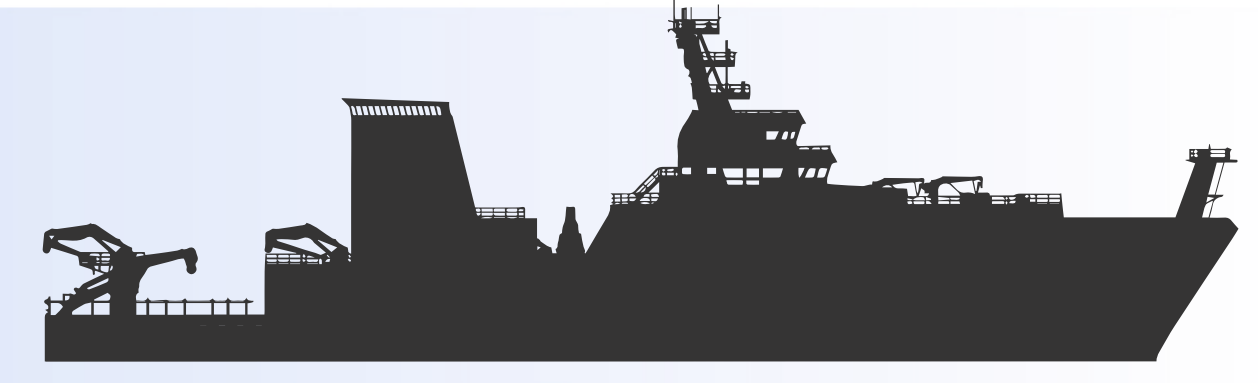




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 und Rohstoffe

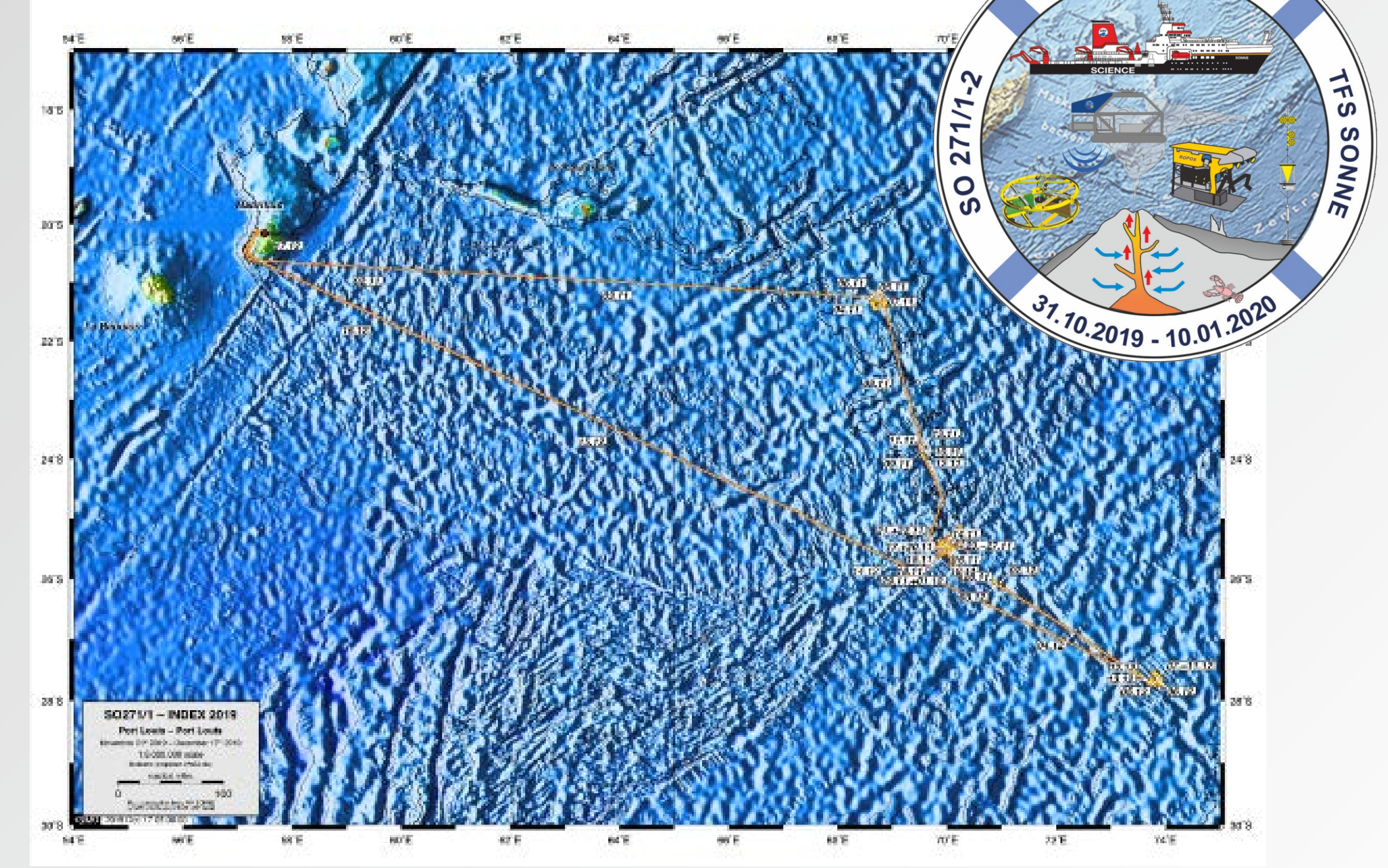
EXPLORING THE INDIAN OCEAN - RESULTS FROM CRUISE SO271/1 GEOZENTRUM HANNOVER

Introduction

The expedition SO271/1 (INDEX 2019 Leg 1) of BGR with TFS SONNE targeted the German license area for polymetallic sulfides in the Indian Ocean. The cruise focused on the detailed bathymetric and geological exploration for active vents and inactive sulfide fields in the license area as well as (paleo) oceanographic, sedimentary and faunal base line studies applying 12 different operational tools. Very few environmental and geological studies exist in this part of the Indian Ocean so far. Our work therefore contributes to the understanding of regional and ocean-wide oceanographic and sedimentation processes and to the faunal census.

