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Seismic Structure of EPR Magma Chamber: New Constraints from the 9°03'N OSC

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The 9°N segment has been extensively studied over the past decades and conflicting models have been proposed to explain the origin of the 9°03'N OSC. In 1997 and 2000, three seismic survey were undertaken near this OSC to study the relationship between patterns of magma supply and the rise axis segmentation. We will present an overview of multichannel, wide-angle seismic imaging and compliance analyses which have provided new constraints on the magma supply at the 9°03'N OSC.

The 20 by 20 km ARAD-3D (Anatomy of a Ridge Axis Discontinuity) reflectivity survey reveals the intricate structure of the melt lens at upper crustal levels [Kent et al., 2000]. A processing technique (range-gated stacking) utilizing amplitude variation with offset (AVO) characteristics of lens reflector gives insight into fine-scale variations of its physical properties, and therefore of its nature (e.g., melt versus mush) . Tomographic inversions show that a strong crustal low velocity zone (LVZ) underlies both limbs of the OSC and part of its basin. At shallow depth, this LVZ underlies the melt lens reflection imaged by the reflectivity survey. Deeper in the crust, the low velocity bodies seem focused beneath the two N-S extremities of the basin. Evidence for a lower crustal melt body also arises from new compliance data. This deep melt body is asymmetric and shifts west of the rise axis. Similarly to the upper crustal melt lens, the deeper body is anomalously wide just north of the OSC [Crawford et al., 2000]. Tomographic inversions of mantle refracted P-waves image a continuous region of low velocity in the shallow mantle [Dunn and Toomey, 2000].

These seismic results show evidence for a robust magma supply beneath the axial discontinuity. Therefore, the OSC is not remotely supplied by melt sources located at ridge segment centers. In addition, the conjunction of the different analyses should provide some important insight on how magma rises in the crust and focuses towards the neovolcanic zone.

Kent et al, *Nature*, 406, 614-618, (2000).
Crawford et al, *Fall AGU abstract*, (2000).
Dunn and Toomey, *Fall AGU abstract*, (2000).