HSE and Os isotope systematics of mantle pyroxenites from the Lherz and Lanzo ultramafic massifs.

T. GAWRONSKI[1]*, H. BECKER[2]

[1*]Institut für Geologische Wissenschaften, Freie Universität Berlin, Germany, gawronsk@zedat.fu-berlin.de
[2]Institut für Geologische Wissenschaften, Freie Universität Berlin, Germany, hbecker@zedat.fu-berlin.de

Mantle pyroxenites provide direct evidence for mantle heterogeneity and magma transport in the mantle. These rocks may form by crystal accumulation at high pressures from mantle derived magmas, melt-peridotite reaction or partial melting of basic rocks in the mantle [1]. Pyroxenites are also useful to study fluxes and fractionation of highly siderophile elements (HSE) during transport in the mantle and to assess the influence of pyroxenites in magma genesis.

The peridotite massifs at Lanzo (northern Italy) and Lherz (southern France) provide the opportunity to study pyroxenites that have equilibrated at different P-T-conditions. The spinel facies Lherz peridotite contains spinel websterites, orthopyroxenites, garnet-clinopyroxenites.The plagioclase facies Lanzo peridotite massif includes spinel and plagioclase websterites, clino- and orthopyroxenites up to several dm in thickness. Aluminum poor websterites at Lherz and Lanzo display highly siderophile elment (HSE: Os, Ir, Ru, Rh, Pt, Pd, Au and Re) patterns similar to fertile lherzolite. In contrast, Lherz clinopyroxenites show more strongly frationated HSE patterns compared to Lanzo clinopyroxenites. with a stronger depletion in Os, Ir, Ru, Rh and Pt relative to Pd, Au and Re. These differences likely reflect different extent of reaction of parental melts with peridotite or different compositions of precursor materials (e.g. recycled oceanic crust). Re-Os data for pyroxenites from Lherz scatter around a 1.7 Ga reference line. This data is consistent with the Re-Os model ages obtained on peridotites [2] and hints that the refertilization of the Lherz body may have occurred in the Proterozoic. These results support the view that the Lherz body is indeed a fragment of Proterozoic continental lithospheric mantle and not Mesozoic oceanic mantle that contains ancient heterogeneities.

[1] Downes, H. (2007), *Lithos* ***99**, 1-24*
[2] Reisberg and Lorand (1995), *Nature* **376**, 159–16

Calibration of thermobarometry (TP) estimates with H_2O and fO_2 data from melt inclusions: Results from the Big Pine Volcanic Field, Western USA.

EATEBAN GAZEL[1,2]*, TERRY PLANK[2], DONALD W. FORSYTH[3], CLAIRE BENDERSKY[2], CIN-TY A. LEE[4], ERICK H. HAURI[5].

[1]Dep. of Geosciences, Virginia Tech, Blacksburg, VA, USA egazel@vt.edu (* presenting author)
[2]Lamont-Doherty Earth Observatory of Columbia University, Palisades, USA.
[3]Dep. of Geological Sciences, Brown University, Providence, USA
[4]Dep. of Earth Science, Rice,University, Houston, USA
[5]Dep. of Terrestrial Magnetism, Carnegie Institution, Washington, USA.

The Big Pine Volcanic Field (BPVF) is an ideal location for constraining the mantle melting conditions westernmost region of the Basin and Range. This work is the first to report H_2O and CO_2 concentrations in Big Pine magmas and fO_2, which are necessary for accurate estimates of the melting conditions. Melt inclusions trapped in primitive olivines (Fo_{82-90}) record surprisingly high H_2O contents (1.5 to 3.0 wt.%) for a location not currently above active subduction. The combined H_2O-CO_2 data are consistent with closed-system degassing from >5 kb (~ 20 km) to the surface. Estimates of the oxidation state of BPVF magmas are also surprisingly high (FMQ +1.0 to +1.5), based on constraints from V partitioning between melt and olivine and melt inclusion S contents (up to 5000 ppm), yielding Fe^{3+}/Fe_T ratios of 23 - 30%. While lithospheric mantle xenoliths from BPVF record low H_2O concentrations (whole rock <75 ppm). Pressures and temperatures of melt equilibration of the BPVF magmas indicate a shift over time, from higher melting temperatures (~1320 °C) and pressures (~2 GPa) for magmas that are >500 ka, to cooler (~1220 °C) and shallower melting (~1 GPa) conditions in younger magmas. The depth of melting also correlates strongly with some trace element ratios in the magmas, with deeper melts having higher Ce/Pb (14-21) and Ba/La (20), closer to typical upper mantle asthenosphere values, and shallower melts having lower Ce/Pb (<14) and variable Ba/La (20-30), more typical of subduction zone magmas, and within the range of the available lithospheric mantle xenolith data from BPVF. The correlated melting conditions and geochemical stratification of the mantle melts are consistent with seismic observations of a shallow lithosphere-asthenosphere boundary (~55 km depth). Combined trace element and cryoscopic melting models yield self-consistent estimates for the degree of melting (~5%) and source H_2O concentration (~1000 ppm). We suggest two possible geodynamic models to explain small convection necessary for magma generation. The first related with the Isabella seismic anomaly, either as a remnant of the Farrallon Plate or lithospheric foundering. The second scenario is related to slow extension of the lithosphere.