

# Board 1668: Insights into the Early Volcanic History of the Walvis Ridge recorded by Chemostratigraphy: Preliminary Data IODP Expedition 391 Site U1575

 Thursday, 14 December 2023

 11:30 - 15:50

 *Poster Hall A-C - South (Exhibition Level, South, Moscone Center)*

## Abstract

The Walvis Ridge system consists of a series of seamounts, ridges, and plateaus formed during the opening of the southern Atlantic Ocean since ~135 Ma. International Ocean Discovery Program Expeditions (IODP) 391 and 397T drilled six sites along the length of the hotspot track to understand the magmatic processes associated with evolving plume-ridge systems. The oldest drilled segment of the ridge system – Frio Ridge – extends from the Etendeka flood basalts in Namibia westward into the Atlantic Ocean. Site U1575 is on the Frio Ridge and is the closest site to the African continent. The site drilled 118.9 m of igneous basement with 70.7 m (59.5%) of recovery. The recovered core consisted of alternating sequences of submarine pillow lavas and sheet flows, some of which were massive (up to 21 m thick). Preliminary major and trace element data demonstrate the basaltic lavas are fractionated ( $MgO = 4.8\text{-}6.4$  wt. %) with modest  $TiO_2$  contents (1.5-2.7 wt. %). The upper 52 m of igneous section (214-267 mbsf) are geochemically consistent throughout the various eruptive styles. However, an abrupt compositional shift to lavas with lower incompatible element abundances ( $TiO_2$ , Zr, Sr, Nb, La, etc.) from 274-311 mbsf demonstrates a clear shift in magmatic source contributions. Below this, the lavas return to compositions similar to the upper portion of the hole. Shipboard natural gamma radiation (NGR) and magnetic susceptibility (MS) measurements correlate with mineralogical and compositional changes. Specifically, decreases in NGR correlate well with decreases in  $K_2O$ , Sr, Y, and Zr. MS is positively correlated with zones containing olivine. Trace element discrimination plots demonstrate a dual character: Ti-V relationships are strongly MORB-like while Th/Nb suggests the lavas have both MORB and plume characteristics, consistent with the formation of the Frio Ridge through plume-ridge interaction. Elevated Zr/Nb and Y/Nb values are also consistent with a hybrid source. The composition of this core contrasts sharply with cores recovered from the younger Guyot Province to the southwest. Sites U1578 and U1585 have episodes of higher  $TiO_2$  contents (>3.5 wt. %) with trace element signatures (e.g. low Zr/Nb & Y/Nb) indicative of a pronounced plume component, consistent with an intraplate setting for the formation of the Guyot Province.

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## First Author



**Wendy R Nelson**

Towson  
University

## Authors



**Zachary Greenwald**

Towson  
University



**John W Shervais**

Utah State  
University



**Drew White**

Utah State  
University



**Mike Widdowson**

University of  
Hull



**Kaj Hoernle**

GEOMAR  
Helmholtz  
Centre for  
Ocean  
Research Kiel



**Tobias Walter Höfig**

Texas A&M



**Rohanna Bowers**

Towson  
University



**Katherine E Potter**

Utah State  
University



**Jesse Scholpp**

Department of  
Geology



**Mbili Tshiningayamwe**

University of  
Namibia



**William W Sager**

University of  
Houston



**Yusuke Kubota**

Tokyo Institute

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