8-4 BTH 21 Cicek, Ceren

IMPLEMENTATION OF A ROCKFALL HAZARD RATING SYSTEM TO THE CUT SLOPES ALONG KIZILCAHAMAM-GEREDE SEGMENT OF D750 HIGHWAY

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A rock fall hazard rating system (RHRS) was implemented to the cut slopes along Kizilcahamam-Gerede segment of D750 (Ankara-Istanbul) Highway. The RHRS developed by the Tennessee Department of Transportation was assessed for thirty five cut slopes which were selected based on a reconnaissance survey along D750 highway, between Kurtbogazi Dam (50 km northwest of Ankara) and Aktas village (15 km to Gerede town of Bolu province).

The stages of the investigation consist of project conception, field investigations and application of this system, assessment and presentation of data. The cut slopes were classified by implementing the method which requires a scoring on an exponential scale assigned to various parameters related to the site and roadway geometry and geologic characteristics. The rating process was completed at two stages: Preliminary and Detailed Rating. Based on the Tennessee RHRS, nineteen cutslopes were assessed according to these two stages while the other sixteen cut slopes were able to be classified only with the preliminary rating stage. Different modes of slope failure (planar, wedge, toppling, rock fall with differential weathering, raveling) throughout the selected segments of the highway were investigated and the slope and highway related parameters such as slope height, ditch effectiveness, average vehicle risk, road width, percent desicion site distance and rockfall history were identified for these nineteen cut slopes. After the scoring process was completed all cut slopes were classified based on their hazard ratings from the point of the problems that they may cause in transportation.

Among these thirty five cut slopes, nineteen of them are rated as “A” slopes which are considered to be potentially hazardous, while a total of seven are rated as “C” slopes which pose no danger. In placing a slope into a “B” category, it is considered that they are not as prone as A slopes to create a danger and a total of nine B slopes are detected. The detailed rating is accomplished for these nineteen “A” slopes and as a result of the scorings, it has been seen that the final RHRS scores range from 164 to 591. The slopes with scores over 300 (both additive and multiplicative) can be counted as more hazardous slopes since they get very high scores both from site and roadway geometry and geologic hazard part.

8-5 BTH 22 Parlak, Oktay

THE RELATIONSHIP BETWEEN ELDIVAN-ELMADAG PINCHED CRUSTAL WEDGE AND NORTH ANATOLIAN FAULT ZONE: AN APPROACH TO THE AGE OF CENTRAL NORTH ANATOLIAN FAULT ZONE

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Recently determined, NNE-SSW trending Eldivan-Elmadag Pinched Crustal Wedge (EPCW) has thrusted eastern and normal faulted western margins. This neotectonic structure is created due to NW-SE compression created between North Anatolian Fault Zone (NAFZ) and Kirikkale-Erbaa Fault Zone (KEFZ). In the north of Cankiri, the EPCW has arc shape geometry and its trend changing to NE-SW and further to east it becomes ENE-WSW that is nearly parallel to NAFZ. In the north of Cankiri, the Korgun fault constituting western margin of EPCW is clearly a normal fault evidenced by undulated fault surfaces. The eastern margin of EPCW has complex thrust faults. The both margins control deposition of Pliocene-Pleistocene clastic Deyim Formation. The arc shaped connection of EPCW to the NAFZ, the strain analysis of GPS data and focal mechanism solutions of micro-earthquakes demonstrate a genetic link between EPCW and NAFZ. Ilgaz and Tosya basins located in the NAFZ contain upper Miocene – Pliocene basin fill in which syn-sedimentary normal faults are observed. The strikes of these normal faults are incompatible with right lateral NAFZ. Therefore, it can be speculated that development of these basins was not related to NAFZ and its initiation must be post Pliocene which is also in agreement with the activation age of EPCW.

8-6 BTH 23 Rashidi, Mohadese

STRUCTURAL INVESTIGATION OF NAYBAND FAULT(MIDDLE PART) BY USING SATELLITE IMAGE PROCESSING

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The studied area is located in East of Central Iran Micro continent (CEIM) and East of Dasht-e Lut, were the Nayband fault located as an old index of tectonic structure. The Nayband fault, with a length of 104 km, known as a right lateral slipping fault, and in some parts with a normal dip slip component.Using satellite image processing methods, we can study some structures such as Releasing bends that caused basaltic eruption and some Quaternary volcanic activities and even some outcrops of salt domes along the Nayband fault system. And also the displacement of the channel & its measurement is detected, that shows the new tectonic activity along the Nayband fault system on this area .

