Tracking lower crustal events with Re-Os isotopes of granulite sulfides

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The composition of the lower crust, sampled by granulite xenoliths, provides critical constraints on the tectonothermal evolution of continents. Granulite whole rock Re-Os isotope systematics are corrupted by crustal assimilation and do therefore not yield meaningful ages [1]. While *in situ* U-Pb geochronology on zircon or monazite in granulites has proven to be a useful tool [2] to date events such as initial crust formation and later mafic underplating or accretion [3], not all granulites carry these minerals. We are analysing Re-Os isotopes and major-elements of single sulfides (pyrites) in kimberlite-entrained granulite xenoliths from the central Slave craton in order to assess whether useful age and petrogenetic constraints can be obtained from these minerals. The granulites have mafic to peraluminous compositions, with variable $\delta^{18}O$, SiO_2 and $Al_2O_3/(CaO + Na_2O + K_2O)$ [4].

Preliminary results show Ni contents of most sulfide grains <1 at%, whereas one grain has 6.7 at% Ni, compared to <<1 at% in kimberlitic pyrite. Re and Os contents are distinctly lower (median 135 and 9 ppb, respectively) and $^{187}Re/^{188}Os$ higher (140) than in sulfides in eclogite xenoliths from the same locality (620 and 70 ppb, respectively, $^{187}Re/^{188}Os = 50$), interpreted to have MORB protoliths.

In the Re-Os isochron diagram sulfides show some scatter likely due to assimilation of older crust, and several generations of sulfides may occur in a single xenolith. The Ni-rich grain lies on a trend of pre-entrainment (ca 90 Ma) sulfide introduction into a high-temperature mantle eclogite, possibly documenting translithospheric effects of events precursory to kimberlite magmatism. Several sulfide grains lie along 3.3 or 2.65 Ga model isochrons corresponding to the age of lower crustal formation/metamorphism [5]. Others plot about a 2.2 Ga model isochron, the age of the Malley-McKay dike swarms previously linked to zircon growth in lower crustal xenoliths [3]. Lower Re and Os contents but higher $^{187}Re/^{188}Os$ may indicate that the protoliths to the granulites crystallised sulfides prior to emplacement in the central Slave lower crust.

[1] Saal *et al.* (1998) *Nature* **393**, 58-61. [2] Simonetti *et al.* (2006) *Int. J. Mass Spec.* **253**, 87-97. [3] Davis (2003) *Geology* **25**, 343-346. [4] C. Krauss, unpubl. data. [5] Davis *et al.* (2003) *Lithos* **71**, 541-573.

Thermobarometric implications of clinopyroxene chemistry in the Plio-Quaternary magmas of Gran Canaria (Canary Islands, Spain)

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New evidences on the Plio-Quaternary volcanism in Gran Canaria (4 Ma to recent) [1] have provided a complete framework of petrographic, chemical, isotopic and thermobarometric data that allows to reinterpret the recent evolution of this island. In this work, bulk rock and mineral chemistry have been used to define P-T paths of the ascending magmas based on clinopyroxene (cpx)-melt thermobarometric calculations following the model of Putirka *et al.* [2].

Plio-Quaternary pristine melts separated at mantle dephts (P~13 kbar and T~1250 ºC) and then rised towards the surface by early adiabatic ascent. Above the MOHO (located at ca. 15 km depth), a first group of magmas continued rising by the same P-T ratios but with a shift towards lower T (~1150ºC). This is interpreted as the effect of intrusion in the colder fragile oceanic crust. Instead, a second group of magmas stagnated close to the mantle-crust discontinuity (P~4 to 6 kbar; 12 to 20 km depth). Most of the ponded pristine magmas are characterized by the presence of reverse zoned cpxs, with green cores of salitic composition surrounded by brown rims classified as diopsides. Petrographic and chemical features of such reverse zoned cpxs favour a xenocrystic origin of the green cores, likely related to magma mixing or mingling processes. Subsequent uprising of this second group of magmas through the crust was not continous but occurred in a spread way.

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[1] Aulinas (2008) PhD Thesis, Univ. Barcelona. [2] Putirka *et al*. (2003) *Am. Min*. **88**, 1542-1554.