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

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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 $\sim$50 m in active quarry walls, the maximum thickness reaches $\sim$3 m, and the depth of fluidization is estimated to be about 30 m. The top seal of fluidized material was provided by a $\sim$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.