Trace elements in garnets of diamondiferous xenoliths from the Nurbinskaya pipe, Yakutia

Z. V. SPETSIUS[1], W.L. GRIFFIN[2], S.Y. O'REILLY[2], AND V.I. BANZERUCK[1]

[1]YaNIGP CNIGRI, ALROSA Co. Ltd., Mirny, Yakutia, 678170, Russia, (spetsius@cnigri.alrosa-mir.ru)
[2]GEMOC ARC National Key Centre, Macquarie University, NSW 2109, Australia, (wgriffin@els.mq.edu.au)

Rare earth elements (REE) and other trace elements were analyzed by LAM-ICPMS in garnets of about 150 mafic and ultramafic diamondiferous xenoliths from the Nurbinskaya pipe. Most garnets are homogeneous in terms of major- and trace-element contents. Garnets from ultramafic xenoliths define two groups, one with sinusoidal REE_N (chondrite normalised) patterns (10 harzburgites, two lherzolites) and one with flat $MREE_N$ (lherzolites, some websterites).

Most eclogitic garnets have LREE-depleted patterns (Ce_N as low as 0.1), and no Eu anomalies. Heavy rare earth elements are variably enriched; most Lu_N varies 20-50. Most websteritic garnets show REE patterns similar to this but they are typically enriched in LREE with Ce_N (0.2-0.5). Garnets with nearly flat HREE and small positive Eu anomalies are common in coesite-bearing eclogites and those containing kyanite and/or corundum [1]. Another group of garnets (n=9) from eclogites and websterites have small negative Eu anomalies. These types of pattern commonly are interpreted as evidence of the reaction of plagioclase to garnet and used to support the origin of mantle eclogites by subduction of oceanic crust [1, 2], but may be simply a redox feature. Garnets from highly aluminous eclogites show convex REE patterns enrichment in LREE and strong depletion of in HREE (Yb_N<5). Garnets of corundum-bearing eclogites commonly have positive slopes within the $LREE_N$, peaking at Sm and then slowly decreasing to about chondritic abundance for Lu. LAM-ICPMS analysis could be used to show how different populations within an eclogite xenolith series can document the heterogeneous evolution of the lithospheric mantle beneath cratonic areas.

References

[1] Spetsius Z.V. (2004) *Lithos* **48**, 525–538.
[2] Jacob D. E., Foley S. F. (1999) *Lithos* **48**, 317–336.

Latest-stage exhumation history of the Central Alps

C. SPIEGEL[1], N. DÖRR[1], M. RAHN[2] AND M. DANIŠÍK[1]

[1]Institute of Geosciences, University of Tübingen, Germany (cornelia.spiegel@uni-tuebingen.de, ninadoerr@gmx.de, martin.danisik@uni-tuebingen.de)
[2]Swiss Federal Nuclear Safety Inspectorate, Villingen, Switzerland (Meinert.Rahn@hsk.ch)

The European Alps, like many other Cenozoic orogens, show a pronounced increase in erosion rages since ~5 Ma. In a recent paper, Willett *et al.* (2006) proposed that this accelerated erosion was due to enhanced precipitation subsequent to the Messinian salinity crisis and marked the transition from orogenic construction to orogenic destruction.

In this study, the latest-stage exhumation history of the Central Alps was investigated by using zircon fission track (ZFT), apatite fission track (AFT) and apatite (U-Th)/He (AHe) thermochronology along the eastern margin of the Lepontine Dome. The study area covers basement nappes east and west of the Forcola fault, a major Alpine normal fault bordering the Lepontine Dome to the east.

ZFT ages from both east and west of the Forcola fault range between 25 and 16 Ma, with youngest ages occurring close to the fault system. These ages reflect a period of enhanced exhumation related to the onset of orogen-parallel lateral extension of the Alps. The area east of the Forcola yielded AFT ages between 17 and 5 Ma and AHe ages between 7.5 and 6 Ma, whereas the area west of the Forcola yielded AFT ages between 9 and 4 Ma and AHe ages between 6.6 and 3.4 Ma. The age difference between basement nappes east and west of the Forcola normal fault indicates that the fault system has been active (or re-activated) during the Latest Miocene to Pliocene, much later than previously assumed. Late Neogene reactivation, however, has also been observed for the Simplon normal fault west of the Lepontine Dome, which is supposed to be conjugated to the Forcola fault. Age-elevation relationships reveal that the area west of the Forcola fault experienced a period of rapid exhumation between approximately 5.5 to 4 Ma, and that exhumation rates slowed down after ~4 Ma. The period of rapid exhumation is temporally consistent with the increase in deposition rates in the foreland basins, whereas the end of rapid exhumation coincided with the end of deformation in the Jura mountains. These temporal relations support the idea of a Pliocene shift from orogenic construction to orogenic destruction and thus to a decrease of the actively deforming area of the Alps.

Reference

Willett S.D., Schlunegger F., and Picotti V. (2006), *Geology* **34/8** 613-616.