Geophysical Research Abstracts
Vol. 19, EGU2017-6211, 2017
EGU General Assembly 2017

A-type granites from the Guéra Massif, Central Chad: Petrology, geochemistry, geochronology, and petrogenesis.

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The poorly studied Saharan Metacraton of North-Central Africa is located between the Arabian-Nubian Shield in the east, the Tuareg Shield in the west and the Central African Orogenic Belt in the south. The Saharan Metacraton is composed of Neoproterozoic juvenile crust and the relics of pre-Neoproterozoic components reactivated during the Pan-African Orogeny. The Republic of Chad, constrained within the Saharan Metacraton, comprises a Phanerozoic cover overlying Precambrian basement outcroppings in four distinct massifs: the Mayo Kebbi, Tibesti, Ouaddaï, and the Guéra. The Guéra massif is the least studied of the four massifs but it likely preserves structures that were formed during the collision between Congo Craton and Saharan Metacraton. The Guéra Massif is composed of mostly granitic rocks. The granitoids have petrologic features that are consistent with A-type granite, such as micrographic intergrowth of sodic and potassic feldspar, the presence of sodic- and iron-rich amphibole, and iron-rich biotite. Compositionally, the granitic rocks of the Guéra Massif have high silica ($SiO_2 \geq 68.9$ wt.%) content and are metaluminous to marginally peraluminous. The rocks are classified as ferroan calc-alkalic to alkali-calcic with moderately high to very high Fe* ratios. The first zircon U/Pb geochronology of the silicic rocks from the Guéra Massif yielded three main age groups: ∼590 Ma, ∼570 Ma, ∼560 Ma, while a single gabbro yielded an intermediate age (∼580 Ma). A weakly foliated biotite granite yielded two populations, in which the emplacement age is interpreted to be 590 $\pm$ 10 Ma, whereas the younger age (550 $\pm$ 11 Ma) is considered to be a deformation age. Furthermore, inherited Meso- to Paleoproterozoic zircons are found in this sample. The geochemical and geochronology data indicate that there is a temporal evolution in the composition of rocks with the old, high Mg# granitoids shifting to young, low Mg# granitoids. This reveals that the A-type granites in the Guéra Massif were probably derived by the repeated melting of a single source region, from an initial fertile source to a less fertile source at distinct intervals. Finally, the oldest inherited zircons indicate that the Guéra Massif is either built upon Paleoproterozoic continental crust or that pre-Neoproterozoic rocks were the source of the silicic Ediacaran rocks.