MARIE THARP LECTURE SERIES
FOR OCEAN RESEARCH | **NO.27**

GEOMAR

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"IT WAS VERY EXCITING IN THOSE DAYS.
WE WERE EXPLORERS."

Marie-Tharp (1920-2006), Oceanographer

Wednesday, 24st April 2019, 11:00 a.m. (11:00h)

GEOMAR Lecture Hall East | Wischhofstr. 1-3, 24148 Kiel

Interplay Between Magmatic, Tectonic and Hydrothermal Processes at Oceanic Plate Margins

Hydrothermal circulation at oceanic plate margins is driven by heat from crystallization of magma and cooling of young oceanic lithosphere. Since the discovery of high-temperature hydrothermal vents on the seafloor forty years ago, much has been learned about the subsurface seawater-rock reactions and the formation of seafloor mineral deposits.

I will present several examples of seafloor hydrothermal systems that illustrate the variable connections between magmatic, volcanic, and tectonic processes; hydrothermal convection within the oceanic basement; and the chemistry of discharging hydrothermal fluids and mineral deposits. Along fast-spreading mid-ocean ridges, such as the East Pacific Rise, robust magma supplies result in extension being mostly accommodated by magmatism. Hydrothermal convection is driven by heat from axial magma lenses at shallow depths which limits the depths of fluid circulation. As spreading rate decreases, faulting with only intermittent volcanic activity accommodates a significant portion of the extension. Fluids are focused along large faults and can reach much greater depths, such as at the TAG hydrothermal field on the Mid-Atlantic Ridge. In convergent margin settings, such as at Brothers submarine arc volcano, fluids react with more felsic rocks, and magmatic degassing significantly impacts the chemistry of circulating fluids and the nature of seafloor mineral deposits. This interplay between magmatic, tectonic and hydrothermal processes facilitates the cycling of heat and mass between the Earth and the oceans.

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