Sulfur isotopic composition of the Sub-Continental Lithosphere Mantle (SCLM)

OLIVIER ALARD[1]

[1]Geosciences Montpellier, CNRS & University of Montpellier, France (oalard@gm.univ-montp2.fr)

The S-isotopic composition of the Earth's mantle (δ34S=0±2‰) has been found to be chondritic [1,2]. Such composition satisfies the paradigm that chemical composition of the whole Earth should be 'chondritic' and provide support to the 'late veneer' hypothesis which is otherwise supported by a broadly chondritic abundances of the highly siderophile (HSE: Os, Ir, Ru, Rh, Pt, Pd, Au, Re) and chalcogenides elements (S, Se, Te) and $^{187}Os/^{188}Os$. However in details, mantle data show large variability ($-7 \leq \delta^{34}S < 10‰$) and a strong dichotomy between in one hand peridotite xenolith showing mostly $\delta^{34}S>0$ [4] and on the other hand sulfide from orogenic massifs showing $\delta^{34}S<0‰$ [2]. These differences could be related to: (i) sampling processes (magmatic vs. tectonic); (ii) sulfide weathering; (iii) the strong contrast between sulfide mineralogy (mss vs. pn); (iv) mantle heterogeneities; or (v) analytical techniques.

Coupling EMP, SIMS, LA-ICPMS and LA-MC-ICPMS, major elements, $\delta^{34}S$, siderophile and chalcophile trace elements, and Os isotopes have been obtained in-situ on 200 sulfide grains from ≥30 mantle samples.

Almost all sulfides from xenoliths or orogenic massifs have $\delta^{34}S<0$ ($-7 \leq \delta^{34}S \leq 0.5‰$). These results do not support a contrasted composition between massif and xenoliths, but still indicate a significant level of heterogeneity within the SCLM. Preliminary results unfold broad correlations between $\delta^{34}S$ and HSE and/or chalcogenides abundances and fractionations and/or $^{187}Os/^{188}Os$. Thus, as for Os isotopes and HSE abundances [4,5], $\delta^{34}S$ is fractionated during mantle processes. These results are in agreement with recent data obatined on lavas [6,7] and sugg*et al*ltogether that S isotopic composition of the modern earh mantle is not chondritic.

[1] M. Chaussidon, F. Albarede, S.M.F. Sheppard, *Earth Planet. Sci. Lett.* **92** (1989) 144-156. [2] M. Chaussidon, J.P. Lorand, *Geochim. Cosmochim. Acta* **54** (1990) 1-12. [3] D.A. Ionov, J. Hoefs, K.H. Wedepohl, U., *Earth Planet. Sci. Lett.* **111** (1992) 269-286. [4] Alard *et al*., *Nature* **407** (2000) 891-894. [5] Alard *et al*. *Earth Planet. Sci. Lett.* **203** (2002) 651-663. [6] R.A. Cabral, *et al*., *Nature* **496** (2013) 490-493. [7] J. Labidi, P. Cartigny, M. Moreira, *Nature* **501** (2013) 208-211.