5.6.P09

Contrasting liquid lines of descent along the northern Knipovich ridge: A result of high- and low-pressure fractionation?

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The northern Knipovich Ridge (76°30' to 78°N) shows axial topographic highs that are associated with off axis, linear arrays of seamounts that parallel the flow line. The topographic highs can be traced approximately 100 km off axis suggesting that segmentation have been more or less stationary for at least 15 m.y. Basalts dredged close to the segment centres display higher fractionation corrected FeO values ($Fe_{8.0}$), lower Al_2O_3, and lower incompatible element concentrations than samples dredged at segment boundaries. These along-axis variations are accompanied by progressively lower εNd values, i.e. more enriched values towards the deepest seafloor. The along-axis variations can be explained by melting of a heterogeneous mantle with incompatible element enriched veins or lenses, where lower degrees of melting result in higher proportions of the enriched component. Samples from axial and off-axial bathymetric highs at 76°30'N show similar isotopic compositions and REE patterns, although differ in FeO with two distinct FeO-MgO liquid line of descents. Porphyritic basalts of the more FeO-enriched type contain highly resorbed clinopyroxene phenocrysts. These features indicate that fractionation below the Knipovich ridge takes place at different pressure. We suggest that the northern Knipovich ridge in general is characterised by relative high-pressure fractionation, and that low-pressure fractionation is restricted to segment centres, which are the only regions where the magma productivity is high enough to sustain shallow level magma reservoirs.

5.6.P10

Juxtaposition of melt migration and high-temperature shear zones (Lanzo, Italy)

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Peridotite mylonite shear zones are commonly found in peridotite massifs [e.g. 1] and in peridotites dredged and drilled from the ocean floor [2-3] and may accommodate much of the deformation during magma-starved periods of (ultra-)slow spreading. Solid state reaction-induced grain size reduction is often assumed as an important process, but the potential role of melt-enhanced reactions is less well known. To provide constraints on the rheological weakening of mantle lithosphere, we investigate the mutual relationships between high-temperature deformation, melt-rock reaction and emplacement of plutonic rocks.

Results of a field study in the north of the Lanzo massif (N-Italy) reveals that a shear zone including perido-tite mylonite has a dimension of > 1500 meters length to at least 250 meters wide. Petrological data and prelimi-nary grain size analyses indicate 4 types of microstructu-res from porphyroclastic (grain size: 0.2 to 1.05 mm, aspect ratios between 1.6 and 2) to ultra-mylonitic (grain size: <0.05 to 0.15 mm, aspect ratios below 1.6). Typical peridotite mylonite bands consist of olivine (ol) + clino-pyroxene (cpx) + orthopyroxene (opx) + plagioclase (plg) + Cr-Al spinel +/- Ti hornblende and enclose coarse porphyroclasts of pyroxene or polycrystalline bands of olivine. Some cpx porphyroclasts show signs of previous reaction textures with a melt (cpx_1 +liq -> opx + plg ± ol), a texture which is common in the southern Lanzo massif [4]. This indicates that the mylonite formation postdates cpx-corroding melt/rock reaction. On the other hand, a series of discordant gabbroic dikes ranging from ol-gabbro to kaersutite-bearing diorites are abundant on one side of the mylonite zone only and are generally weakly deformed.

Our preliminary results indicate that melt migration and high temperature deformation are juxtaposed both in time and space. Melt-rock reaction may cause grain size reduction which in turn led to localisation of deformation. Melt-enhanced shearing might be a prerequisite for the formation of large-scale detachment faults and oceanic core complexes at mid-ocean ridges.

References

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