been thrust on the ophiolitic complex. Neogene cover young units with minor amount of Alluvium deposits have been formed by the upper litholgy in the region. The serpentinite and altered radiolarite formation are formed by lubricous ground for the railway line in the region.

A RAMAC CUII GPR system was used with a bi-static 100 MHz center band shielded antenna to acquire profile data. Totaly 35 km was surveyed on different parts of the railway line by considering the results of the geologic research and petrograpical studies. When we started to study, rail construction of some parts of the line had already been completed. Therefore, during studies, we gathered the data on the backfilled way on the three parallel profiles spaced 1m apart or on the service way next to the railway line. There was a tunnel on the line. We also gathered two parallel profiles data on the tunnel and four profiles data next to the tunnel to evaluate the stability according to the discontinuities.

The petrographical studies and GPR results indicated that the areas with Jurassic alloctonous limestones thrusted on the ophiolitic rocks had deep and large fractures and cavities. The resulted radargrams indicated the thrust fault locations under the rail line. This limestone did not have a root and did not have big thickness. Therefore, the limestone could be move on the ophiolitic serpentinite unit. There were approximately horizontal and thin fracture segments under some parts of the tunnel nearly 8m in depth. There was an important collapsed zone filled up before. At the same time, there were thin and short fractures in the Jurassic limestone under the tunnel which was seen clearly on the radargrams. However, it was appeared that the hazard could not me removed completely because of the horizontal fracture. The areas with lacustrine limestones included disordered small fractures. Finally some areas had terra rossa because of the results of a large karstification. These areas could cause soil liquefaction during rainy season. The stability of these areas has to be controlled with ordered small periods.