2012 Fall Meeting
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AN: **T13G-2702** ***Poster***
TI: Seismic structure of the North Pacific oceanic crust prior plate bending at the Alaska subduction zone
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AB: Seismic reflection profiles across North Pacific oceanic Plate reveal the internal structure of a mature oceanic crust (42-56Ma) formed at fast (70mm/yr, half rate) to intermediate (28mm/yr, half rate) spreading rates. Data used in this study were collected with the R/V Langseth in summer 2011 as part of the ALEUT (Alaska Langseth Experiment to Understand the megathrust) program. MCS data were acquired with two 8-km streamers and a 6600 cu. in. air gun array. We collected a series of profiles across the subduction zone system but also across the preexisting structures of the oceanic crust before being affected by subduction zone processes. Additionally, two 400-km OBS refraction lines were shot coincident with MCS profiles. The multi-channel seismic (MCS) data across oceanic crust formed at fast spreading rates contain abundant bright reflectors mostly confined in the lower crust above the Moho discontinuity and dipping predominantly toward the paleo-ridge. Along these profiles, the Moho discontinuity is observed as a bright event with remarkable lateral continuity. The lengths of the dipping reflectors are on the

order of 5-km, with apparent dips between 10 and 30°. These reflectors represent discrete events, with spacing between 0.3 to 5 km without any obvious regularity. These dipping events appear to sole out within the middle crust (1 to 1.5 s beneath basement) and most of them terminate at the Moho. The Moho is much weaker or absent on the northern profiles acquired across the North Pacific oceanic crust formed at intermediate spreading rates. Basement topography is rougher and no clear dipping events have been imaged suggesting that the spreading rate may be an important factor that controls the strength and abundance of such dipping reflectors and the lateral change in the Moho reflection characters. Lower crustal dipping reflections (LCDR) have been only imaged at very few places across the Pacific oceanic crust: (Eittreim et al., 1988, Reston et al. 1999, Ranero et al., 1997, Hallenborg et al., 2003). These LCDR have been interpreted as being either formed near the spreading center during accretion or off-axis post-accretion structures. Interpretations proposed included lithologic banding from passive accretion, shear structures from active mantle upwelling, off-axis magmatism, or enhanced reflectivity of latent structures by crustal aging (e.g., hydrothermal circulation, etc). Another alternative that we propose is that the dipping reflectors are shear zones that form in the lower crustal mush zone due to active upwelling that contain frozen melts segregated into the shear zones during deformation. Characteristics of the wide-angle reflection data are also different between the two lines. Lateral variations in the Moho reflections and crustal refractions are clearly observed and will be discussed with respect to the structures imaged on the coincident reflection images. The transition between fast to intermediate spreading rates occurs near a triple junction that separated the Pacific, Kula and Farallon plates that ceased spreading in the Late Eocene. MCS profiles across and around the fossil triple junction reveal deep reflections into the crust and below the Moho down to 15-km depth. These reflections could possibly be caused by gabbroic melts that froze in the mantle lithosphere when the triple junction was abandoned.

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