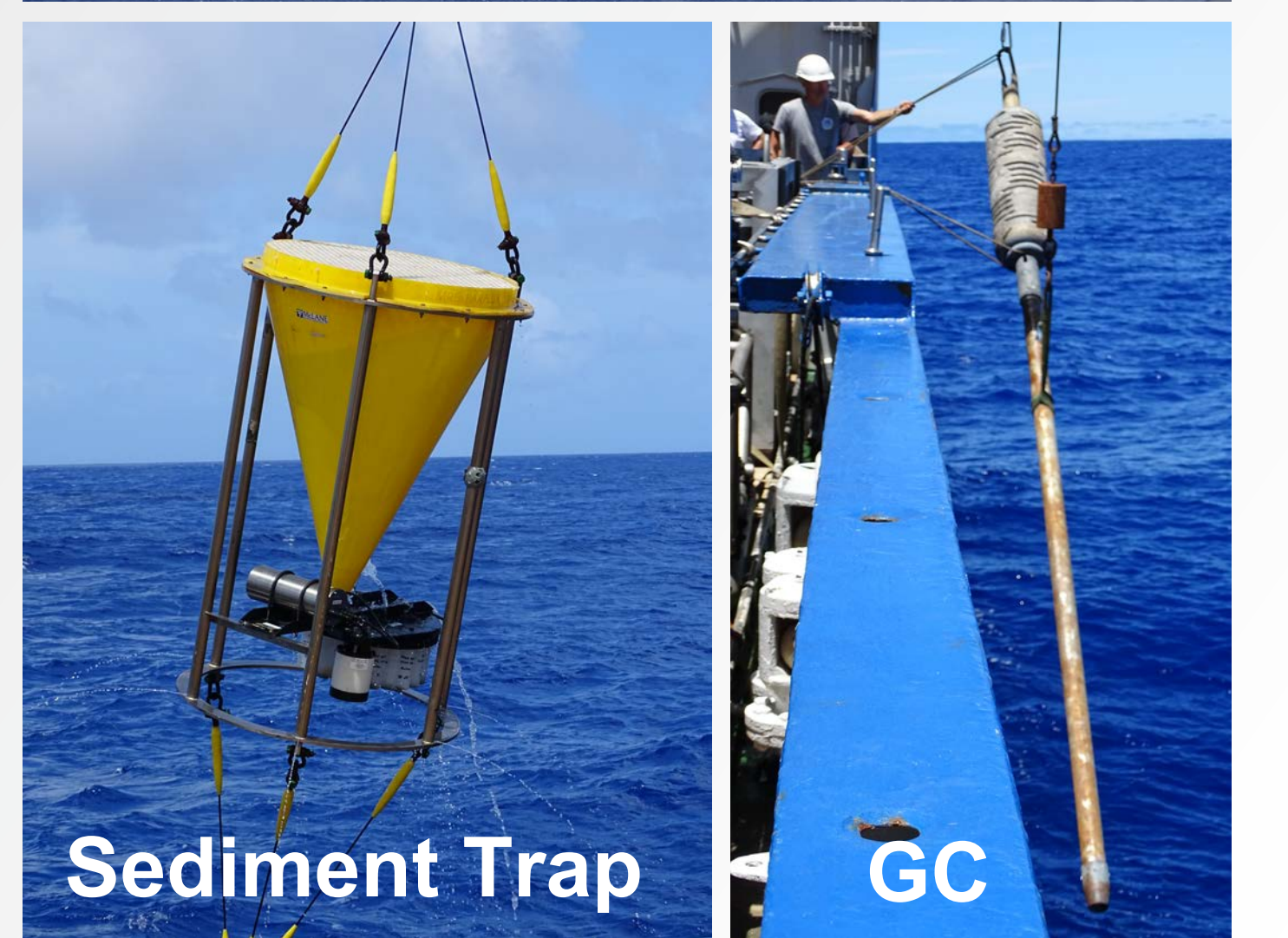
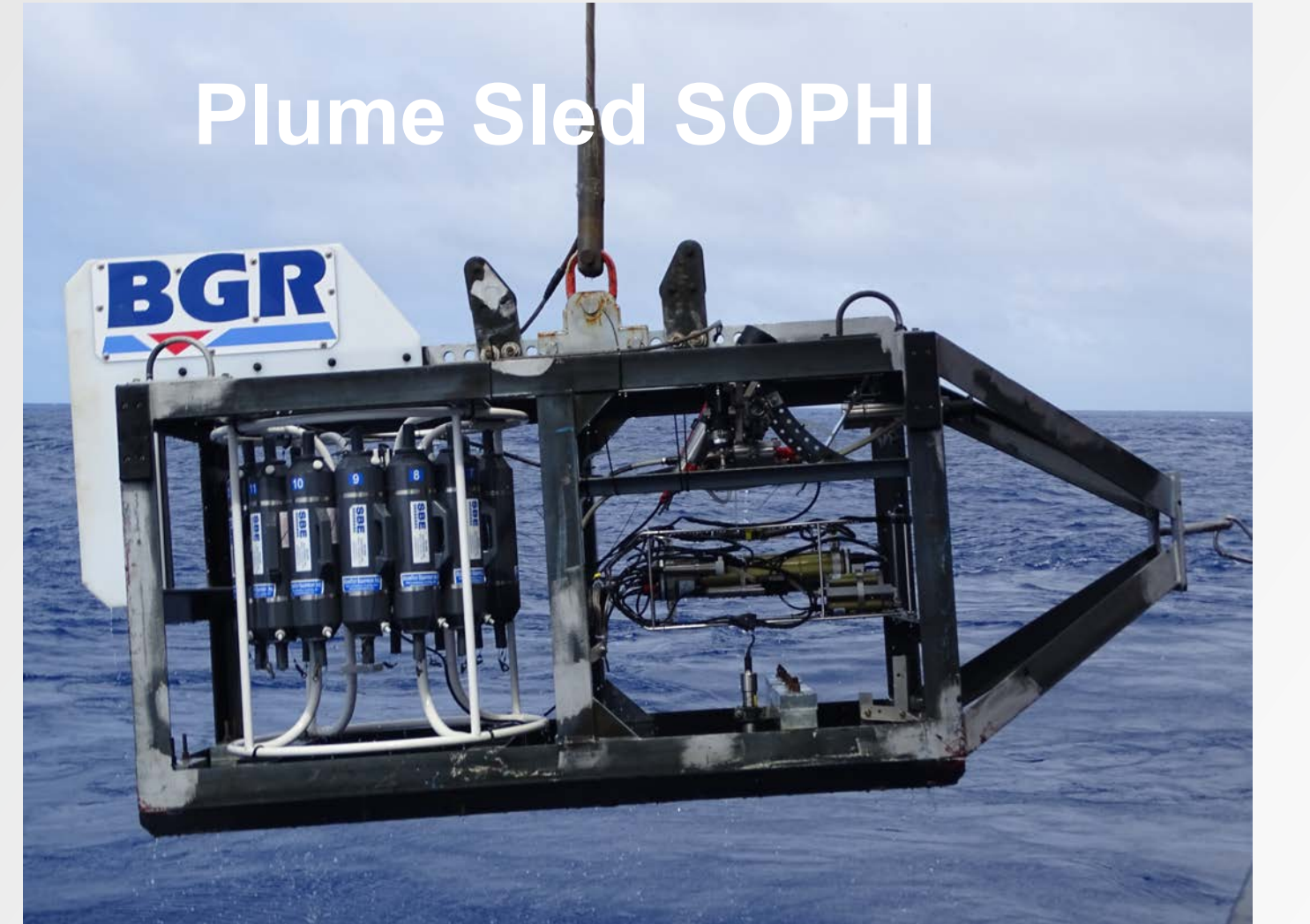
Results of this expedition are due to the collaborative work of colleagues from the Universities of Hamburg, HCU Hamburg, Kiel, Erlangen, Padua, the DZMB Senckenberg am Meer Wilhelmshaven and INES GmbH, as well as GEOMAR in Kiel together with BGR.

