Geophysical Research Abstracts
Vol. 14, EGU2012-9172, 2012
EGU General Assembly 2012

Nature and distribution of ultramafic layers in the mantle section of the Oman ophiolite: implications for early magma genesis below a spreading centre

M. Python (3,1), G. Ceuleneer (2), A. Tamura (3), and S. Arai (3)

(1) Hokkaido University, Department of Natural History Sciences, Sappro, Japan (marie@earth.s.kanazawa-u.ac.jp), (2) Laboratoire Géosciences Environnement Toulouse, Observatoire Midi-Pyrénées, Toulouse, France (georges.ceuleneer@get.obs-mip.fr), (3) Kanazawa University, Department of Earth Sciences, Kanazawa, Japan (kamui@kenroku.kanazawa-u.ac.jp, ultrasa@kenroku.kanazawa-u.ac.jp)

Pyroxenitic dykes transposed into parallelism with the high-temperature plastic flow structures of their host harzburgites (layerings) are common features in the mantle section of the Oman ophiolite. In order to better constrain their origin, we performed a systematic survey of these layerings (524 sampling stations distributed all along the Oman range). They generally crop out as series of several parallel layers, a few mm (one crystal) to several cm thick, with a characteristic spacing of a few cm. Their host is usually harzburgite showing, in one third of the cases, a gradual increase in the Opx content toward the layer and, elsewhere, no variation in the Opx mode. Locally, concordant dunites (a few mm to a few cm thick) are in contact or associated with the pyroxenites as isolated layers. The modal composition of the layers themselves is quite variable, covering a wide part of the ultramafic domain: most of them are orthopyroxenites and websterites. Clinopyroxenites, wehrlites, clinopyroxene-bearing harzburgite and lherzolite are less common. Mineral composition of the layers is globally within the field of the mantle harzburgites, i.e. primitive in terms of Mg# and highly depleted in incompatible elements (HFSE and LILE). The Al content of the pyroxenes from the layers is, on average, slightly higher than the one of mantle harzburgites, and much higher than the Al content of pyroxene in discordant pyroxenitic mantle dykes. At the local scale, most layers are in chemical equilibrium with their host harzburgite and composition variation within the layer itself or its host are not observed. Cpx trace elements content shows compositions richer in REE than the Cpx from Oman harzburgite with chondrite normalised profiles slightly dipping in the HREE field suggesting magmatic evolution in the presence of garnet. Two-pyroxenes geothermometer show equilibrium temperatures between 950 and 1100°C, indicating high temperature of final equilibration and transposition. The distribution map shows that layerings appear at any level in the mantle section, close to the basal thrust plane as well as a few tens of meters below the Moho. They are, however, unevenly distributed at the scale of the ophiolite: abundant only in the northernmost massifs from the Wuqbah to the Fizh blocks with exceptionally low abundance in the Hilti block. They are rare to non-existent in the south-eastern massifs (Sumail, including the Maqsad diapirs, Wadi Tayin, etc.). The conditions for their genesis or preservation were thus not encountered everywhere. Clearly, this distribution map mimics the one of discordant (later) mantle dykes: pyroxenitic layers are almost absent in the south-easternmost massifs and in Hilti where discordant dykes belong to the MORB kindred. Layers are abundant in massifs where discordant mantle dykes crystallized from depleted andesites. Accordingly, it is tempting to attribute the origin of the pyroxenite layers to igneous processes similar to those leading to the genesis of the depleted magma suites in the Oman ophiolite, although pyroxene crystallization and equilibration occurred at greater depth in the case of the layers, consistently with their chemical composition and transposed nature.