

Three-Dimensional Reflectivity Image of the Melt Sill and Moho- Implications for Crustal Accretion Process at Fast Spreading Centres

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Moho (named after Mohorovicic, 1909) is a boundary separating the differentiated crust from the depleted mantle. As over seventy percent of the Earth's crust is created at ocean spreading centers, it is fundamental to understand when the Moho is formed and how the crust is accreted during its formation and evolution. Geodynamical studies suggest that the lower crust is formed in a single thin crustal magma reservoir (Henstock et al, 1993; Phipps Morgan and Chen, 1993) whereas petrological studies suggest that it is formed in thin melt sills at different depths in the crust (Kelemen et al, 1997). Using three-dimensional seismic reflection images, here we report that Moho is present right beneath the ridge axis and crustal magma chamber, which suggests that the Moho is formed at zero-age. The absence of any other large observable melt sills between the crustal magma chamber and Moho at zero-age places limits on the contribution of secondary melt sills to the accretion process, and therefore supports the geodynamical model, a single melt sill model, of crustal accretion processes at fast ocean spreading centers. The presence of zero-age Moho also provides constraints on the mode of melt delivery from the mantle into the upper crustal magma reservoir and on the efficiency of the crustal accretion process.

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