MANTLE HETEROGENEITY BENEATH THE SUPER-SEGMENT OF THE AUSTRALIAN-ANTARCTIC RIDGE

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A 300-km-long super-segment of the Australian-Antarctic Ridge bounded by two large-offset transform faults can be divided into three sub-segments on the basis of depth variations and contrasting axial morphologies. The western (WS), central (CS) and eastern (ES) subsegments are characterized respectively by an axial plateau, axial high with small rift valley and a pronounced axial valley as depth drops by 1,000m. Seamount chains are located to the north of the WS and south of the CS. Major and trace elements reflect the effects of thcker lithosphere for the seamount samples. Along the supersegment, major, trace and isotope data vary substantially, with isotope data showing as large a range as there is across the entire spreading center influenced by the Galapagos hot spot. Isotopes show remarkably linear correlations with each other. Incompatible element abundances and moderately compatible element ratios (Sm/Nd, Lu/Hf) correlate well with the isotopes, except for a few samples from the WS and CS that show evidence of recent trace element depletion, pehaps associated wih active upwelling as indicated by the adjacent seamount chains. Large isotopic gradients show that even in this magmatically robust region melt delivery is vertical and not well-mixed along the axis. ES has the most depleted isotopes and trace elements, a deep rift valley, and the lowest $Na_{8.0}$ and highest $Fe_{8.0}$. The correlations between major elements and isotopes distinguishes this region from global trends. Instead, mantle heterogeneity is controlling segment characteristics, with changes in mantle composition that are reflected in major elements as well as trace element and isotopes. In contrast to global variations, low Na contents are associated with the deepest part of the ridge and the most depleted isotope compositions.