8-7 BTH 24 Toori, Moosarreza

NEOTECTONICS OF ZANJAN (CENTRAL IRAN): A LEFT LATERAL STRIKE-SLIP SYSTEM AND RELATED STEPOVER STRUCTURES

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Escape tectonics developed in the collision zones and strike-slip faults are the main tectonic elements. Arabia- Eurasia continental convergence is continuing in Iran according to seismic and GPS data. This N-S convergence cause right lateral (Tebriz, Zagros) and left lateral (Dashte Beyaz, Elburz) strike-slip systems. Zanjan (Zengan) is located between Tehran and Tebriz and its neotectonic structures are not well determined. In this area, Sultaniye, Geydar and Tarim mountains are located as NW-SE trending highlands parallel to the Zagros and Elburz mountains where the pre-Neogene rocks come to contact with Quaternary deposits occupying the lowlands. Our morpho-tectonic studies indicate that active E-W trending left lateral strike-slip faults control the morphology of the Zanjan area. They are evaluated as western continuation of main left lateral Mosha-Shahrud fault that is the main structure of Elburz mountain. The left and right stepping of the left lateral strike-slip faults creates pull-apart basins and push-ups. Kazvin basin is an example of pull-apart basin and Sultaniye is located on the push-up region where the rivers flow opposite directions towards NW and SE. In the restraining bends single or double vergent thrust faults trending NW-SE is developed and deformed Quaternary sediments. This explains NW-SE trending highlands in the region. Geological record of this uplift is lying in the Upper Miocene-Quaternary alluvial and fluvial sedimentary deposits around Sultaniye. Lower part of coarse clastic sedimentary succession is composed of fragments of Eocene units whereas that of upper part contains metamorphic rock fragments that its original outcrops are located in the core of Sultaniye mountain. The uplift of the NW-SE trending highlands and related strike slip system is operational since Late Miocene. Maximum displacement of the geological units in the area is 25 km. If GPS data of 4mm/year is considered, it is clear that most of the deformation must be absorbed in the sidestep and restraining bends.

8-8 BTH 25 Gürbüz, Alper

PULL-APART BASIN FEATURES IN 2D AND 3D

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Pull-apart basins are depressions associated with geometrical irregularities of strike-slip faults. However, many uncertainties complicate the interpretations of their geometrical aspects. This study presents a review of current literature and a new data set from the pull-apart basins along the North Anatolian fault zone about the angular and scale characteristics of these basins to understand their geometries in 2-D and 3-D. Angular data in literature that attained from the natural cases, experimental and numerical studies represent a mean acute angle of 33° between the master faults and diagonal faults. Pull-apart basins along the North Anatolian fault zone also present the similar acute angles. As represented by experimental studies, this value is a result of overstep geometry. Some declinations may be observable in pull-apart basins located at zones controlled by composite regimes. Scale characteristics of pull-apart basins from all over the world indicate a good 2-D relationship between basin length and width as firstly suggested by Aydin and Nur (1982). A similar relationship between length and depth data has also been proposed by Hempton and Dunne (1983). In this study a comparison among the length, width, and depth parameters of pull-apart basins in 3-D from the well-known active and ancient pull-apart basins suggests that there may be an empirical relationship. This relationship would be most cheap and useful method to predict sediment thickness of pull-apart basins which are one of the important reservoirs for economic resources. Independent from the type of potential resource (oil, gas, ore deposits, or groundwater), sedimentary thickness is the most important parameter in understanding the attainability of the resource. The application of the proposed relationship to the pull-apart basins along the North Anatolian fault zone and some other basins around the world predicts new sediment thicknesses. By the addition of more sediment thickness data by drilling and geophysical methods to current literature, the accuracy of the regression and predicted values will increase.

SESSION NO. 9, 08:30

Monday, 4 October 2010

Subduction, collision and orogeny. Posters Part 1 (*Yitim zonu jeodinamigi, çarpisma tektonigi ve orojenez*)

METU Convention and Cultural Centre, Exhibition Hall

9-1 BTH 26 Dokukina, Ksenia

ARCHAEAN AGE AND PETROLOGY OF GRANITOIDS FROM GRIDINO AREA (BELOMORIAN ECLOGITE PROVINCE) AS LIMIT IN THE TIME OF HIGH-PRESSURE PROCESSES

