Hydrogen concentration in mantle xenoliths from the Veneto Volcanic Province (NE Italy)

A. CARRARO[1], H. BUREAU[2], D. VISONÀ[1], C. RAEPSAET[2], Y. FUCHS[3] AND H. KHODJA[2]

[1]Dipartimento di Geoscienze, Università di Padova, Italy (a.carraro@unipd.it, dario.visona@unipd.it)
[2]Laboratoire Pierre Süe, UMR9956, CEA Saclay, Gif-sur-Yvette, France (helene.bureau@cea.fr, caroline.raepsaet@cea.fr, hicham.khodja@cea.fr)
[3]Laboratoire des Géomatériaux, Université de Marne la Vallée, France (yves.fuchs@univ-mlv.fr)

Hydrogen contents were quantified in olivine (ol) and clinopyroxene (cpx) grains using the nuclear microprobe. The analysed minerals form spinel peridotite xenoliths with protogranular to porphyroclastic texture, hosted in alkaline basalts from two localities of the Eastern Veneto Volcanic Province (NE Italy). Mineral compositions indicated good re-equilibration at T-P upper mantle conditions (T = 850-950°C and P = 1.7±0.04 GPa). A combination of ERDA (Elastic recoil Detection Analysis) and RBS (Rutherford Back Scattering) methods were used for H measurements (Laboratoire Pierre Süe, France). The following analytical conditions were applied: $^4He^+$ energy = 3.0 MeV, beam spot size = 4x4 μm^2, 4x16 μm^2 for ERDA, scanned on large sample areas, scattering angle = 170°, recoil angle = 30° (see also Bureau and co-workers, this issue). 22 samples were prepared following a specific protocol in order to decrease the effect of H absorbed at the surface of the polished samples. The same grains were analysed with electron microprobe, in order to check possible chemical heterogeneities in the areas investigated by ERDA. Chemically homogeneous ERDA maps were selected using Daudin *et al*. (2003): results reported below are referred to H depleted zones:

Sample	**Wt ppm H**	**H_2O ppm wt oxyde**	**Tot rel uncert**
Ol-vpol2	**24**	**213**	**15**
Ol-vsol4	**17**	**145**	**15**
Cpx-vppx2	**50**	**444**	**14**
Cpx-vspx3	**45**	**398**	**13**

All cpx grains show H contents in the ranges reported from the literature for mantle analogue phases, obtained by commonly used IR spectroscopy, whereas ol grains have H concentrations close to or higher than maximum values reported for mantle ol (Ingrin & Skogby, 2000). Cpx samples systematically show H contents higher than those found for olivine: this is confirmed by recent IR data (Demouchy *et al*., 2006) and probably due to the fact that H diffusion at mantle temperatures is faster in olivine than in pyroxene.

References

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In situ cosmogenic nuclides in river bedload. Implications for catchment-scale erosion rate and surface exposure dating

SEBASTIEN CARRETIER, VINCENT REGARD AND CAROLE SOUAL[1]

LMTG - Observatoire Midi-Pyrénées - UMR 5563 UR 154 CNRS / IRD / University of Toulouse – 14 av. E. Belin – 31400 Toulouse – France (carretie@lmtg.obs-mip.fr, regard@lmtg.obs-mip.fr)

Terrestrial Cosmogenic nuclides (TCN) have been widely used to date the exposure of alluvial surfaces and to estimate catchment scale erosion rates. However, dispersion in TCN concentrations in distinct samples of the same locality remains to be explained.

We develop a numerical model to calculate the TCN concentration at a clast center on hillslope and along a main river path. The hillslope model is an analogue to freeze-thaw and rock fall. In river, transport velocity of clasts depends: 1- on a probability to be buried in a mixing sediment layer, which depends on clasts size, or within adjacent terrace, 2- on clast size, which decreases downstream by abrasion. Below a specified size, clasts go in the washload. We run the path of numerous clasts of variable size and we analyse statistically their TCN concentration at river outlet.

Clast abrasion tends to increase the mean and variance of concentrations of the small clasts fraction because this class incorporates initially big clasts which traveled a long distance and initially small clasts launched near outlet. However, the final size-concentration relationship depends on the initial size distribution. This suggests that minimizing inheritance in surface exposure dating requires the analysis of clast size distribution and lithology. Moreover, this size-concentration relationships suggests that the largest hillslope inheritance is not necessarily in fine sand but may be in coarser fractions. The distribution of concentrations does not evolve any more from a certain river length corresponding to a no-deposition critical travel length. This suggests that bedload might integrate only material from the bottom of large catchments, which might bias TCN-derived catchment-scale erosion rates. The proposed theory can be tested from measurements in bedload sediments of differing sizes. In addition, we provide approximate analytical solutions which could permit to constrain the mean transport velocity law for a clast.