SO271/1 cruise track



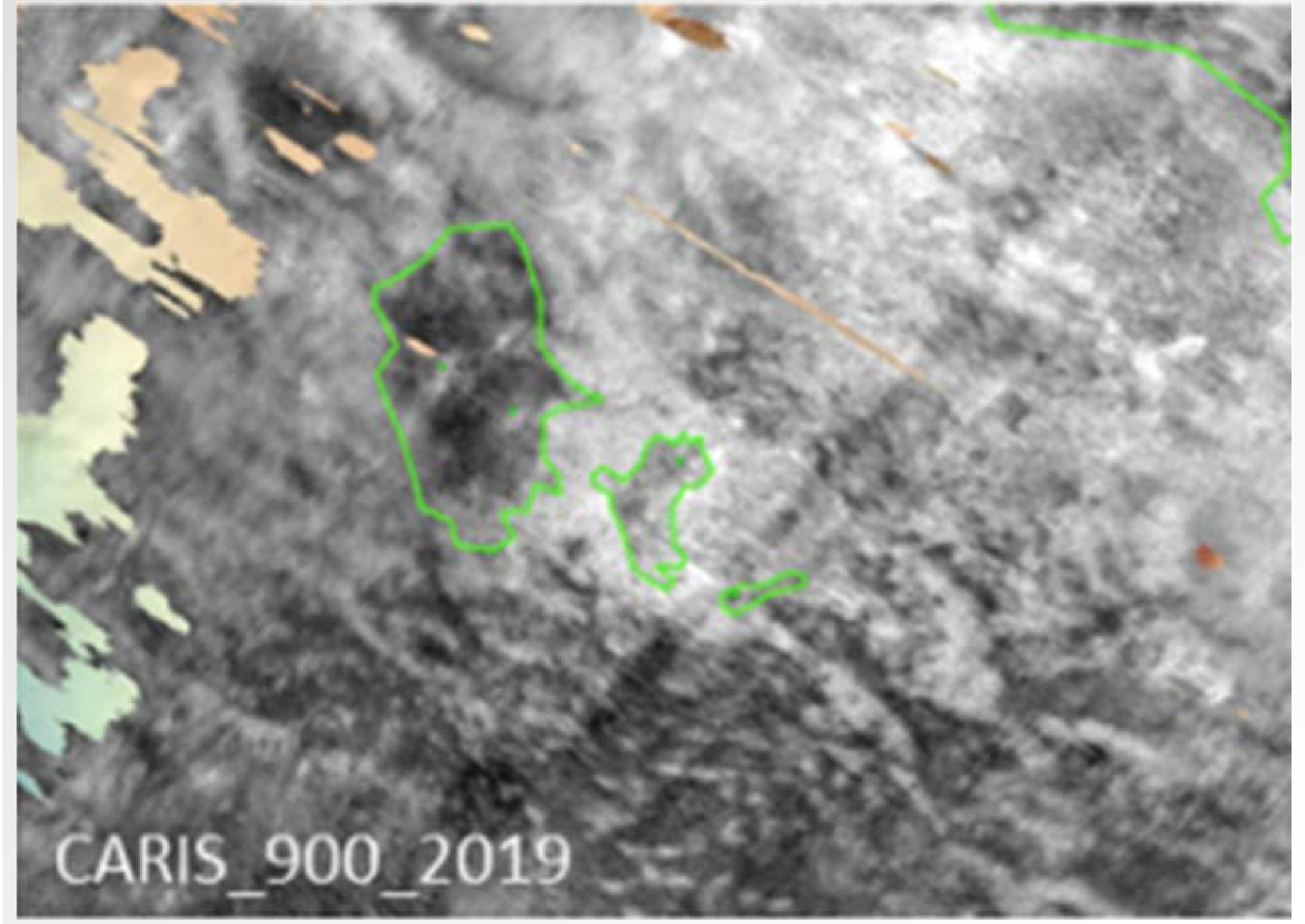
Cruise plot for SO271/1, courses along the southern Central Indian Ridge and the northern Southeast Indian Ridge, Central Indian Ocean. The cruise started and ended in Port Louis, Mauritius. Numbers refer to dates in Nov. and Dec. 2019.

