Geophysical Research Abstracts
Vol. 14, EGU2012-10264, 2012
EGU General Assembly 2012

Overriding plate structure of the Nicaragua convergent margin: Constraints on the limits of the seismogenic zone and the 1992 tsunami earthquake

V. Sallarès (1), A. Meléndez (2), M. Prada (1), C. R. Ranero (3), K. McIntosh (4), and I. Grevemeyer (5)

(1) Unidad de Tecnologia Marina - CMIMA - CSIC, Barcelona, Spain (vsallares@cmima.csic.es), (2) Institut de Ciències del Mar - CMIMA - CSIC, Barcelona, Spain, (3) ICREA at Institut de Ciències del Mar - CMIMA - CSIC, Barcelona, Spain , (4) University of Texas, Institute for Geophysics (UTIG), Austin, US, (5) IFM-GEOMAR, Kiel, Germany

We present 2D P-wave velocity models of the Nicaragua convergent margin along two perpendicular wide-angle seismic profiles acquired in the rupture area of the 1992 tsunami earthquake. The models focus on the structure of the overriding plate and the geometry of the inter-plate boundary. In the trench-perpendicular profile, the basement shows increasing velocity reflecting a progressive decrease in the degree of rock fracturing of the igneous basement. Upper mantle-like velocities are obtained at a depth of $\sim$10 km beneath the fore-arc Sandino basin, indicating that the mantle wedge is shallow and located close to the trench. A mismatch between the inter-plate reflector in the velocity models and along coincident multi-channel seismic profiles is best explained by a $\sim$15% velocity anisotropy, suggesting locally-enhanced rock fracturing which is related with the presence of a prominent subducted seamount. The frontal part of the overriding plate is probably too fractured to store elastic energy, unless the presence of local asperities such as the subducted seamount makes it conditionally stable by locally increasing the normal stress. The downdip limit of the seismogenic zone occurs near the tip of the mantle wedge, indicating that it is probably controlled by the presence of a weak, serpentinized mantle wedge beneath the Sandino basin. The hypocenter of the 1992 main shock is not particularly shallow (20-22 km), but seismological data indicate that it triggered sub-events near the trench, the main of which coincides with the subducted seamount. We show that the slow propagation velocity and long duration of the 1992 earthquake could be explained by rupture propagating within the fractured basement rocks and not into the sediments.