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

Fanyang Hu1, Fuyuan Wu1, Mihai N. Ducea2,3, James B. Chapman4

1State Key Laboratory of Lithospheric Evolution, Institute of Geology and Geophysics, Chinese Academy of Sciences
2Department of Geosciences, University of Arizona, Tucson, AZ 85721, USA
3Faculty of Geology and Geophysics, University of Bucharest, Bucharest, Romania
4Department of Geology and Geophysics, University of Wyoming, Laramie, WY 82071, USA

Email: hufanyang@mail.iggcas.ac.cn

Introduction

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). 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. These granitoid rocks include ~210-200 Ma Gongga monzogranite and granite, ~175 Ma Zheduo porphyritic to coarse-grained granite, ~50 Ma Zhedu gneissic granite, ~38-28 Ma Zheduo gneissic monzogranite, and ~6-3 Ma Zhedu fine-grained monzogranite and leucogranite.

Geological background

Outcrop features

Figure 2. Outcrop features of the ZD-GG granitoid intrusive complex. (A) ZD coarse-grained leucogranite intruded into gneissic granite. (B) ZD fine-grained monzogranite intruded into coarse-grained granite. (C) ZD gneissic monzogranite. (D) ZD coarse-grained granite. (E) ZD fine-grained granite. (F) ZD fine-grained leucogranite intruded into migmatite. (G) GG fine-grained granite. (H) GG monzogranite.

Figure 3. Major and trace elements of ZD-GG granitoid intrusive complex. (A) Total alkali vs. SiO2 (Middlemost, 1994). (B) A/NK vs. A/CNK (Maniar and Piccoli, 1989). (C) Zr/Hf vs. Eu/Eu* (Ea07/Si07×Gd07/0.5). (D) Rb vs. Eu/Eu*. (E) Rb/Sr vs. Ba. (F) Ba vs. Rb. (G) Sr/Y vs. (La/Yb)d. (H) Ba/Rb vs. Zircon saturation temperature (Boehnke et al. 2013).

Figure 1. Location of the Zheduo-Gongga (ZD-GG) granitic intrusive complex. (A) Location of the Zheduo-Gongga granitic intrusive complex in the eastern margin of Tibetan Plateau. (B) Simplified geological map of the Zheduo-Gongga granitic intrusive complex. After Li et al. (2015).

Figure 4. Isotopic data changes with time. (A) 37Sr/36Sr data of plagioclase. (B) εNd(t) values of apatite. (C) εNd(t) values of zircon. (D) δ18O values of zircon.

Major and Trace elements

1. Episodic magmatism since the India-Asia collision in the eastern margin of the Tibetan plateau and could be compatible to the Mesozoic magmatism in the same area.

2. Whole-rock geochemistry and mineral isotopic features indicate two different sources are mainly involved in their formation, including basement of western margin of the Yangtze Craton and Songpan-Ganzi sediments.

3. Juvenile magma generated during the Pliocene argues against the transportation of middle-crustal materials from the central Tibetan to the eastern margin of the Tibetan Plateau.

Conclusions

References

Boehnke et al., 2013, Chem. Geol., 351, 324-334.
Du et al., 2014, Lithos, 196-197, 67-82.
Huang et al., 2009, Lithos, 112, 367-381.
Li et al., 2007, Int. Geol. Rev., 49, 357-373.
Schoenbohm et al., 2006, Geology, 30, 813-816.
She et al., 2006, Chem. Geol., 231, 159-175.
Zhao et al., 2007, J. Geol. 115, 675-689.

Acknowledgements: This study was supported by the NSFC Grant Nos. 41888101 and 41902055.

Isotopic features

Sr-Nd-HF-O isotopic data show that primarily sources are western margin of the Yangtze Craton and Songpan-Ganzi sediments.

Figure 3. Isotopic features of different sources. (A) εNd(t) vs. εHf-Nd reflecting Hf-Nd decoupling. (B) εNd(t) vs. εHf-Nd (4 Ma). Data from western margin of the Yangtze Craton (Zhao and Zhou, 2007; Huang et al., 2009; Du et al., 2014; Chen et al. 2015; Songpan-Ganzi xenoliths (Wang et al., 2016); Songpan-Ganzi sediments (She et al., 2006; Siggoy et al., 2014; Qiangtang xenolith (Lai et al., 2007). (C) δ18O vs. εHf (4 Ma).

This study was supported by the NSFC Grant Nos. 41888101 and 41902055.