Geophysical Research Abstracts
Vol. 16, EGU2014-12670-1, 2014
EGU General Assembly 2014

First paleoseismological assessment of active deformation along the eastern front of the southern Alps (NE Italy, Friuli). Insights on the 1511 earthquake causative fault.

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The study area belongs to the Julian Prealps that represent the easternmost portion of the Plio-Quaternary front of the eastern Southalpine Chain (ESC), a south-verging polyphase fold and thrust belt, in evolution from the Middle Miocene to the Present. Here, the WSW-ENE trending, SW- verging thrusts of the ESC join the NW-SE trending, right-lateral strike slip Idrija fault system, which develops along the Italian-Slovenian boundary.
The area is characterized by medium/high seismicity testified by both large historical and instrumental earthquakes. The DBMI11 (Locati et al., 2011) records the 1348 Carinzia earthquake (Mw= 7.02), the 1511 Idrija earthquake (Mw=6.98), and the 1976 Friuli earthquakes on May (Mw=6.46) and September (Mw=5.98)
We studied a segment of the Susans-Tricesimo thrust system, namely the Colle Villano (CV) thrust, identified by means of geological and geophysical investigations (Galadini et al., 2005). New geological and geomorphological analyses allowed identifying the surficial geomorphic evidence of recent blind thrusting along the structure, represented by gentle scarps and surface warping.
In order to characterise the Late Pleistocene-Holocene activity of this blind thrust, paleoseismological investigations were performed along one of CV thrust-related fault scarps. We dug three trenches $\sim$1 km to the north of the Magredis village. The analysis of the trench walls allowed identifying deformation events induced by the fault activity. Two subsequent episodes of deformation are distinguished by localised warping (few metres in wave length) of the sedimentary sequences exposed by the excavations and secondary extrados faulting. One event occurred between 544-646 AD (radiocarbon cal. age, 2σ) and 526-624 AD the other – probably the last one – occurred close to 1485-1604 AD.
The last displacement event is consistent with the aforementioned 1511 earthquake both in terms of chronology of the deformation and location of the causative fault. This seismic event, which is one of the largest events that struck Northern Italy in the past millennium, has been tentatively attributed to the activation of Idrija fault system (Fizko et al., 2005). However, no paleoseismological evidence of this has been provided to date, the damage distribution of this event suggests its seismogenic source to be located at the easternmost portion of the Julian Prealps, and our investigations indicate that the ESC has been probably involved in the seismotectonic framework of the 1511 seismic event.
The present study provides information useful for updating and improving the knowledge on active faulting of the NE sector of the ESC and provides geological insights, substantiated by paleoseismological investigations performed for the first time along the front of the ESC, about one of the most problematic seismotectonic issues of Northern Italy, i.e. the 1511 earthquake.

References

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