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Seismic slip history of the Pizzalto fault (Central Apennines, Italy) using in situ 36Cl cosmogenic dating

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A prerequisite to constrain fault-based and time-dependent earthquake rupture forecast models is to acquire data on the past large earthquake frequency on an individual seismogenic source.
Here we present a paleoseismological study on the Pizzalto fault using the in situ produced cosmogenic nuclide 36Cl (Schlagenhauf et al., 2011). The Pizzalto fault, located in central Italy about 50 km southeast of the epicenter of L'Aquila 2009 earthquake, is about 12 km long, SW dipping and belongs to the 30 km long Rotella-Aremogna active normal fault system. Recent activity along the Pizzalto fault is suggested by the presence of a continuous and linear 2 to 5 m high limestone fault scarp that was sampled every 10 cm at a site located in its particularly well-preserved central portion. 49 samples have been chemically processed and measured, and their 36Cl and Cl concentrations have been determined using isotope dilution mass spectrometry at the French AMS national facility ASTER located at CEREGE. Modeling the in situ 36Cl concentration with the scarp height allow deciphering the age and slip of the last major earthquake events on the fault.
To derive those earthquake parameters, we used the published Matlab code from Schlagenhauf et al. (2011) that we implemented with a Monte Carlo approach to explore a large number of earthquake recurrence scenarios varying both the number of events, their slip and their ages. The "a priori" constraints input in the Monte Carlo code were: 1-the number of events, which is given by the stacking of individual probability density functions (assumed to be Gaussian) of each sample concentration; and, 2-the cumulative slip that should be equal to the height of the fault scarp. The first results show that 36Cl concentrations are reproduced better considering five events occurring over the last 5 ka and a previous one at about 13 ka. This suggests that most earthquake events clustered during a period of intense seismic activity preceded by a longer quiescence time.
References:
Schlagenhauf, A., Gaudemer, Y., Benedetti, L., Manighetti, I., Palumbo, L., Schimmelpfennig, I., Finkel, R., Pou, K.,. Using in-situ Chlorine-36 cosmonuclide to re- cover past earthquake histories on limestone normal fault scarps : A reappraisal of methodology and interpretations. Geophys. J. Int. 182, 36–72 doi : 10.1111/j.1365-246X.2010.04622.x, 2010.