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# The magmatic record of continental breakup along the west margin of southern Africa: dolerite dikes from NW Namibia to the Cape Peninsula

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The west margin of southern Africa is a classic example of a volcanic rifted margin and it shows a strong apparent gradient in the intensity of magmatism from north to south. The high-intensity magmatic activity in the northern part, marked by the Etendeka CFB province at about 130 Ma, is conventionally attributed to a mantle plume but other ways to enhance mantle melting have been proposed. A decreased intensity of magmatism farther south along the margin is suggested by onshore geology and by variations in the thickness of underplated igneous crust inferred from marine seismic records. Early Cretaceous dolerite dike swarms occur along the entire margin, from the Etendeka province of Namibia in the north, to the Cape peninsula in the south. These dikes are under study to provide a record of the composition of magmas produced and give insights on the conditions and causes of mantle melting in the high- and low-intensity margin segments. Here we discuss a geochemical comparison of contemporary dike swarms located at the extreme ends of the study area: the False Bay swarm on the Cape peninsula and the Henties Bay-Outjo (HOD) swarm in NW Namibia. The False Bay dikes form a differentiated tholeiitic series ($SiO_2$ = 50-58 wt.%, Mg# = 60-20) with uniform incompatible trace element ratios and Sr-Nd-Pb isotope composition ($^{87}Sr/^{86}Sr_i$= 0.7064, $\varepsilon Nd_i$ = -2 and $^{206}Pb/^{204}Pb_i$ = 18.72). The HOD dike swarm is much larger than the False Bay swarm and also more diverse. We recognize three magma groups in the HOD: (a) crustally-contaminated tholeiites with $^{87}Sr/^{86}Sr_i$= 0.710-0.712, $\varepsilon Nd_i$ = -2 to -7, and $^{206}Pb/^{204}Pb_i$= 18.74-19.10, (b) MORB-like tholeiites with $^{87}Sr/^{86}Sr_i$= 0.704-0.705, $\varepsilon Nd_i$ = +2 to +6, and

$^{206}Pb/^{204}Pb_i$= 18.00-18.83, and (c) ne-normative OIB-like basalts with $^{87}Sr/^{86}Sr_i$= 0.7055-0.7059, $\varepsilon Nd_i$ = 0 to -2, and $^{206}Pb/^{204}Pb_i$= 18.30-18.61.

We attribute the greater diversity of magmas and the stronger crustal influence in the HOD swarm to the higher volume flux and thermal impact of magmatism in this region. Some of the HOD tholeiites have picritic bulk compositions (>12 wt.% MgO), and olivines reach $Fo_{90-93}$, indicating komatiitic parental melts. This suggests that high mantle temperatures and active upwelling were the cause of enhanced melting in the Etendeka province. Similar compositions have not been found in dikes from the Cape peninsula, and melting there probably followed a passive upwelling model.