Plate boundary and major fault system in the overriding plate within the Shumagin gap at the Alaska-Aleutian subduction zone

Details

Meeting	2013 Fall Meeting
Section	Tectonophysics
Session	Subduction Plate Boundaries From the Trench to Sub-arc and Beyond II Posters
Identifier	T43D-2696
Authors	BECEL, A*, Lamont-Doherty Earth Observatory - Columbia University, Palisades, NY, USA Shillington, D J, Lamont-Doherty Earth Observatory - Columbia University, Palisades, NY, USA Nedimovic, M R, Dalhousie University, Halifax, NS, Canada Keranen, K M, Cornell University, Ithaca, NY, USA Li, J, Lamont-Doherty Earth Observatory - Columbia University, Palisades, NY, USA Webb, S C, Lamont-Doherty Earth Observatory - Columbia University, Palisades, NY, USA Kuehn, H, Dalhousie University, Halifax, NS, Canada
Index Terms	Marine seismics [3025] Subduction zone processes [3060] Subduction zones [7240] Continental margins: convergent [8104]

Abstract

Structure in the overriding plate is one of the parameters that may increase the tsunamigenic potential of a subduction zone but also influence the seismogenic behavior and segmentation of great earthquake rupture. The Alaska-Aleutian margin is characterized by along-strike changes in plate interface coupling over relatively small distances. Here, we present trench normal multichannel seismic (MCS) profiles acquired across the Shumagin gap that has not broken in many decades and appears to be weakly coupled. The high fold, deep penetration (636 channel, 8-km long streamer, 6600 cu.in airgun source) MCS data were acquired as part of the ALEUT project. This dataset gives

us critical new constraints on the interplate boundary that can be traced over ~100 km distance beneath the forearc with high variation in its reflection response with depth. These profiles also reveal the detailed upper plate fault structure and forearc morphology. Clear reflections in the overriding plate appear to delineate one or more large faults that cross the shelf and the upper slope. These faults are observed 75 km back from the trench and seem to branch at depth and connect to the plate interface within this gap at ~11 s twtt. We compare the reflective structure of these faults to that of the plate boundary and examine where it intersects the megathrust with respect of the expected downdip limit of coupling. We also compare this major structure with the seismicity recorded in this sector. The imaged fault system is associated with a large deep basin (~6s twt) that is an inherited structure formed during the pre-Aleutian period. Basins faults appear to have accommodated primarily normal motion, although folding of sediments near the fault and complicated fault geometries in the shallow section may indicate that this fault has accommodated other types of motion during its history that may reflect the stress-state at the megathrust over time. The deformation within the youngest sediment also suggests also that this fault system might be still active. The coincident wide-angle seismic data coincident with one MCS profile allow the addition of more information about the deep P-wave velocity structure whereas the streamer tomography (Michaelson-Rotermund et al., this session) around the fault system add more detailed view into the complex structure in the shallow portions (upper 2km) of these structures showing a low velocity zone along one large fault suggesting that this fault is still active. These large-scale structures imaged in the overriding plate within the Shumagin gap are probably sufficiently profound to play a major role in the behavior of the megathrust in this area, segmentation of great earthquake rupture area, tsunami generation and may influence the frictional properties of the seismogenic zone at depth.

Cite as: Author(s) (2013), Title, Abstract T43D-2696 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.

Powered by LODSPeaKr