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Thermochronological investigation of the Karakorum fault

Loraine Gourbet (1), Maria Giuditta Fellin (1), Gweltaz Mahéo (2), Philippe Hervé Leloup (2), David L. Shuster (3), and Colin Maden (1)

(1) ETH, Geological Institute, Switzerland (loraine.gourbet@erdw.ethz.ch), (2) Laboratoire de Géologie de Lyon, France, (3) UC Berkeley -and- Berkeley Geochronology Center

The Karakorum fault is a major active dextral strike-slip fault that extends along 900 km and separates the western Tibetan plateau from NW Himalaya. In addition to its strike-slip motion, the Karakorum fault locally presents a normal component of motion, especially south of the Bangong lake, in the Gar-Baer pull-apart basin, where it is attested by numerous impressive triangular facets facing NW. In this area, strike-slip motion is proposed to have started prior to 23 Ma [1,2] and normal motion is proposed to have been initiated ∼14 Ma ago [3]. Others propose that strike-slip motion did not start before 11-12 Ma [4,5].

Here, we use low-temperature thermochronometry to focus on the timing and potential variations of normal motion of the Karakorum fault through time, in the Gar-Baer area.

Granitic samples collected east of the Karakorum fault, on the Tibetan plateau, have mean zircon (U-Th)/He cooling ages ranging from 30 to 46 Ma and mean apatite (U-Th)/He ages ranging from 26 to 36 Ma. At first order, these ages are consistent with a slow exhumation of SW Tibet since the Eocene. In contrast, in the footwall of the fault, samples collected in the Himalayan Ayilari range have ZHe ages ranging from 8 to 16 Ma and AHe ages ranging from 1.9 to 14 Ma. This shows a rapid, continuous cooling since 16 Ma. We will use thermal modeling combining multiple thermochronometers from this dataset and published studies [1] (Ar-Ar, fission tracks) in order to reconstruct the exhumation history of the Ayilari range and constrain the initiation time of the Gar-Baer basin.

[1] Valli, F., Leloup, P.H., Paquette, J.-L., Arnaud, N., Li, H., Tapponnier, P., Lacassin, R., Guillot, S., Liu, D., Deloule, E., Mahéo, G., 2008. New U–Th/Pb constraints on timing of shearing and long-term slip-rate on the Karakorum fault. Tectonics 27 (5). http://dx.doi.org/10.1029/2007TC002184.
[2] Leloup P.H., R.F. Weinberg, B. Mukherjee, R. Lacassin, E. Boutonnet, P. Tapponnier, F. Valli, H. Li, M.-L. Chevalier, N. Arnaud, J.-L. Paquette, 2013. Comment on « Displacement along the Karakoram fault, NW Himalaya, estimated from LA-ICP-MS U–Pb dating of offset geologic markers » published by Shifeng Wang et al. in EPSL, 2013. EPSL 363, 242-245. doi: 10.1016/j.epsl.2012.12.012.
[3] Valli, F., Arnaud, N., Leloup, P. H., Sobel, E. R., Mahéo, G., Lacassin, R., Guillot, S., Haibing, L., Tapponnier, P. & Xu, Z., 2007. Twenty million years of continuous deformation along the Karakorum fault, western Tibet: A thermochronological analysis. Tectonics 26 (4). http://dx.doi.org/10.1029/2005TC001913.
[4] Murphy, M.A., Yin, A., Kapp, P., Harrison, T.M., Ding, L., Guo, J., 2000. Southward propagation of the Karakoram fault system, Southwest Tibet: timing and magnitude of slip. Geology 28, 451–454.
[5] Wang, S., Wang, C., Phillips, R.J., Murphy, M.A., Fang, X., Yue, Y., 2012. Displacement along the Karakoram fault, NW Himalaya, estimated from LA-ICP-MS U–Pb dating of offset geologic markers. EPSL 337–338, 156–163.