American Geophysical Union, Fall meeting 2012, San Francisco, Calif., 3-7 december, abstract #OS43C-1837

Testing 8000 years of submarine paleoseismicity record offshore western Algeria : First evidence for irregular seismic cycles

Meeting 2012 Fall Meeting

Section Ocean Sciences

Session Marine Geohazards II Posters

Identifier OS43C-1837

Authors
Ratzov, G*, Domaines Océaniques, IUEM, Plouzané, France
Cattaneo, A, GM-LES, IFREMER, Plouzané, France
Babonneau, N, Domaines Océaniques, IUEM, Plouzané, France
Yelles, K, CRAAG, Algiers, Algeria
Bracene, R, Division Exploration, SONATRACH, Boumerdès, Algeria
Deverchere, J, Domaines Océaniques, IUEM, Plouzané, France

Index Terms
Submarine landslides [3070]
Paleoseismology [7221]
Paleoseismology [8036]

It is commonly assumed that stress buildup along a given fault is proportional to the time elapsed since the previous earthquake. Although the resulting « seismic gap » hypothesis suits well for moderate magnitude earthquakes (Mw 4-5), large events (Mw>6) are hardly predictable and depict great variation in recurrence intervals. Models based on stress transfer and interactions between faults argue that an earthquake may promote or delay the occurrence of next earthquakes on adjacent faults by increasing or lowering the level of static stress. The Algerian margin is a Cenozoic passive margin presently inverted within the slow convergence between Africa and Eurasia plates (~3-6 mm/yr). The western margin experienced two large earthquakes in 1954 (Orléansville, M 6.7) and 1980 (El Asnam, M 7.3), supporting an interaction between the two faults. To get meaningful statistics of large earthquakes recurrence intervals over numerous seismic cycles, we conducted a submarine paleoseismicity investigation based on turbidite chronostratigraphy. As evidenced on the Cascadia subduction zone, synchronous turbidites accumulated over a large area and originated from independent sources are likely triggered by an earthquake. To test the method on a slowly convergent margin, we analyze turbidites from three sediment cores collected during the Maradja (2003) and Prisme (2007) cruises off the 1954-1980 source areas. We use X-ray radioscopy, XRF major elements counter, magnetic susceptibility, and grain-size distribution to accurately discriminate turbidites from hemipelagites. We date turbidites by calculating hemipelagic sedimentation rates obtained with radiocarbon ages, and interpolate the rates between turbidites. Finally, the age of events is compared with the only paleoseismic study available on land (El Asnam fault). Fourteen possible seismic events are identified by the counting and correlation of turbidites over the last 8 ka. Most events are correlated with the paleoseismic record of the El Asnam fault, but uncorrelated events suggest that other faults were active. Only the 1954 event (not the 1980) triggered a turbidity current, implying that the sediment buffer on the continental shelf could not be reloaded in 26 years, thus arguing for a minimum time resolution of our method. The new paleoseismic catalog shows a recurrence interval of 300-700 years for most events, but also a great interval of >1200 years without any major earthquake. This result suggests that the level of static stress may have drastically dropped as a result of three main events occurring within the 800 years prior the quiescence period.

Cite as: Author(s) (2012), Title, Abstract OS43C-1837 presented at 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec.