Focused Melt Flow and Abyssal Magmatism at Lower Supply Rates

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We mapped the MAR from 16° to 17°N, including 2 major core complexes, and an intervening smaller complex bounded by back-tilted volcanic blocks. The southern complex faces a large axial volcanic high, while a deep axial rift faces the northern complex. At the northern complex Intermingled peridotite, gabbro, and mylonites were abundant with minor diabase, while at the central complex peridotite was abundant with subordinate diabase, and at the southern complex only abundant greenschist pillow basalt, diabase and minor peridotite were found.

In the North the scarcity of dikes and greenschist pillow lavas, together with an abundance of peridotites and intermingled gabbros can be expected from beneath a magma-poor rift; consistent with a veneer of pillow lavas over scattered dikes and small gabbro bodies in partially serpentinized peridotite. In the south there should be a thick dike section due to robust magmatism, making it difficult to expose underlying gabbros. Moreover, while massive gabbros on a fault surface are very difficult to sample, the core complexes were also short-lived, with heaves <10 km exposing only pillow lavas and dikes for much of their length.

The 16°30' Core Complex resembles the Kane Complex at 23°N, which consisted of a weak magmatic center in the north, a larger complex to the south, and central area where only peridotite and dike and pillow lava hanging wall debris are exposed. These magmatic centers also were ephemeral, lasting 100's of thousands of years before fading away. The spacing of the magmatic centers, however, was shorter than at 16°30'N. These systematics again appear at ultraslow spreading ridges, where amagmatic spreading segments link with widely spaced magmatic centers, often 100's of kilometers apart to form curvilinear plate boundaries. Thus, at slower spreading ridges, melt flow through the mantle to the crust is focused to discrete points along ridge axes, and not necessarily to the midpoint of 2nd order segments, while the spacing appears a function of magma supply rate, decreasing with melt supply beneath the ridge.