Geophysical Research Abstracts
Vol. 13, EGU2011-12241, 2011
EGU General Assembly 2011

Geomorphological evidence for recent activity of the Vodice fault and its potential for seismic hazard in Ljubljana basin (Slovenia)

Petra Jamšek (1), Lucilla Benedetti (2), Marko Vrabec (3), and Miloš Bavec (1)

(1) Geological Survey of Slovenia, Dimičeva 14, 1000 Ljubljana, Slovenia (petra.jamsek@geo-zs.si), (2) Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement, BP 80, Europôle Méditerranéen de l'Arbois, 13545 Aix-en-Provence Cedex 4, France, (3) University of Ljubljana, Faculty of Natural Sciences and Engineering, Department of Geology, Aškerčeva 12, 1000 Ljubljana, Slovenia

The Ljubljana basin, the most densely populated and urbanized area of Slovenia, experiences constant seismic activity and has been the site of strong historical seismic events with magnitude as high as 6.2 (Ljubljana 1895). Moreover, the basin is filled with Quaternary sediments reaching thickness up to 280 m in some parts, which may significantly enhance site effects and therefore increase the earthquake vulnerability of the area. However, active faults capable of producing strong magnitude earthquakes in this area are poorly known.
15 km north of Ljubljana, accurate topography and satellite images analysis reveal the presence of an ENE-WSW oriented, 10 – 11 km long scarp, between 5 to 25 m high within the Quaternary basin infill. Some authors have previously described this feature as a terrace riser of the Sava river, and lately as a reverse fault. Folding was reported in a clay pit at the eastern end of the scarp. Westward, where the fault cuts the N-S running Sava river, Quaternary conglomerates are also folded and offseted. Evidence of ongoing uplift is attested by the presence of abandoned streams across the structure and perched valleys. Active streams strongly incise the northern, hanging wall compartment, this upper surface being clearly older as shown by its degradation mostly due to dolines. A series of detailed topographic profiles levelled across the scarp show that the height of the scarp varies from 25 to 5 m, therefore suggesting it can not be interpreted as a terrace riser of a former course of the Sava river. All these observations lead us to interpret the Vodice scarp as the surface expression of an active reverse fault.
Using preliminary optical stimulation luminescence ages of deformed sediments located at the eastern tip of the fault, and a northward dip of 35 – 45°, we can estimated a minimum slip-rate along the Vodice fault of about 0.2 – 0.4 mm/yr over the last 115 $\pm$ 32 ka. An earthquake of magnitude 6.2 – 6.3 on this 10 km long fault would trigger an average displacement of $\sim$ 0.5 m with an average recurrence time of 1200 – 3000 yr. The Vodice fault could therefore be a potential source for the Ljubljana 1895 earthquake. Quantitative analysis of the morphology and an accurate paleoseismological study are warranted to assess the seismic history of this fault and its potential for seismic hazard in central Slovenia.