



## Evidence for a long-term geochemical zonation of the Tristan-Gough Hotspot

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The Walvis aseismic ridge and associated Guyot Province in the South Atlantic connect the Etendeka continental flood basalts (CFB) in Namibia with the volcanically active islands of Tristan da Cunha and Gough. Available age data indicate age progressive magmatism along this volcanic lineament consistent with a hotspot track origin (O'Connor and Duncan 1990). The Walvis aseismic ridge and guyots may also serve as a textbook example for the life cycle of a mantle plume: from vigorous, widespread CFB volcanism during the initial plume-head stage to generation of an aseismic ridge above the plume stem during the hotspot stage to production of discrete volcanic edifices during melting of a diffuse upwelling (possibly small blobs) during the final stages. Here we report new geochemical data for volcanic rocks from the Guyot Province where two distinct and spatially separated seamount chains can be identified - the Tristan and the Gough tracks. A total of 22 samples from these volcanic subtracks and the Walvis Ridge have been analyzed for major and trace elements and Sr-Nd-Pb isotopic ratios in order to map out possible compositional differences between the two seamount chains. Notably trace element and Sr-Nd-Pb isotopic data indicate distinct source compositions for the two seamount tracks, suggesting a long-term spatial zonation of the Tristan-Gough mantle source. While the Gough source seems to be most strongly influenced by the EMI mantle endmember and possibly by EMII and FOZO, the Tristan source shows a stronger influence of the FOZO-type component. The lavas from the Walvis ridge at DSDP Site 525 commonly serve as the Atlantic EMI-type endmember, a component that continues to be present within the Gough track. Furthermore, the Gough source seems to melt to a lower degree and/or is generally more trace element or garnet enriched than the Tristan source. These different geochemical signatures can be traced back for at least the past 60 Ma, the time when volcanism along the Walvis Ridge split into low volume, diffuse volcanism along the Gough and Tristan tracks. Assuming a constant upwelling rate of the plume material of about 40 mm/yr (based on published data for Tristan da Cunha; Bourdon et al. 2006), this would indicate that the spatial zonation of the plume extends at least 2400 km depth, although shallow interactions with recycled subcontinental material cannot be excluded. Finally the breakup of the Walvis ridge into compositionally discrete seamount tracks suggests that the single-column structure of the early plume may have split right along the zonation boundary to form a two-column system or blobs reflecting decreasing plume activity with time.

### References:

Bourdon B et al. 2006 Nature, 444: 713-717.  
O'Connor J M and Duncan R A 1990. Journal of Geophysical Research, 95(B11): 17475-17502.