Geophysical Research Abstracts
Vol. 20, EGU2018-17959, 2018
EGU General Assembly 2018

The Origin of potassic volcanic rocks and adakitic intrusions in southern Tibet

Zhidan Zhao, Dong Liu, and Di-Cheng Zhu
China University of Geosciences Beijing, School of Earth Science and Resources, Beijing 100083, China (zd-zhao@163.com)

Elucidating geodynamic processes at depth relies on a correct interpretation of petrological and geochemical features in magmatic records. In southern Tibet, both potassic volcanic rocks and adakitic intrusions exhibit high Sr/Y and La/Yb, and low Y and Yb concentrations. But these two rock types have contrasting temporal-spatial distributions and isotopic variations. We present a systematic study on the postcollisional potassic and adakitic rocks in order to investigate their petrogenetic links with the coeval mantle-derived ultrapotassic rocks and shed light on the potential input from underthrusted Indian continental crust. We found that adakitic intrusions with higher K_2O/Na_2O tend to display lower Y and higher SiO_2, suggesting that the mantle-derived ultrapotassic melts, showing relatively high Y and Yb concentrations, only played a minor role in adakitic magmatism. Therefore, the unradiogenic $^{143}Nd/^{144}Nd$ and the dramatic decrease of zircon $\varepsilon_{Hf}(t)$ values since ~35 Ma shown by postcollisional adakites should be interpreted as reflecting the crustal input from Indian plate. Unlike adakitic intrusions in southern Lhasa subterrane, potassic volcanic rocks share similar spatial distributions with ultrapotassic rocks, and their isotopic discrepancy is diminishing with volcanic activity becomes younger and migrates eastward. Evidence from whole-rock Pb and zircon Hf isotopes further indicates that potassic volcanic rocks are more likely to originate from partial melting of the overthickened and isotopically heterogeneous Lhasa terrane crust rather than the underthrusted Indian continental crust. The elevated Rb/Sr and varying Sr/CaO in potassic volcanic rocks provide an argument for sanidine + plagioclase + clinopyroxene as the major fractionating phases during magmatic differentiation. These findings not only highlight the significance of potassic and adakitic rocks in providing constraints on the geodynamic processes beneath southern Tibet, but also imply that special caution is needed if we attempt to probe into the nature of mantle lithosphere using isotopic tracers of the Tibetan ultrapotassic rocks.