Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.17418

Magmatic and geodynamic evolution of the King's Trough Complex – The Grand Canyon of the North Atlantic

ANTJE DÜRKEFÄLDEN[1], JÖRG GELDMACHER[1], FOLKMAR HAUFF[1], DIETER GARBE-SCHÖNBERG[2], MAXIM V. PORTNYAGIN[1], JOHANNA SCHENK[1], MICHAEL STIPP[3] AND DR. KAJ HOERNLE, MA, PHD[1,2]

[1]GEOMAR Helmholtz Centre for Ocean Research Kiel
[2]University of Kiel
[3]Martin-Luther-University Halle-Wittenberg
Presenting Author: aduerkefaelden@geomar.de

The King's Trough Complex (KTC) is a major canyon-like structure in the eastern North Atlantic and consists of several deep basins: The huge King's Trough in the west is flanked by elongated seamount-like structures, while at its eastern opening the smaller Peake and Freen Deeps are separated by the Palmer Ridge. The King's Trough is located in an area of elevated seafloor covered with numerous seamounts, which transitions to the Mid-Atlantic Ridge (MAR) flank toward the west. The KTC has been only sparsely sampled so far [1-3] and its origin is debated for around five decades. Therefore, we carried out extensive sampling by dredging as well as bathymetric mapping of the KTC and the Gnitsevich Seamounts to the NW during R/V METEOR cruise M168 in 2020 and conducted major and trace element and radiogenic isotope (Sr-Nd-Hf-Pb) analyses in order to decipher their magmatic and geodynamic evolution.

Whereas lavas from the Peake and Freen Deeps and Palmer Ridge show N- and E-MORB trace element and mostly moderately depleted radiogenic isotope compositions, samples from the King's Trough and Gnitsevich Seamounts display enriched OIB-like compositions with only a few exceptions. This geographic transition would be consistent with involvement of a mantle plume (Azores plume?) that was located beneath or near the MAR resulting in elevated seafloor in the King's Trough area and its enriched geochemical composition. The troughs probably formed by rifting and/or transtension after crust formation and may represent either an extinct spreading ridge or oceanic transform fault forming a temporal plate boundary between the Iberian and Eurasian plates. At its eastern end, the KTC cuts into older oceanic crust, perhaps formed prior to any plume-ridge interaction and thus possesses transitional and normal MORB composition. Age data and additional radiogenic isotope data are pending and will show if the ridges on the King's Trough flanks represent younger, plume-related excess volcanism or simply the tops of tilted ocean crust of a former plate boundary.

[1] Chernysheva et al. (2013) *Doklady Earth Sciences* **448(2)**, 194-199. [2] Lisitsyn et al. (1996) *Oceanology* **36(3)**, 398. [3] Stebbins & Thompson (1978) *J. Volcanol. Geotherm. Res.* **4(3)**, 333-361.