Cerium isotope systematics in the Mariana arc-basin system

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The rare earth elements include two radiogenic systems with long-lived parents: ^{138}La-^{138}Ce ($T_{1/2}$= 292.5 Ga) and ^{147}Sm-^{143}Nd ($T_{1/2}$= 106 Ga). The inverse chemical behaviour of parent/daughter elements during magmatic processes generate a linear anticorrelation in a Ce-Nd isotope space. However Ce displays a specific behavior in supergene environments because of its two valence states (3+ and 4+). The participation of sediments with strong negative Ce_N/Ce^* ($Ce^*=[La_N+Pr_N]/2$) anomalies in the generation of subduction zone magmas produce lavas with Ce-Nd signatures that lie off the mantle array. In this study we report Ce and Nd isotope measurements of Mariana arc and backarc volcanics as well as samples recovered from the subducted slab assemblages: ODP Site 801 sediments and serpentinite (blueschist) melanges from ODP Site 1200.

Ce and Nd isotopic ratios were measured by TIMS at the Laboratoire Magmas et Volcans. The long-term precision on the AMES standard ^{138}Ce/^{142}Ce ratio is 80 ppm (33 months) however during the same analytical session the external precision is ~40 ppm. Our mean chondritic value is 0.0225654±7 in agreement with previous studies [1].

Mariana arc magmas have e_{Ce} between -0.9 to -0.3, similar to MORBs, whereas they are less radiogenic in Nd (e_{Nd} from 6.1 to 8.2). Basalts from the arc and backarc basement (Mariana Trough) have significantly lower e_{Ce} (-1.8 to -1.6). Subducted sediments plot in the bottom right quadrant in the e_{Ce}-e_{Nd} diagram (e_{Ce}: 0.3 to 1.1 and e_{Nd}: -8.6 to -0.8).

Our preliminary results show that in a binary Ce-Nd isotopic mixing model the local depleted mantle (pre-arc basement and Mariana Trough) are a better mixing end-member for the arc lavas than the common mantle source of MORB. These results will be compared to those measured in other oceanic arcs with contrasting geodynamic settings [2, 3].

[1] Makishima and Masuda, (1993), *Chem. Geol.* **106**, 197-205; [2]. Shimizu et al., (1992), *Contrib. Mineral. Petrol.* **110**, 242-252; [3] Bellot et al., *Geochim. Cosmochim. Acta*, submitted.