MAJOR, TRACE ELEMENT AND ISOTOPE VARIATIONS ALONG THE SUPER-SEGMENT OF THE AUSTRALIAN-ANTARCTIC RIDGE

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The 300-km-long super-segment in the middle of the Australian-Antarctic Ridge system is bounded by two large-offset transform faults, and has an intermediate spreading rate (70 mm/yr) and relatively shallow axial depth (~2,000 m). This super-segment has only small offsets along its entire length, but can be divided into three second order segments with very different morphology on the basis of undulating depth variations. The westernmost 2nd order segment has a well developed axial high, the central segment is a plateau with small rift valley typical of intermediate spreading ridges, and intersects a small seamount chain, and the east develops into a a pronounced axial valley as depth drops by 1000 m approaching the transform. MgO contents of the glassy sparsely phyric basalts (7-8.5%) are typical of intermediate spreading ridges, except for highly differentiated samples at the western transform boundary, and one in the central segment. There are large and well correlated variations in trace element ratios such as La/Sm and Sr-Nd-Pb-Hf isotopes along strike. Variations in axial morphology and depth correspond well with trace element and isotope variations, suggesting mantle composition is influencing ridge morphology in this region, except for a few samples that have enriched isotopes but depleted La/Sm, suggesting very recent trace element fractionation. Large isotopic variations are preserved even within the the second order segments, showing limited lateral transport and no significant effects of magma chamber homogenization along strike. On a remarkably fine scale, mantle heterogeneity and recent dynamic processes beneath the super-segment have strongly influenced both geochemistry and ridge morphology of the super-segment, showing an important influence of mantle heterogeneity for magma production and ridge expression.