Evidence for Quaternary earthquakes from paleo-fluidization structures along the Pernambuco lineament (NE-Brazil).

Yago Nestola (1), Fabrizio Balsamo (1), Francisco Hilario Rego Bezerra (2), Fancisco Cézar Costa Nogueira (3), and Fabrizio Storti (1)

(1) Università di Parma, Physics and Earth Science Dept. "Macedonio Melloni", Parco Area delle Scienze, 157A - 43124 Parma, Italy, (2) Department of Geology, Federal University of Rio Grande do Norte, Natal, RN, 59078-970, Brazil, (3) Department of Mechanical Engineering, Federal University of Campina Grande, Campina Grande, PB, 58429-140, Brazil

Plate tectonics theory postulate that seismicity is mostly restricted to the plate’s boundaries. Nevertheless, intraplate earthquakes occur in stable continental areas such as the NE-Brazilian craton, where seismicity is clustered along fault systems reactivating major Neoproterozoic shear zones. Moreover, evidence for tectonic activity is recorded in the Cenozoic post-rift formations, widely outcropping along the coast of the NE-Brazilian passive margin.

To investigate such unexpected seismic and tectonic activity we performed a structural field survey along the coastal segment of the Pernambuco shear zone, where the Miocene sandstone of the Barreiras Fm. and the overlying Quaternary post-Barreiras deposits extensively crop out. They are separated by a Tortonian lateritic paleosoil and are affected by mainly extensional faulting, associated with some strike-slip deformation, clustered in N-S, WNW-ESE, and NE-SW trends.

In the proximity of the Pernambuco shear zone, in the hinterland of the Recife town, we found evidence for paleo-fluidization structures in post-Barreiras deposits, where mobilized materials include cm-dm-sized, heterogeneous angular clasts in a sandy-dominated matrix. The extent of the exposed fluidized bodies exceeds ~50 m in active quarry walls, the maximum thickness reaches ~3 m, and the depth of fluidization is estimated to be about 30 m. The top seal of fluidized material was provided by a ~80 cm thick clay layer. Such fluidizations are located few hundreds meters far from a major NE-SW-trending, sin-sedimentary extensional fault zone developed in Quaternary deposits, which is consistent with a left-lateral strike-slip sense of shear of the Pernambuco shear zone. Our results further improve the knowledge of paleo-seismic activity along the Pernambuco shear zone and, in particular, provide additional information for the seismic hazard assessment in the high-density populated area of the Recife town.