Geophysical Research Abstracts,
Vol. 10, EGU2008-A-05762, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-05762
EGU General Assembly 2008

Evolution of the geodynamic context of the Oman ophiolite deduced from the distribution of orthopyroxenite dykes in mantle peridotites

Marie Python (1,2), Georges Ceuleneer (2) and Shoji Arai (1)

(1) Faculty of Sciences, department of Earth Sciences, Kanazawa University, Kakuma-machi, Kanazawa, 920-1192, Japan (marie@earth.s.kanazawa-u.ac.jp; ultrasa@kenroku.kanazawa-u.ac.jp), (2) Université Paul Sabatier, C.N.R.S-U.M.R.5562, Observatoire Midi-Pyrénées, 14, avenue Édouard Belin, 31400 Toulouse, France (ceulener@dtp.obs-mip.fr)

Pyroxenitic dykes are ubiquitous features in the mantle section of the Oman ophiolite but those predominantly composed by orthopyroxene are relatively uncommon. Orthopyroxenite dykes are present in a few tens of the 1500 sites we sampled in the Oman peridotites. In the field, when they are not cropping out as isolated dykes, orthopyroxenites appear as groups of 10 to 30 cm wide parallel discordant dykes cross-cutting Opx-rich concordant features (from the layering, i.e. Opx alignments in the harzburgite, to the orthopyroxenite dykes parallel to the layerings and showing sharp contacts with the host peridotite). Concordant and discordant features can be distinguished using field, textural and chemical characteristics, layerings containing kinked olivines, relatively low Cr# spinels and showing higher concentrations in Al and Cr and lower REE contents in Cpx and Opx than discordant dykes.

The discordant orthopyroxenite dykes are relatively primitive cumulate (Opx Mg#$>$86%) but this parameter does not account for the very low content in minor and trace elements in both Opx and Cpx that is likely the consequence of an ultra-depleted source. Their Cr-spinels show a chemistry close to that of boninites with unusually high Cr# (mostly above 0.6) and low Ti content. Moreover, the compositions (major and trace elements) of Cpx and Opx show that these discordant orthopyroxenite dyke crystallised from a low-Ca boninitic melt. The concordant dykes contain relatively

high amounts of olivine and show a pyroxene chemistry intermediate between the one of layerings and discordant dykes, suggesting a continuity between the processes that led to the formation of these features. Two of these dykes however are exceptional in terms of mineral chemistry: the Cr# of their Cr-spinel is indeed closer to that of the layerings than that of the other discordant dykes and the LREE contents of their Cpx and Opx are about five times higher than that of the others dykes. These two dykes are located close to the Muqbariah fault zone and are associated in the field with abundant intrusions of pyroxenitic and gabbronoritic pegmatites. They probably share a common mantle source with the MORB-derived cumulates abundant in the nearby Maqsad area.

Discordant orthopyroxenites are abundant only in about fifteen outcrops, all located in the westernmost part of the ophiolite. This high abundance of orthopyroxenites in the West is not related to their stratigraphic position: Fields of orthopyroxenite dykes may be found right below the Moho, close to the crustal section, as well as in the deepest parts of the mantle section, close to the metamorphic sole. An east-west variation existed in the Oman former spreading centre itself, that led to the formation of abundant orthopyroxenite in the West and not in the East. Except for the two from the Muqbariah area, the orthopyroxenite dykes may be interpreted as the consequence of circulation of a depleted Si-rich boninitic melt within the mantle during the lifetime of the omanese former spreading centre. This melt was more abundant in the north-western part of the ophiolite and is the probable result of the tectonic position of this segment that was subjected to a stronger arc-type influence, contrary to the south-eastern part of the ophiolite that recorded injection of MORB-type melts. These observations can be interpreted in the frame of progressive opening of a marginal basin.