Multichannel seismic imaging along the Vance and Cleft segments of the southern Juan de Fuca Ridge

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We use new multichannel seismic data to constrain accretionary processes and the structure of young oceanic crust formed along the intermediate-spreading southern Juan de Fuca Ridge (JdFR). The data was collected in summer 2002 on board the {\it R/V Maurice Ewing} (EW0207) in a series of axis-parallel profiles running between south of Axial volcano and the Blanco fracture zone, and cross-axis profiles up to 600-k.y.-old crust. Preliminary stacks of common-mid-point gathers collected along the axis of this portion of the ridge show a prominent mid-crustal reflector interpreted as the top of an axial magma chamber (AMC). The AMC is present along most of the length of both Vance and Cleft segments, at depths of ~1.0-1.2 s two-way-travel time (TWTT) (~2.3-2.8 km) below the seafloor along the Vance segment, and at ~0.9 s sub-seafloor TWTT (~2 km) along the Cleft segment including the Cleft Observatory site. The AMC was also observed in the cross-axis profiles at similar depths as a narrow reflector flanked by diffraction hyperbolae. This preliminary interpretation suggests that magma is present within the crust and that the potential for volcanic eruptions exists along most of the southern JdFR. The Cleft and Vance segments are both underlain by an AMC which is deeper than that observed at fast-spreading ridges, but continuous along similar distances. Seismic layer 2A along the both segments varies in thickness between 0.3 and 0.5 s TWTT (~400-600 m). While along the Vance segment layer 2A does not appear to thicken off-axis, we observe a systematic thickening from ~400 m on-axis to ~600 m few kilometers off-axis at the center and southern sections of Cleft, where the ridge morphology is more inflated. These observations support the hypothesis that layer 2A thickening with age is primarily controlled by the off-axis emplacement of lava flows driven by topographic gradients. Reflections from the Moho were also observed in most of the preliminary stacks along off-axis profiles. The Moho appears as a weak, discontinuous low-frequency reflection at depths of 2.1-2.3 s sub-seafloor TWTT, which typically indicates crustal thicknesses of ~6.3-6.9 km. Future analysis of the complete dataset will improve our knowledge of crustal construction and the relationships between tectonic, volcanic, and hydrothermal events along intermediate-spreading ridges.