

## Distributions of Th isotopes in the North Pacific Ocean

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We investigated the vertical distribution of thorium isotopes in mid-latitudes of the Pacific Ocean especially <sup>230</sup>Th as a test case of scavenging of metals, and discuss the control factor of the distribution of <sup>230</sup>Th.

Sea water samples were collected on board the R/V Hakuho-Maru during KH-00-3 (The Bootes expedition) on Jun-July, 2000 and KH-03-1 (The Hydra expedition) on Jun-August, 2003. For <sup>230</sup>Th measurements, large-volume water samples of 250 liters for each depth were obtained. After separation with anion exchange, <sup>230</sup>Th was determined by alpha spectrometer. For <sup>232</sup>Th measurements, clean sampling techniques were applied. <sup>232</sup>Th was determined by SF-ICP-MS (Finnigan Element 2).

<sup>230</sup>Th section shows lateral uniformity in the upper ca. 3000 m, but below 3000 m, <sup>230</sup>Th distributions show geographical variations. Regarding the stratified hydrography in the deep layer, the depletion of <sup>230</sup>Th could be attributed to local bottom scavenging at seafloor and diffusion of low <sup>230</sup>Th sea water.

<sup>232</sup>Th section along 20°N did not indicate definite lateral transport effect. Assuming no lateral transport of <sup>232</sup>Th in the Central Pacific, atmospheric <sup>232</sup>Th input is calculated to be 1.2 µg/m<sup>2</sup>/year from <sup>232</sup>Th concentration in water column and <sup>230</sup>Th residence time. This calculated input corresponds with the estimation based on dust flux and averaged <sup>232</sup>Th concentration in the dust (2–5 µg/m<sup>2</sup>/year [1]).

[1] Roy-Barman *et al.* (1996).

## Using trace elements to constrain relationships between minerals and glasses in mixed-magma volcanic rocks

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Assessing geochemical relationships between minerals and glasses in mixed-magma volcanic rocks can be challenging because of the scrambling of the different magmas and crystal cargos. These and subsequent processes preclude assuming simple genetic relationships between any crystal and the adjacent glass. An example is the 309±6 ka, ~13 km<sup>3</sup> DRE Fasnía Member of the Diego Hernández Formation, Tenerife. The Fasnía represents the eruption of a mixture of two distinct end member phonolite magmas and a small amount of mafic magma that resulted in a significant volume of hybrid phonolite magma. Microprobe and LA-ICP-MS analyses of crystals and glass in Fasnía pumices have revealed three distinct pyroxene groups (salites with ~1wt% Na<sub>2</sub>O, Na-salites with >1.5wt% Na<sub>2</sub>O, and titanaugites), titanites with a range in compositions (32.3 to 36.7 wt% TiO<sub>2</sub>), and three dominant phonolitic glass compositional fields that were not resolvable by bulk pumice analyses; low-Zr phonolite (500 to 850 ppm Zr), high-Zr phonolite (>1800 ppm Zr), and hybrid phonolite (1100 to 1800 ppm Zr). Clearly the titanaugites crystallized in the mafic magma, however confidently matching salites, Na-salites, and titanites with their respective parental magmas required a more rigorous approach. We applied the lattice strain trace element partitioning model using REE in the salites, Na-salites, titanites, and ~500 glass analyses. First, apparent REE mineral-melt partition coefficients for pyroxenes and titanites were calculated using all the glasses. Then the apparent partition coefficients for each mineral-glass pairing were evaluated using a linear form of the lattice strain model equation. Mineral glass pairs with the best linear correlation coefficient were identified as equilibrium pairs. Using this approach we are able show that salites crystallized in low-Zr phonolite magma and Na-salites crystallized in hybrid phonolite. Similarly, the titanites crystallized in low-Zr and hybrid phonolite. This suggests that high-Zr phonolite was crystal-free and may represent a filter-pressed or super-heated liquid.