Instruments



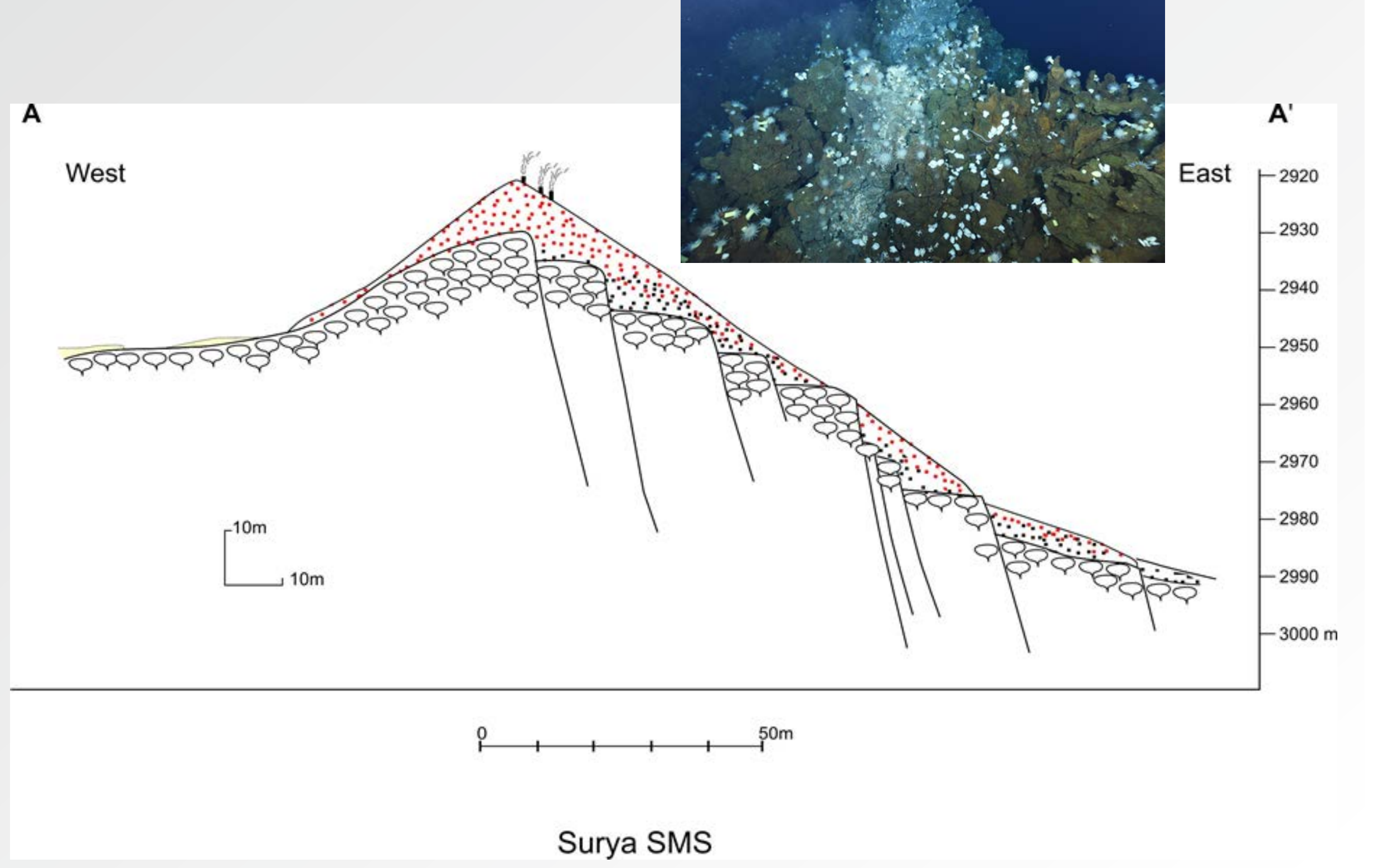
High-resolution backscatter

Focus of research was laid on the application of backscatter data for seabed classification and the detection of hydrothermal sites. In the figure below backscatter mosaic of the ALPHA field in Cluster 04 is shown with hydrothermal sites indicated.



