**Constraints on hydrothermal fluid fluxes from Tl geochemistry**

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Hydrothermal circulation of seawater is a fundamental process in the formation and aging of the ocean crust. This hydrothermal activity has a major impact on ocean chemistry, which in turn may be used to investigate past and present variations of the Earth’s climate. The hydrothermal contribution to ocean chemical budgets depends on the composition and flux of hydrothermal fluids.

Thallium (Tl) exhibits distinct behaviour in axial and off-axial hydrothermal systems [1]. During on-axis high-temperature hydrothermal circulation, Tl is leached from the sheeted dikes with no fractionation in Tl isotope composition (ε205Tl). In contrast, isotopically light Tl is added to the upper crust from seawater during low-temperature off-axis circulation. A simple Rayleigh fractionation model can be used to account for the decreasing extent of Tl-enrichment and isotopic fractionation with depth [1].

We present new MC-ICPMS measurements of Tl concentrations and isotopic compositions of ocean crust produced at slow- (Macquarie Island), intermediate- (Ocean Drilling Program Holes 504B and 896A, and the Juan de Fuca Ridge), and fast- (ODP Hole 1256D) spreading rates. These data allow us to constrain the axial and off-axial hydrothermal fluid fluxes required to produce the observed shifts in Tl concentration and isotopic fractionation with depth [1].

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The uppermost basement from ODP Hole 504B displays ε205Tl = -20. Since seawater is characterized by ε205Tl = -6, the off-axis uptake of Tl by the ocean crust is associated with a fractionation factor of 0.9986. We evaluate which minerals are responsible for Tl-uptake from seawater using analyses of samples that exhibit different styles of alteration.