

## Low basalt-source water contents inhibiting the formation of Large Igneous Province in the Leiqiong area (South China)

XIAO-YAN GU<sup>1</sup>, QUN-KE XIA<sup>2</sup>, PIAO-YI WANG<sup>3</sup>

<sup>1</sup>School of Earth Sciences, Zhejiang University, Hangzhou 310027, China (gxy0823@zju.edu.cn)

<sup>2</sup>School of Earth Sciences, Zhejiang University, Hangzhou 310027, China (qkxia@zju.edu.cn)

<sup>3</sup>School of Earth and Space Sciences, University of Science and Technology of China, Hefei 230026, China (wangpy15@mail.ustc.edu.cn)

For the formation of a Large Igneous Province (LIP), the high rate of melt production requires rigorous melting conditions (abnormally increasing temperature, substantial decompression, addition of fusible components, and presence of water). In this contribution, water contents in the primary magmas of Cenozoic basalts in the Leiqiong area of China were estimated according to the method based on measuring water contents of clinopyroxene (Cpx) phenocrysts [1], to certify the relative paucity of water in the source of Leiqiong basalts as a critical factor inhibiting the formation of LIP in the Leiqiong area.

Nine of studied basalts are tholeiitic and the other eleven samples are alkalic. Both types display OIB-like incompatible trace element compositions. The olivine liquidus temperatures are estimated in the range of 1430 °C to 1540 °C, consistent with heating by a lower mantle-rooted plume, the existence of which has been evidenced by a seismic low-velocity anomaly beneath this region [2]. Olivine phenocrysts have higher NiO contents (0.19-0.37 wt. %) and Fe/Mn (66-107), indicating the participation of pyroxenites into the basalt source. Water contents of Cpx phenocrysts in tholeiites are systematically higher than those in alkali basalts and, the recovered water contents in primary magmas are 0.83±0.30 wt. % and 0.44±0.19 wt. %, respectively. Regardless of lithology, these values fall in the range of OIB, significantly lower than water contents of the primary magmas of many Phanerozoic LIPs (e.g., 3.44±0.89 wt. % for Emeishan LIP [3]). The low water contents in primary magmas correspond to a relatively 'dry' mantle source.

Despite the existence of a mantle plume in the Leiqiong area and the contribution of fusible components (pyroxenites) in the basalt source, the Cenozoic basalts in this region cover an area of only 7000 km<sup>2</sup>, too low considering the criteria of the LIP. The paucity of water in the basalt source, which can lower melt production and the velocity of plume upwelling, should play a critical role in inhibiting the formation of LIP in the Leiqiong area.

[1] Goldschmidt, Xia et al. (2013), *Earth Planet. Sci. Lett.* 361, 85-97.

[2] Goldschmidt, Xia et al. (2016), *Gond. Res.* 36, 46-56.

[3] Goldschmidt, Liu et al. (2017), *Nat. Commu.* 8, 1824.