



The rift-to-drift transition in the North Atlantic: A stuttering start of the MORB machine?

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It is generally accepted that rupturing of continents is followed by localized seafloor spreading at mid ocean ridges (MOR), which are considered, on geological time scales, to be symmetric and steady state. The continuity of this process is documented by the correspondence of crustal accretion ages and magmatic ages. While these processes are well studied at present-day MOR, little is known about how stable these systems are during their embryonic stage. Even though our understanding of the mechanisms associated with extension and rifting of continents improved significantly in the last decade the processes that ultimately start the MOR basalt (MORB) engine and the switch from rifting to drifting are still poorly constrained. One of the most striking results of ODP drilling along the Iberia-Newfoundland conjugate margins was the scarcity of effusive magmatism and only minor volumes of intrusive rocks even in areas with undisputed oceanic magnetic anomalies. This observation is in conflict with numerical melting models that generally predict large volumes of MORB type melt. The genetic and temporal relationships of alkaline and MORB type magmatism associated with the onset of seafloor spreading may clarify the rift-to-drift transition. Here we present new mineral U-Pb and ^{40}Ar - ^{39}Ar age data (Leg 1277, 1070, 1069, 1068, 1067) together with Pb, Nd, Sr isotopic data from ODP samples (Leg 1277 and 1070) across the conjugate Iberia-Newfoundland magma-poor margins. We aim to document the igneous history related to the onset of seafloor spreading in the southern North Atlantic. Our data record a complex igneous and thermal history related to the transi-

tion from rifting to seafloor spreading. The results show that the rift-to-drift transition is marked by a stuttering start of MORB type magmatic activity. Localized MORB magmatism was replaced by basin-wide alkaline events, which resulted from delocalization of deformation and magmatic processes. During these 'tectonic' spreading episodes, low degree of decompression melting resulting in alkaline magmatism. Such 'off-axis' magmatism might be a common process in (ultra-) slow oceanic spreading systems, where 'magmatic' and 'tectonic' spreading varies in both space and time.