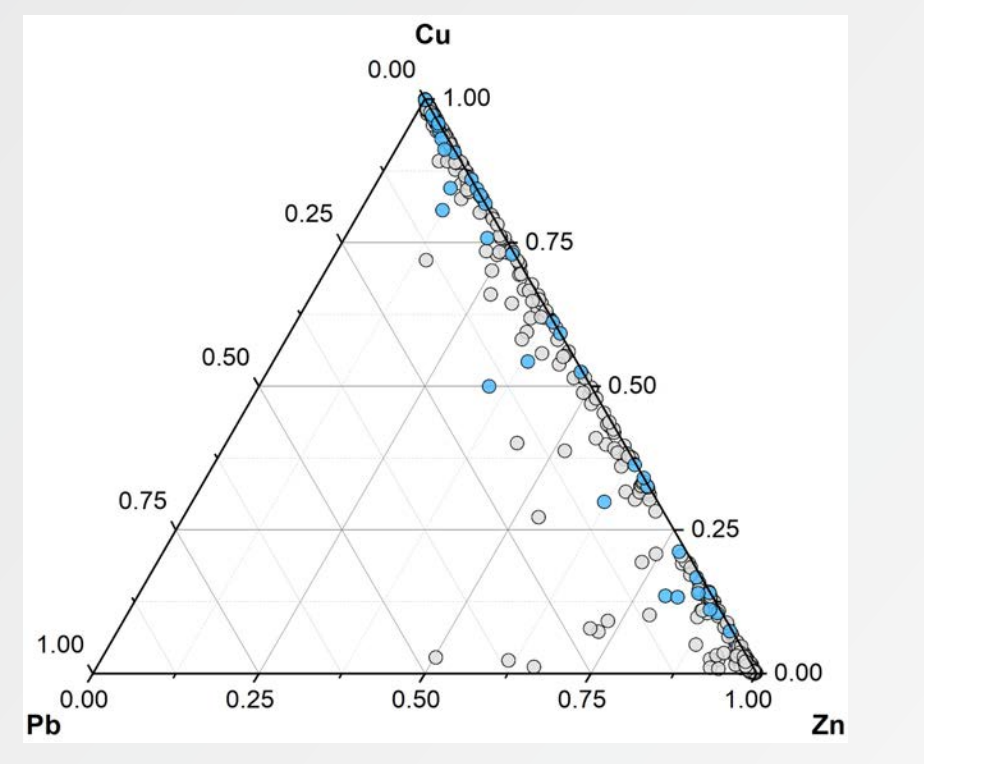
Geological mapping and interpretation

High resolution geological maps and interpretative cross sections are one basis for resource assessment. In the figure below a cross-section through the SURYA hydrothermal site detected during SO271/1 and an UW photograph of a sulfide chimney from the top of the hydrothermal mound are shown.



Geochemistry and mineralogy

