Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.19558

Hydrothermal fluids at continental breakup – insights from sulfide trace elements and fluid inclusions from the South China Sea continent-ocean transition

JÖRG FOLLMANN[1], FROUKJE M. VAN DER ZWAN[1], MATTHIAS FRISCHE[2], THOR H. HANSTEEN[2] AND SVEN PETERSEN[3]

[1]KAUST - King Abdullah University of Science and Technology
[2]GEOMAR Helmholtz Centre for Ocean Research
[3]GEOMAR Helmholtz Center for Ocean Research

Presenting Author: joerg.follmann@kaust.edu.sa

The role of hydrothermal circulation during continental breakup and the initial formation of a young oceanic crust is poorly constrained. The northern margin of the South China Sea is a location where continental breakup can be studied [1,2]. Cores from a hydrothermal stockwork in the continent-ocean transition here, drilled by IODP Expedition 368, provide a unique opportunity to study hydrothermal circulation during initial ocean crust formation.

Petrographic studies of the retrieved core, reaching 164 m into the basement, revealed hydrothermally altered MORB basalts and sheet lava basalts[3], hosting a hydrothermal stockwork mineralization with different stages of development.

These different mineralization stages form a paragenetic sequence that consist of 1) an early-stage alteration phase, dominated by a vein-style epidote-quartz-pyrite-chalcopyrite ± sphalerite mineral assemblage, and associated chloritization of the wall-rocks, and 2) a younger phase, of siderite-ankerite-dolomite-pyrite veins with minor proportions of covellite, digenite, and bornite that cross-cuts the previous chlorite-alteration and mineralization.

To understand hydrothermal mineralization during continental breakup, it is crucial to study the characteristics as well as the spatial and temporal changes of fluid composition and temperatures, alteration, and mineralization between the stages and within the veins.

We will present trace element distribution data for sulfides in each mineralization stage covering different depths and discuss changes in the elemental budget and sulfidation states. Insights into the temperature, composition, and salinity of the corresponding fluids are provided by fluid inclusion data from epidote, quartz, and carbonates.

These findings provide, for the first time, an understanding of the chronology and evolution of hydrothermal circulation stages during continental breakup and the formation of the South China Sea.

[1] Courtillot, V. (1982), *Tectonics*, 1(3): 239-250.

[2] Withmarsh R., Manatschal, G., Minshull, T. (2001), *Nature*, 413 (6852): 150-154.

[3] Sun, Z., Jian, Z., Stock, J.M., Larsen, H.C., Klaus, A., Alvarez Zarikian, C.A., and the Expedition 367/368 Scientists (2018), *Proceedings of the International Ocean Discovery Program*, 367/368.