Li Isotopic Composition of Arc-Related Lavas from Viti Levu, Southern Fiji

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Isotopics composition of Li in volcanic arc lavas reflects the composition of their sources and can be potentially used to determine the relative contributions of subducted oceanic crust, sediments and material derived from the overlying mantle wedge (Moriguti and Nakamura 1998, Tomascak et al. 2000, Chan et al. 2002).

Li was extracted from samples of mid-Miocene (15–10 Ma) early-arc tholeiites collected from the southern shore of the Viti Levu Island (southern Fiji) and from the late-arc rift-related calc-alkaline basalts and shoshonites of late Miocene – Pliocene age (5.5 to 3 Ma) from the northern coast of Viti Levu. We have used a two-stage ion exchange chromatography to separate Li from the matrix prior to the analysis on ICPMS to avoid the matrix induced bias of isotopic data. We have utilized low volume (2 mL) polyethylene and PFA columns and conventional ion exchange techniques (Dowex anion 1-X8 and cation 50W-X8 ion exchangers) to achieve quantitative separation of Li. Isotopic composition of Li was measured by quadrupole (VGE PQ3) ICPMS. The external correction for instrument mass bias utilized measurements of the NBS lithium carbonate L-SVEC standard before and after each sample.

Li isotopic composition of the studied lavas from the southern Fiji Island varies between −19.7‰ and +0.2‰ δ^6Li. The large range of Li isotopic composition reflects, to some extent, a strong post-magmatic alteration of some lava samples. There is, however, a clear zoning in the Li isotopic composition across the Fiji volcanic arc from the isotopically heavier early-arc tholeiites to the calc-alkaline basalts and shoshonites which have isotopically lighter Li. Assuming a normal chemical zoning of magmas across the volcanic arc (tholeiitic–calc alkaline–shoshonitic), the observed Li isotopic composition of lavas suggests a shift towards lighter Li sources with increasing depth of the subducted slab. This zoning is also consistent with progressively less contribution of the subduction component to the arc magmas at higher depths of the Wadati-Benioff zone.

References

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Magnetic Susceptibility as an Indicator of Tectonic Setting of Granitic Rocks of the Bohemian Massif

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The bulk magnetic susceptibility of granitic rocks is very variable. It ranges from the order of 10^{-6} (SI of units is used) in leucocratic granites to the order of 10^{-1} in some granodiorites or tonalites. However, the susceptibility is not distributed homogeneously, but displays a bimodal distribution. One mode corresponds to the values of 10^{-3} to 10^{-2} and the other one to those of 10^{-5} to 10^{-4}. In the petrophysical literature, the former mode granites are simply referred to as magnetic, while the latter as non-magnetic or weakly magnetic. The susceptibility of the magnetic granites is carried by magnetite, while in the weakly magnetic granites it is carried mostly by paramagnetic minerals (mafic silicates, ilmenite).

From the point of view of their composition, granitic rocks do not also create a homogeneous group, but can be divided into different types, originated in different tectonic settings. Two of the types are of particular importance: an I (igneous) type, broadly corresponding to the biotite hornblende tonalite association, and an S (sedimental) type, broadly corresponding to the two-mica granite association. These two types can be accomplished by another two: an M type corresponding to the most calc-alkaline plagiogranites and an A type corresponding to anorogenic alkali granites.

From the point of view of magnetic minerals, granitic rocks can be divided basically into two series, one being