



The impact of the descending, rough surface Nazca plate on the hazard potential of the Peruvian convergent margin

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We use swath bathymetry data acquired during the RV Sonne cruise SO146 GEOPECO and complement them with swath data from adjacent regions to analyse the morphotectonics and hazard potential of the Peruvian convergent margin. The Nazca plate is not covered with sediments and the long-term aridity of the adjacent South American continent prevents significant superficial erosion. Consequently, the Peruvian trench has only a very thin fill and igneous crust with a very rough surface is subducted along the entire Peruvian trench. The styles of roughness differ significantly along the margin with linear morphological features trending in various directions, most of them oblique to the trench and roughness magnitudes of a few to several hundred meters. Oblique convergence and resulting strain partitioning cause a transtensional stress regime in the outer fore-arc. The Peruvian margin experiences $M_w > 8$ seismic events with recurrence intervals of slightly more than hundred years in each region. An exceptional number of the large earthquakes have been identified as tsunami earthquakes. However, seismicity is not uniformly distributed along the margin but several segments can be identified which correlate with lower plate morphological styles. The anomalous roughness of the Nazca plate, e.g. the ripple-morphology of the Mendaña Fracture Zone, or the collision of fracture zones and an aseismic ridge with the margin may explain the frequency of tsunami earthquakes at the Peruvian margin and also the observed pattern of seismicity. This study demonstrates that combining geomorphological and geophysical analyses have a high potential to better assess convergent margin hazard.