

Variations in Shallow off-axis Crustal Structure and Ridge Segment Morphology Along the Southeast Indian Ridge

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Along the Southeast Indian ridge (SEIR) there is a systematic variation in axial morphology and axial depth with distance away from the Australian Antarctic Discordance. Since spreading rate (72-76mm/yr) and mantle geochemistry appear constant along this portion of the SEIR, variations are attributed to a gradient in mantle temperature. In this study we report on a multichannel seismic survey investigation of ridge flank structure along the SEIR. There are three distinct forms of ridge crest morphology found within our study area: axial highs, rifted axial highs, and shallow axial valleys. Axial highs have shallow magma lens (~1500 m), and thin on-axis layer 2a (~300 m). Rifted axial highs have a deeper magma lens (~2100 m) and thicker on-axis layer 2a on-axis (~450 m). Beneath shallow axial valleys, no magma lens is imaged, and layer 2a is thick on-axis (450+ m). There is a step-like transition in magma lens depth, and layer 2a thickness with changes in morphology along the SEIR. We have also found that the presence of a melt lens on-axis corresponds with areas of lower relief abyssal hills on the ridge flank. This relationship suggests that the portions of ridge segments with a melt lens at present have persisted as regions of greater melt delivery in the past. This study focuses on the shallow off-axis crustal structure. We will investigate how the geometry and thickness of layer 2a differs within and between segments as a function of axial and ridge flank morphology. There is evidence of significant thickening of layer 2a off-axis (within 1-3 km) at axial high segments, with moderate thickening seen at rifted axial high, and no thickening seen at shallow valley segments. The geometry and thickness of layer 2a structure will be examined to assess variations in the form and manner of formation of abyssal hills as the axial morphology and axial crustal structure change along the axis."