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Last years eclogites were found in the Belomorian mobile belt (location – Gridino and Salma). It is considered that in the Gridino eclogite-bearing zone (Northern Karelia) the eclogites have got two ages of formation: Archaean and Paleoproterozoic (Volodichev et al., 2004). Lenses of Archaean eclogite (2720.7±8 Ma) are in the felsic gneissic matrix as strongly deformed pods or layers and it is considered that they were formed in the enviroment of “warm” subduction of oceanic crust. Other type of “local” eclogite displayed in undeformed and deformed mafic dikes. Geochronology studies of mafic high-pressure metamorphic dykes gave Archaean dates coupled with Paleoproterozoic (2.35-2.42 Ga). Geochemical and petrological investigations of the both types of eclogites displayed a likeness in the chemical composition and the united step-by-step metamorphic P-T trend for all mafic rocks (from eclogite to amphibolite through HP-granulite). We dated Zircons (SHRIMP II) from granitoids which cross-cut the mafic postulate Paleoproterozoic dykes. New geochronology data permitted to determine the Archaean age of high-pressure metamorphic event.

The first sample was collected from a Phen-Fsp-Qtz leucosome developed at the continuation of the granulite gabbro dike, which was subjected here to deformation, amphibolization and migmatization. Petrological studies of the leucosome showed high-pressure magmatic relicts: Ba-bearing phengites (3.17 cations Si per 11 atoms O), K-Ba feldspar, mirmekite and near solidus symplectic intergrowths of Czo, Phe and Qtz. The conditions of leucosome crystallization are 16-20 kbar for 650 °C. Evidences of change the eclogite to granulite conditions are: Bt replaces the Phe; grossular Grt and Cpx replace the Czo-Qtz symplectites; Pl breaks down with antiperthite forming. The granulite stage was at 750-800 °Cfn and 10-12 kbar. Last superposed amphibolitic metamorphic event fixes new mineral forming (600 °C at 8 kbar): Hbl replaces Cpx, new Bt and Czo with Ep forming. Zrns the Phen-Qtz-Fsp leucosome subdivide into some crystal faces. First routine Zrn group is brownish subhedral 100 x 200 µm grains, with clear core-rim structures in CL images. The cores display a relic oscillator zoning with underwent an alteration and a metamict. It is typical for magmatic Zrns with high-content of uranium (more 3000 ppm). One analysis of the least metamict core of the same Zrn gives concordant age 2713±6 Ma. The Zrns have a distinctive chemical composition characterized by low Th/U ratio (0.05), much enriched REE concentrations than others Zrns (summa REE=1205 ppm) and have smaller negative Eu (Eu/Eu*=0.57) and positive Ce anomalies (Ce/Ce*=1.62) at a relative flat chondrite-normalised REE pattern (Lu_N/Sm_N=21; LuN/SmN = 131). Second extended Zrn group is colourless ovoid 100x150 µm grains show core-rim zoning. In general Zrns are characterized a high-uranium (522-935 ppm) structureless cores. Some Zrns have a fir-tree zoning which is typical for high-pressure Zrns. The cores vary by Th/U ratio (0.11-0.32) and their age 2707±20 Ma. The REE pattern of such Zrn is characterized by a positive Ce anomaly, a negative Eu anomaly (Eu/Eu*=0.33), and low enrichment in HREE with respect to MREE (Lu_N/Sm_N=13, Lu_N/La_N=135). In rare instances the inner core display fine magmatic oscillatory zoning; external core has properties corresponding cores of second group. One point from inner oscillator core gave older age 2793±14 ($^{207}Pb/^{206}Pb$). All Zrns are surrounded by narrow structureless cracked low uranium (66-155 ppm) rims. Concordia age 1938±35 Ma and corresponds to the Svecofennian Orogeny, when imbricate thrusting brought deep-seated rocks of the Belomorian belt to shallower amphibolite levels (Bibikova et al., 2004). The rims are depleted in all the trace elements, except Hf and much low Th/U ratio (0.00-0.01). The REE pattern of rims is characterised by positive Ce anomaly, a negative Eu anomaly (Eu/Eu* = 0.41-0.51), and enrichment in HREE with respect to MREE and LREE (Lu_N/Sm_N=17-79, Lu_N/La_N=89-392).

Second geochronological sample was collected from enderbite vein cutting an eclogite gabbronorite dyke. Mineral composition of enderbite is Grt-Bt-Opx-Cpx-Pl-Qtz equilibrium paragenesis. There are no petrological evidences of amphibolite transformations in the enderbite. PT-path estimation of enderbite forming is 721 °C at 10 kbar. Zrns from the enderbite are subdivided into two groups. First group is subhedral grains with fine-scale oscillatory zoning, magmatic Th/U ratio (0.55-0.85) and ages about 3 Ga corresponding of the time of tonalite forming. Second Zrn group is subhedral structureless black in CL grains and rims around the