FULLY FUNDED Royal Society PhD Project
at the School of Ocean and Earth Science,
National Oceanography Centre Southampton, University of Southampton.

Determining the duration of ridge flank hydrothermal exchange
and its role in global biogeochemical cycles

Supervisors: Dr Rosalind Coggon and Prof Damon Teagle (Ocean and Earth Science, University of Southampton), and Prof Anthony Koppers (Oregon State University, USA)

Ocean chemistry reflects a dynamic balance between riverine inputs, biological processing, sediment burial, and hydrothermal exchanges with ocean crust. Current models of seawater geochemical evolution generally only consider high temperature hydrothermal venting along ridge axes, ignoring the lower temperature reactions across the vast ridge flanks. Investigating ridge flank exchange, however, is not easy: it requires scientific ocean drilling through thick sediments into the oceanic crust. To date, most investigations have taken place on only young and very old crust. Consequently, although there is a measurable conductive heat flow anomaly in young ocean crust for on average ~65 million years, whether this thermal exchange also results in continual chemical exchange is not known.

The student will work on the very first samples of 7-61 Ma ocean crust from the Southern Mid-Atlantic Ridge flank that were collected in spring/summer 2022 by the International Ocean Discovery Program. Working in the state-of-the-art geochemistry laboratories at the University of Southampton, they will use both traditional and novel radiometric-dating techniques to determine the ages of formation of hydrothermal vein minerals. The student will also have the opportunity to develop a new method for $^{40}$Ar/$^{39}$Ar dating of clay minerals, during two 3-month visits to work with Prof Koppers in Oregon. The data generated will allow the timing and duration of ridge flank hydrothermal exchange to be determined, and consequently its role in setting the chemical composition of the oceans, for the first time.

Preferred start date: 1st October 2023 – but some flexibility possible
Open to UK/EU applicants

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This project aims to quantify hydrothermal exchange, providing a baseline to investigate vital Earth processes from records of past ocean chemistry.