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Geochemical and isotopic data of Zheduo-Gongga granitic intrusive complex, eastern margin of the Tibetan Plateau: no evidence for middle-lower crustal flow

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Geophysical studies have shown that middle-lower crustal flow started from central Tibetan Plateau may exist in the eastern margin of the Tibetan Plateau, which controls the mountain building, crustal thickening and deformation (Schoenbohm et al., 2006; Bai et al., 2010; Bao et al., 2015; Zhu et al., 2017). However, no geological and petrological evidence have been presented. We carried out detailed studies on the geochemical and isotopic compositions of the Mesozoic-Cenozoic Zheduo-Gongga granitic intrusive complex on the eastern margin of the Tibet Plateau. Geochronology studies show that these granitoid rocks are formed during Mesozoic to Cenozoic, including ~220-200 Ma Gongga granodiorite to biotite granite with mafic enclaves, ~40 Ma Zheduo gneissic granite, ~28 Ma Zheduo monzogranite, and ~20-4 Ma Zheduo biotite granite and monzogranite. Two groups of geochemical features are obtained: Group 1 (gnessic granite, granodiorite, monzogranite, and leucogranite) has relatively low K2O, Th/La, La/Yb and Rb/Sr ratios, but high Sr/Y ratio with no Eu negative anomalies; Group 2 (biotite granite) has relatively high K2O, Th/La, La/Yb and Rb/Sr ratios, but low Sr/Y with strong negative Eu anomalies. The Sr-Nd-Hf-O isotopic studies on plagioclase, apatite and zircon show that their sources are primarily the basement of the western margin of Yangtze Craton and Songpan-Ganzi sediments. These features indicate that they have different petrogenesis processes. Group 1 is mainly derived from partial melting of mafic rocks in the lower crust, whereas the Group 2 is primarily derived from partial melting of metasedimentary rocks experiencing fractionation of plagioclase. Magma derived from different sources mixing with each other are observed as well. Therefore, from geochemical aspects, no exotic materials are involved in the formation of granitoid rocks during Mesozoic to present. The flow of crustal material in the middle-lower crust may be not existed. The low velocity and high conductivity layer in the middle-lower crust may represent a regional partial melting zone, which could be related to the upwelling of asthenosphere. Both crustal deformation and upwelling of asthenosphere may contribute to the crustal thicknening and uplift.