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Nature and melting processes of the lithosphere beneath the North-East Qiangqtang terrane, Central Tibet, during Eocene times.

Fanny Goussin (1), Stéphane Guillot (1), Karel Schulmann (2,3), Carole Cordier (1), Emilien Oliot (3,5), Anne Replumaz (1), Pierrick Roperch (4), and Guillaume Dupont-Nivet (4)

(1) ISTerre, Université Grenoble Alpes, Grenoble, France (fanny.goussin@ujf-grenoble.fr), (2) IPSG, Faculty of Science, Charles University, Prague, Czech Republic (schulmann.karel@gmail.com), (3) EOST, Institut de Physique du Globe, Université de Strasbourg, Strasbourg, France, (5) Géosciences Montpellier, Université de Montpellier, Montpellier, France (emilien.oliot@umontpellier.fr), (4) Géosciences Rennes, Université de Rennes, Rennes, France (pierrick.roperch@univ-rennes1.fr)

At the time of the collision with India (∼55Ma), the southern margin of Asia was a composite continental domain resulting from an already long history of successive accretions of different terranes having different rheologies. Knowledge about the structure, composition and thermal state of the Tibetan lithosphere through time is thus fundamental to understand the respective contributions of pre-Cenozoïc and Cenozoïc tectonics in the building of the Plateau to its present-day elevations.
We focused on the boundary between the Qiangtang terrane to the south, and the Songpan-Ganze terrane to the north. We jointly studied deep crustal xenoliths and associated (ultra-)potassic magmatism from the Eocene basins of Nangqian and Xialaxiu (Qinghai Province, China), north of the Qiangtang terrane. The aims were to retrieve the composition and the thermal state of the lower crust during Eocene times, to study the behavior of the lower crust and lithospheric mantle of the Eastern Qiangtang terrane and the adjacent Songpan-Ganze terrane at the time of the collision, and the link with the magmatic activity.
Crustal xenoliths are of two types: biotite-rich, amphibole bearing metasediments; and garnet-bearing quartzo-feldspathic gneisses. Such assemblages are typical of very high-grade amphibolite and granulite facies metamorphism; further study should allow us to quantify the pressures and temperatures those rocks experienced until the time they were sampled by their host lavas.
Major element geochemistry places the c.a. 51-49 Ma (Spurlin et al., 2005) Xialaxiu volcanic field in a fairly differentiated (SiO_2∼65-70 wt%) high-K field of the calc-alcaline series. Trace element analysis suggests a strong crustal contamination of the primary mantellic melts. C.a. 38-37 Ma (Spurlin et al., 2005) Nangqian magmatic bodies span across the alkaline series, with high to extreme (K2O∼6wt%) values. Complex major and trace element patterns, coupled with high-resolution microprobe data on pyroxene xenocrysts, suggest that enrichment occurred at the source by metasomatism of the lithospheric mantle.
Further work will precise which mechanisms could have accounted for such a metasomatism of the mantle beneath the Northern Qiangtang terrane during Eocene, and whether the lower crust had an autochtonous or allochtonous nature.