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Saheb Granitoid Batholith, North of Kurdistan: An Evidence of Cretaceous-Paleocene Magmatism in the Sanandaj-Sirjan Zone

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Introduction

The Iranian plateau is part of the Alpine-Himalayan orogenic belt, which consists of several continental fragments separated from each other by major boundary faults and/or ophiolitic suture zones (Gansser, 1981). Generally, the tectonic evolution of Iran has been controlled by the opening and closure of the Proto-Tethys, Paleo-Tethys and the Neo-Tethys during the Precambrian-Cambrian, Paleozoic and Cenozoic, respectively.

The study area is located in the northwest of Iran (the Kurdistan province) and 20 km northeast of the city of Saqez. This area is a part of the northern Sanandaj-Sirjan Zone (Aghanabati, 2005). This belt is response to opening and subduction of Neo-Tethyan oceanic crust beneath the Central Iran (Alavi, 1994). During Cretaceous-Tertiary eras, numerous granitoid bodies were formed in this belt. The Saheb granitoid is one of these granitoid bodies which mainly consists of monzogranite, quartz monzonite and quartz monzodiorite. The aim of this research study is to discuss the evolution of the Late Cretaceous-Early Paleocene Saheb granitoids in the Sanandaj-Sirjan zone based on geology, petrography and geochronology results.

Material and methods

In this study, 70 rock samples were collected from different types of intrusive rocks from which 30 thin sections were prepared for petrographic studies. Furthermore, four samples from the granitoid bodies (quartz monzonite, quartz monzodiorite and monzogranite) were selected for U-Pb dating. Approximately 100 to 150 zircon grains were hand-picked by a binocular microscope from each sample. Cathodo-luminescence imaging and dating of zircon grains were examined at the China University Geosciences (Wuhan branch). Geochronological analysis were performed by using the (LA)-ICP-MS method at the China University Geosciences (Wuhan branch). The detailed analytical method is presented in Liu et al. (2010a, 2010b).

Geology of the study area

The Saheb granitoid body is located in the Sanandaj-Sirjan zone. According to the geological map of Chapan (scale: 1/100000, Kholghi khosraghi, 1999), the Precambrian to Quaternary units are exposed in the study area. The oldest units are the Kahar, Bayandor and Soltanieh Formations with Precambrian to Cambrian age. The Permian sediments, the Ruteh and Doroud Formations, include sandstone, shale and carbonate. The Jurassic units are found in the northwest of the region, and include sandstones and shale. The Cretaceous sedimentary units are

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located in the south of the study area. These sediments contain sandstone, limestone, silty-limestone, shale and dolomitic limestone. During Late Cretaceous-Early Paleocene era the Saheb granitoid intruded within the oldest units and caused Fe skarn type deposits in the Saheb area. The Saheb granitoid have been cut by a series of diabasic dikes.

Results

The Saheb granitoid consists of several intrusive bodies containing quartz monzonite, quartz monzodiorite and monzogranite. The major minerals in the quartz monzodiorite consist of plagioclase (35- 40%), quartz (15- 20%), orthoclase (20- 25%), and mafic minerals such as biotite and amphibole (10-15%) with granular texture. The quartz monzonitic rocks show granular and poikilitic textures. Plagioclase (25-35%), quartz, orthoclase (30- 40%), biotite and amphibole (10-15%) are the main important minerals in the quartz monzonite. Plagioclase (20-25%), quartz (20-30%), orthoclase (30-40%), biotite and amphibole (15%) are the major minerals in the monzogranite.

Zoning in zircon crystals from all four samples is well developed representing their magmatic origin (Hancar and Miller, 1993). Measurements of U-Pb in the Saheb granitoid zircon grains of quartz monzonite samples show their ages to be 62.03±0.56 Ma and 58.9±0.9 Ma. The age of monzogranite is 67.9±1.3 Ma and the age of quartz monzodiorite is 61.1±0.56 Ma. Generally, the age of this granitoid body indicates that the Saheb granitoid has occurred during the Cretaceous- Paleocene time.

Discussion

Based on field and microscopic studies, the Saheb granitoid bodies have been divided into three types of quartz-monzonite, quartz-monzodiorite and monzogranite. The field and mineralogical studies suggest that the Saheb granitoid is an I-type granitoid. The mineralogical variations in this granitoid suggest that the fractional crystallization has played an important role in differentiation of different compositional phases in the Saheb granitoid.

According to the geochronological results, during Late Cretaceous to Early Paleocene, the Saheb granitoid intruded within the Permian and Cretaceous units in the magmatic-metamorphic Sanandaj-Sirjan zone. These granitoids were formed by subduction of Neo-Tethys Ocean beneath the Iranian plateau. It should be mentioned that the intrusion of these granitoids into the Permian carbonates and Cretaceous carbonate and shale caused formation of skarn type iron oxide mineralization.

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