Mantle peridotites from the Stalemate F.Z. (NW Pacific)

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The Stalemate Fracture Zone (SFZ) is a 500 km long SE-NW trending transverse ridge between the northernmost Emperor Seamounts and the Aleutian Trench, which originated by flexural uplift of Cretaceous (?) oceanic lithosphere along a transform fault at the Kula-Pacific plate boundary [1].

The lithosphere cropping out along the NW flank of the SVZ was sampled by dredging during the R/V Sonne cruise SO201-KALMAR Leg 1b. Strongly altered mantle rocks ranging from pyroxene-rich lherzolites and pyroxene-poor dunites were obtained at the station DR37 at the northern SVZ bend. The compositions of primary minerals (*Cpx*, *Opx*, *Sp*) change systematically from lherzolites to dunites. *Sp* in lherzolites has higher Mg#, NiO, lower Cr#, Fe^{3+}# and TiO_2 (Mg#=0.65-0.68, NiO=0.26-0.34 wt%, Cr#=0.26-0.33, Fe^{3+}#=0.021-0.030, TiO_2=0.04-0.09 wt%) than spinel in dunites (Mg#=0.56-0.64, Cr#=0.38-0.43, TiO_2=0.19-0.28 wt%, NiO=0.19-0.26%, Fe^{3+}#=0.027-0.043). *Cpx* in lherzolites is moderately Mg- and Ni-rich, Ti- and Na-poor, has lower Cr# (Mg#=91.7-92.4, Cr#=0.12-0.16, TiO_2=0.06-0.15 wt%, Na_2O=0.19-0.41 wt%, NiO=0.06-0.09 wt%) and is extremely MREE- and Zr-depleted (C1-normalized Yb_n=4.0-5.6, Sm_n/Yb_n=0.05-0.14, Zr_n/Y_n=0.001-0.009) compared to clinopyroxenes analyzed in a sample of dunite DR37-3 (Mg#=93.7, Cr#=0.16, TiO_2=0.23wt%, Na_2O=0.85wt%, NiO=0.06wt%, Yb_n=5.7-7.4, Sm_n/Yb_n=0.22-0.27, Zr_n/Y_n=0.22). Some *Cpx* from lherzolites have flattened or strongly U-shaped patterns of REE (Sm_n/Yb_n=0.11-0.49, La_n/Sm_n=0.36-3.6) though their major element composition is indistinguishable from the more LREE depleted *Cpx*.

The variations of *Cpx* and *Sp* compositions can be explained by the two-stage process [2]: 1) near fractional melting of depleted mantle to 10-12%, 2) interaction of the residual lherzolite with N-MORB-like melts to form dunites. The protolith of lherzolites and dunites dredged from the SFZ can thus represent disintegrated parts of shallow oceanic mantle variably modified by melt percolation.

[1] Lonsdale (1988) *GSA Bulletin* **100**, 733–754. [2] Kelemen, Shimizu, Salters (1995) *Nature* **375**, 747-753

Unusual apatite crystals and pegmatites with Rare Earth Elements tetrad effect

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Dolní Bory pegmatite deposit in the Czech Republic, display well developed zonality and different concentrations of rare earth elements with chondrite-normalized patterns that show a clear convex tetrad effect. Similar patterns and zonality exhibit also apatite crystals (Fig. 1). The Y/Ho and Sr/Eu ratios and very high Y and U content of the apatite samples correspond with evolved fractionation relative to the corresponding chondritic values. Based on the La/Lu, Sr/Eu and Y/Ho ratios of apatite, the apatite zones can be divided into two main groups which reflect two main stages of magma-fluid evolution, namely, a magmatic and a magmatic hydrothermal transition stage.

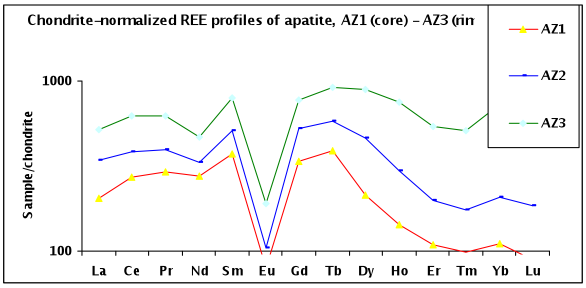

Figure 1: Chondrite-normalized REE profiles (apatite).

Interaction of a most evolved parental fluid with already formed pegmatite matrix and apatite probably produced the strongest REE tetrad effect in the youngest white zones of apatite rims (AZ3).