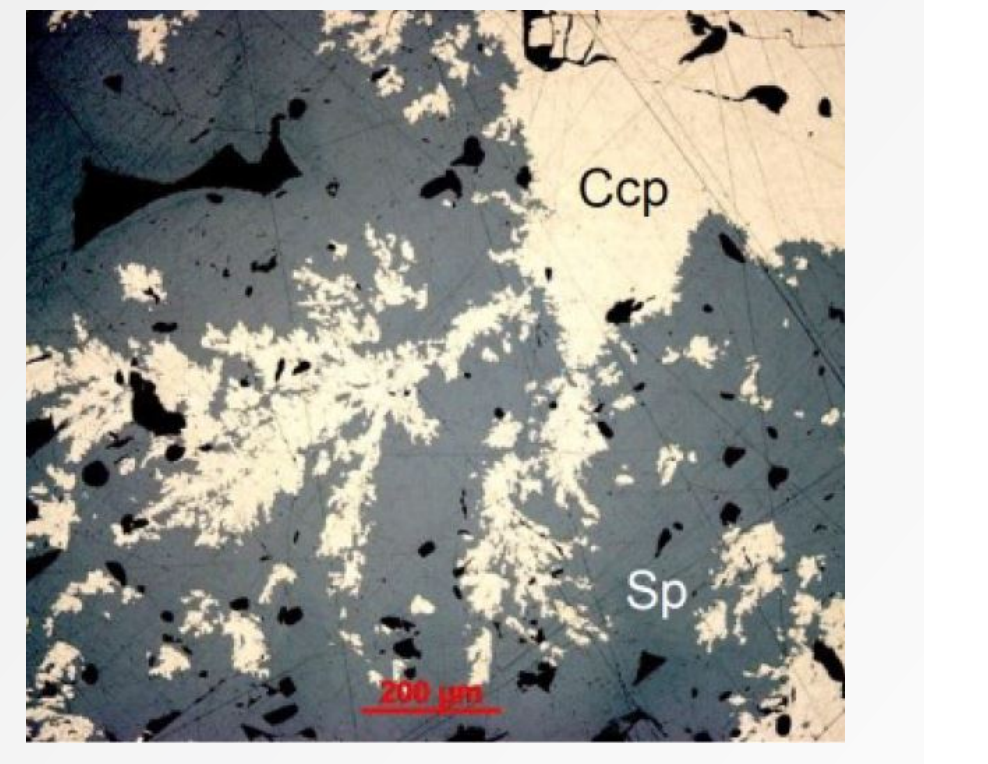
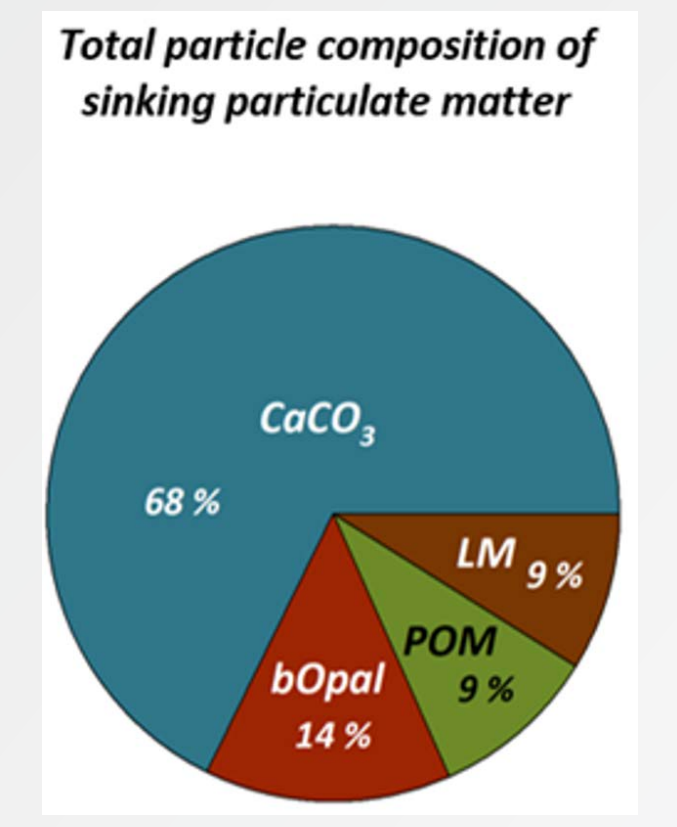
Bulk geochemical analysis as well as ore mineral assemblages, mineralization textures, and mineral chemistry were studied. Sulfides reveal Cu-Zn bimodal chemistry reflecting temperature-dependent precipitation of sulfide minerals from hydrothermal fluids. Chalcopyrite disequilibrium indicates fluid temperature fluctuations.



