MAJOR, TRACE ELEMENT AND ISOTOPIC 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 second-order segment has a well-developed axial high, while the central segment is a plateau with a small rift valley typical of intermediate spreading ridges and intersects a small seamount chain. The east develops into a pronounced axial valley as depth drops by 1000 m upon approaching the transform. MgO contents of the glassy sparsely phyric basalts (7-8.5%) are typical of intermediate spreading ridges save some highly differentiated samples at the western transform boundary and one sample in the central segment. Large well-correlated variations are observed for 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 that mantle composition is influencing ridge morphology in this region except for a few samples that have enriched isotopes but depleted La/Sm, indicating very recent trace element fractionation. Large isotopic variations are preserved even within 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.