

# **Are rupture zone limits of great subduction earthquakes controlled by upper plate structures? Insights from seismotectonics, continental deformation and Coulomb modelisation along southern Peru Margin**

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Subduction of the Nazca plate beneath the Peruvian margin has produced numerous megathrust earthquakes during the last century and still constitute mature seismic gaps in some places such as in between Ilo (Peru) and Arica (Chile) for example. The rupture zones of the 1604, 1784 and 1868 southern Peru events were partially reactivated by the Arequipa 2001 ( $M_w = 8.5$ ), whose rupture zone was about 350km- long and stopped propagating on Ilo Peninsula region. Just after the occurrence of 2001 event, some reactivation of a continental fault system is identified through the local seismic network and describe deformation processes occurring perpendicularly to the trench. The Chololo and associated crustal fault systems define some 80-km-long margin crustal blocks and the major one coincides with the 2001 earthquake southern limit of the rupture zone as it propagated to the south. These blocks are made from Late Jurassic and Cretaceous plutonic rocks from the Coastal Batholith; these are outcropping in some places and evidenced by the aeromagnetic mapping elsewhere around the area.

Another boundary between two major rupture zones of great subduction earthquake was reactivated recently, perpendicularly to the trench by the seismic crisis of October 2006,  $M=6.4$ , near Lima, right at the southern end of the rupture zone of the 1974 event ( $M_w=8.1$ ).

Those boundaries corresponding to discontinuities (faults ?) trending nearly perpendicular to the trench that act as earthquake barriers during rupture of large events. Because rupture ends on those structures, the coseismic stress changes there are large. We plan to estimate the co- and post-seismic stress changes transferred by the 2001 Arequipa earthquake on the Ilo barrier in order to see which of those two (possibly both) controls the current seismic activity on the Ilo Barrier. We finally discuss the implications of those results in terms of the "characteristic earthquake" model."

These results suggest that continental deformation should give us clues to define the pattern of segmentation of the subduction zone by studying seismotectonics and its

relation to the segmentation of the upper continental plate.