The submarine Chatham Rise, east Zealandia, is a key location of the early continental breakup of the eastern Gondwana (< 100 Ma; [1]). It has been suggested that a mantle plume beneath Zealandia and West Antarctica existed and that a slab window formed as a consequence of the collision of the Hikurangi oceanic plateau with the Chatham Rise, allowing deeper mantle material to upwell and hence cause the rifting. However, the exact processes that have led to this rifting and the sequence of reorganization in the upper mantle in course of and after the breakup of Zealandia from West Antarctica are still unclear. We present new major and trace element and Sr–Nd and high-precision Pb isotope data from submarine samples recovered during the R/V Sonne research expedition SO246 at the southeast Chatham Rise, covering the Chatham Rise Terrace and adjacent areas of the margin and the abyssal plain. The samples include alkali and tholeiitic basalts and minor basanite and trachybasalt, all of which have a composition between ocean island basalt (OIB) and mid-ocean-ridge basalt (MORB). Trace element ratios (e.g., Th/Yb, Nb/Yb) indicate that all but one seamount were derived from enriched sources at a low degree of melting, while one of the seamounts close to the abyssal plain was derived from a depleted mantle source at a high degree of melting. Sr-Nd-Pb isotope variations further support contribution of at least three distinct mantle source components, including a HIMU (high time-integrated U/Pb)-type sources, an enriched mantle (EM)-type sources, and a depleted mantle (N-MORB)-type source. These observations appear to be consistent with previous published data and models proposed by [2] and [3]. These sources will be placed in a chronological framework by incorporating further geochemical data and 40Ar-39Ar ages, providing us better insights into the sequence of events and magmatic processes that occurred at this region.

References:

Plain Language Summary

Authors

Ester Munoz Jolis *
GEOMAR Helmholtz Centre for Ocean Research Kiel
Kaj Hoernle  
GEOMAR Helmholtz Centre for Ocean Research Kiel

Folkmar Hauff  
GEOMAR Helmholtz Centre for Ocean Research Kiel

Dieter Garbe-Schönberg  
CAU Kiel

Reinhard Werner  
GEOMAR Helmholtz Centre for Ocean Research Kiel

Karsten Gohl  
Alfred Wegener Institute Helmholtz-Center for Polar and Marine Research Bremerhaven

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