

## Identifying the complex melting reaction from 20 Ma to 14 Ma in Tsona leucogranite in Southern Tibet: geochemistry, zircon U-Pb chronology and Hf isotopes evidence

Qingshang Shi, Zhidan Zhao, Dong Liu, and Di-Cheng Zhu

State Key Laboratory of Geological Processes and Mineral Resources, and School of Earth Science and Resources, China University of Geosciences, Beijing, China (zdzhao@cugb.edu.cn)

The Miocene leucogranites, the record of the evolution of the Himalayan-Tibetan Orogen, extensively intruded the Greater Himalayan Sequence (GHS), and distributed along the South Tibetan Detachment System (STDS) (Guo and Wilson, 2012). Here we present a study of geochemistry, zircon U-Pb chronology and Hf isotopes on the Yamarong leucogranites from Tsona area, Eastern Himalaya, to explore the petrogenesis of the rocks, including melting condition and mechanism, and source of fluid within the magmatism through time. Our new results include: (1) The age of the Yamarong leucogranites range from 14 Ma to 20 Ma (YM1510-1 =  $19.7 \pm 0.1$  Ma,  $n = 13$ ; YM1502-1 =  $17.5 \pm 0.1$  Ma,  $n = 12$ ; YM1412 =  $14.2 \pm 0.1$  Ma,  $n = 18$ ), which suggest that the anatexis processes have lasted for more than 6 Ma. (2) The geochemical features are different between the rocks with changing ages, especially between 20 Ma and 17 Ma. The Rb/Sr value of 20 Ma leucogranites (4.1-6.84) is lower than that of 17 Ma samples (5.12-19.02). The 20 Ma leucogranites have higher Ba contents (188-337 ppm) than that of 17 Ma rocks (50-158 ppm), which exhibit different trends in the Rb/Sr versus Ba plot, and reveal different melting reaction from 20 Ma to 17 Ma. (Inger and Harris, 1993) (3) The  $\varepsilon_{Hf}(t)$  isotopes of 20 Ma leucogranites are lower (average  $\varepsilon_{Hf}(t) = -12.5$ ) than that of 17 Ma ones (average  $\varepsilon_{Hf}(t) = -10$ ), which implies differential dissolution of inherited zircon during two partial melting events possibly due to different fluid contribution (Gao et al., 2017); (4) The positive linear relationship of LREEs versus Th in the rocks, with relatively higher contents of Th and LREEs in the 20 Ma, and lower in the 17 Ma leucogranites, which suggests the relationship were mostly controlled by monazite. And this further indicates more monazite was dissolved from the source region in the early stage ( $\sim 20$  Ma) than the later (17 Ma) (Gao et al., 2017). In summary, our study provides new evidence for the complex melting mechanism, from fluid-fluxed melting at  $\sim 20$  Ma to later fluid-absent melting at  $\sim 17$  Ma of muscovite in the metasedimentary sources. The  $\sim 20$  Ma magmatism in Tsona area may represent the early stage of exhumation, with more fluid possibly came from either the Lesser Himalayan sequence (LHS) or the Cretaceous – Paleogene molasses beneath the along – strike extrapolation of the Yamarong leucogranites source (Harrison and Wielicki, 2016).

### Reference:

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