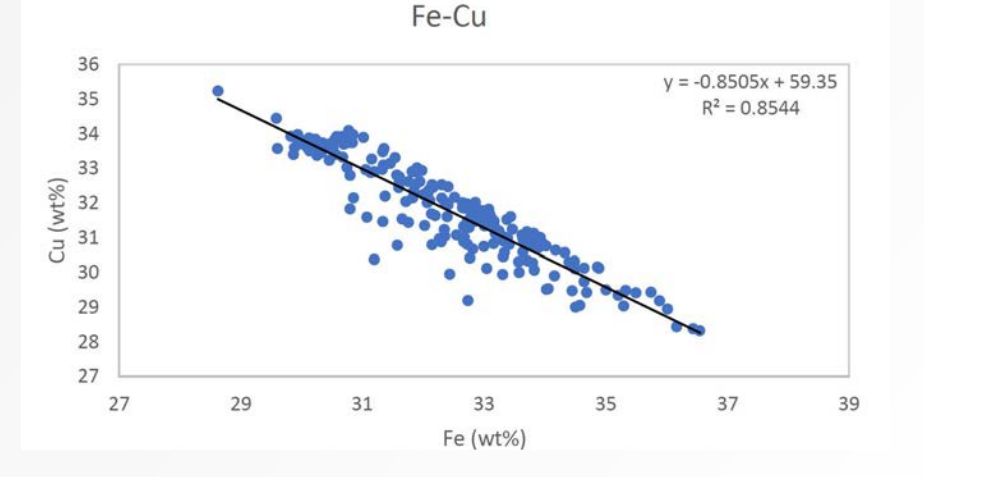
Composition of massive sulfides from the entire license area.

Sediment trap moorings

There is limited field data on POC fluxes in the Indian Ocean and virtually nothing is known on sinking particulate matter fluxes in the southern Indian Ocean subtropical gyre (IOSG). Within the INDEX program sinking particulate matter and surface sediments have been sampled between 2014 and 2019.



Chalcopyrite-sphalerite intergrowth



Fe-Cu correlation in chalcopyrite

We thank the BMBF and PTJ for providing the shiptime and master Oliver Meyer and the ship's crew for their support.