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Amsterdam-St Paul Hotspot: Evidence for multiple phases of activity

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The construction of the Amsterdam-St. Paul (ASP) plateau is related to the interaction between the Southeast Indian Ridge (SEIR) and the ASP hotspot.

A chain of seamounts located to the NE of the Plateau has been K/Ar dated and appears too young to be the track of ASP hotspot on the Australian plate [Janin et al., 2008]. However, new age data from the area show that this chain was formed during two different stages, the first one being younger than 2 My, and the other much older. The two types of seamounts have different morphologies. The younger ones are smaller and elongated while the older ones are more massive [Maia et al., in prep]

The two types of seamounts can be distinguished using their geochemical composition which is highly alkaline for both. The youngest ones are very enriched with (La/Sm)norm higher than 3. The oldest ones are also enriched but not as much with (La/Sm)norm between 2.5 and 2.8. A heterogeneous enriched mantle as the source of them could be an explanation but according to the geochronological constraints we consider that the old seamounts are related to the expression of the ASP plume on the Australian plate while the young ones result of melting due to a crustal crack over an enriched mantle.

The construction of ASP Plateau is also the result of several phases in the hotspot activity. Geophysical observations established that the ASP-SEIR system is conditioned by plume flux variations and by the relative movement between the plume and the spreading center [Maia et al., 2008]. Geochemical data analyses confirm that the intensity of the interaction between the plume and the ridge fluctuated in time. The oldest lavas (about 3 +/- 0.5 My old) have a stronger hotspot signature than the 1.5 My old lavas, but weaker than the most recent ones.