Geophysical Research Abstracts,
Vol. 11, EGU2009-4906, 2009
EGU General Assembly 2009

Chronology of last earthquake on Firouzkuh Fault using by C14

H. Nazari (1,2), J-F. Ritz (2), R. Walker (3), H. Alimohammadian (1), R. Salamati (1,2), A. Shahidi (1), R. Patnaik (4), and M. Talebian (1)

(1) Research institute for Earth sciences, Geological Survey of Iran, P.O.Box:13185 1494, Tehran-Iran, (2) Laboratoire Géosciences Montpellier - UMR 5573, Université Montpellier 2, 34095 Montpellier Cedex 05, France, (3) COMET, Department of Earth Sciences, University of Oxford, Parks Road, Oxford, OX1 3PR, UK, (4) Center of Advanced Study in Geology, Panjab, University Chandigarh-160014, India

The Firouzkuh fault with about 70 km length extending from east of Mosha fault in Aminabad village to Gadok in north east of Firouzkuh and easily is traceable on satellite images and aerial photographs (Nazari, 2006). Geologically this fault bounded between Jurassic – Cretaceous deposits in east (hanging wall) and Plio-Quaternary sediments in the west (foot wall) fault, (Aghanabati and Hamedi, 1994).
This fault with NE-SW trend, located at northern part of south Firouzkuh high lands, and is partially compatible with F-16 magnetism (Yossefi and Firedburg, 1977). This fault initially was known as south trending thrust fault (Berberian et al., 1996), then included as left-lateral dextral fault (Jackson et al., 2002) and after all as sinstral-normal fault (Nazari et al., 2005) However, due to dispersal pattern of deformation on different faults, make sit difficult to fully understand the geometry and mechanism of the latest activity of Firouzkuh fault. In bigger scale, presence of eastern mountains and pattern of younger deformation in fault plain, especially in Firouzkuh domain, there is an evidence of left-Lateral dextral fault with vertical component for Firouzkuh fault. In a compressed structural regim, the vertical component can be consider as a thrust component that has caused the formation and general morphology of the area or a fault plain with south – west dipping.
There is no palaeoseismic data or recorded large scale seismic activity related to Firouzkuh fault. Although historically, Firouzkuh fault is located in komes seismic zone (856 AD, Io= X, Ms= 7.9), but since Firouzkuh is an intermountain area, no historic seismic activity is reported from that area. There are number of recorded seismic activity such as 1969, 1973, 1975, 1979, 1985, 1989, 1990, and 2008 with magnitude of less than 4.8 except Gadok earthquake in 1990 which its magnitude was 5.8 and this is the greatest recorded seismic activity of Firouzkuh area, the morphotectonic and palaeoseismic study during last 5 years on Firouzkuh fault (Nazari, 2006) reveal seismic activity of this area and the rate of movement in young event is about 2 mm/yr. The Firouzkuh fault is close to Firouzkuh, Damavand, Semnan and Tehran cities, therefore, gathering information about the geometry, mechanism and characteristics of activity of Firouzkuh active fault, will help us possible to prediction of fault activity and minimize the resulted damage. Therefore chronology of last event is quit important. In this paper to date the last seismic event in Firouzkuh fault. We have used C14 dating on human bones recovered from F2 trench, along with Quaternary sedimentology of young alluvium deposits of eastern Firouzkuh city.
Paleoseismic analysis and C14 dating along the Firouzkuh left –Latural Strike-slip fault indicates the central Alborz has been witnessed large earthquakes during the late Holocene. Here we provide data from one of the two excavated trenches with 15 m length, 2m width and 4 m depth dug across the gauge zone in east Firouzkuh city, where we found some evidence for last paleoearthquake associated to seismic re-activity of Firouzkuh fault. The last seismic event is evidenced by cutting young superficial deposits and overlaid by alluvium deposits which yielded fragments of human bones.
The generated C14 date from human bones, found at palaeoseismological trench (F2) on Firouzkuh fault, indicates an age of 1131-1187 B.P. year for alluvium deposits bearing these bones since from stratigraphical point view, this alluvium deposits (unit 4) are overlaid by faulted recent sediments (unit 1, and these recent sediments are cut due to recent activity of Firouzkuh fault, which are younger than human bone bearing alluvium, we may come to conclusion that the time event of this earth quake must be younger than obtained C14 date (1159 $\pm$ 28). In other hand since the human bones have been found in a place not similar to grave, we may assume that the body was on the surface at the time of earthquake event. Now, assuming equal rate of weathering and sedimentation,

we can calculate the annual sedimentation rate by 1.7 – 1.9 mm and this calculated rate is more than towice of sedimentation rate for Hezar Darreh sediments (0.62 mm/yr) in Eivan-kay area, south of Tehran city(Ballato et al., 2008).

Considering being in situ of human bones, differences in sedimentation rate may be related to sedimentation environment of river, seasonal flooding and geomorphology of the area. In case, if the human bones are not in situ, the bone bearing sediments will be younger and under this circumstances the sedimentation rate will be much more than the previous one. At any condition there will be no change in estimated time of last earthquake event associated with recent reactivity of Firouzkuh fault.

According to estimated slips per event on palaeoseismological log of eastern wall of French F1, event magnitude of each palaeoearthquakes was $M \approx 7$.

Key words: Firouzkuh Fault, Human Bones, Paleoearthquake, Alborz, Iran