Abstract

The Central Atlantic Magmatic Province (CAMP) is the largest igneous event on Earth (~$7x10^6$ km^2). Its emplacement is linked to the onset of the fragmentation of Pangaea and to the opening of the central Atlantic Ocean around the Triassic-Jurassic boundary. Remnants of the CAMP are represented by dykes, sills and lava flows cropping out on four continents: North and South America, West Africa and Europe. Mesozoic igneous rocks (mainly dolerites) are well-known in the western part of the Saharan platform, but only few data have been published on their age and geochemistry. The purpose of this study is to present new $^{40}Ar/^{39}Ar$ age and geochemical data on dolerites from southwestern Algeria, occurring as sills, dykes and a scarce lava flows over the Reggane, Tindouf, Hank and Bechar basins.

$^{40}Ar/^{39}Ar$ analyses were performed on plagioclase separates from twelve dolerite samples. A plateau-age of 198.9 ± 2.3 Ma is obtained on a dolerite sample from the Tindouf basin. This first plateau-age obtained on dolerites from southwestern Algeria represents the best estimate of the CAMP emplacement in Algeria. Other samples display disturbed age spectra, reflecting various contributions of alteration by sericite and/or excess argon. Weighted mean ages corresponding to the less altered plagioclase fractions yielded approximate ages ranging from 192.7 ± 3.0 and 198.9 ± 1.8 Ma. These ages are partly in agreement with the peak activity of the CAMP at 198.1 Ma and 199.1 ± 1 Ma highlighted in the neighbouring Taoudenni (Mali) and Moroccan basins, respectively.

Geochemical characteristics show that these rocks are low-Ti tholeiites similar in composition to the CAMP low-Ti tholeiites. Based on trace elements and Rare Earth Elements, four groups are defined in the Algerian Sahara, corresponding to the so-called lower, intermediate, upper and recurrent units that constitute the volcanic pile from the Moroccan High Atlas. The first three groups are also correlated to the lower, intermediate and upper units recently identified in the Moroccan Middle Atlas and in the Ksour Mountains (Algeria).

Our new data show that: (i) the sills, dykes and lava flows from southwestern Algeria belong to the CAMP; (ii) geochemical signature of most of these dolerites and basalts is identical to the low-Ti CAMP magmas which are assumed to derive from an enriched lithospheric mantle source. Some dolerites from the Tindouf basin are geochemically identical to the basalts of the recurrent unit in Morocco which derived from a less depleted mantle source involving an asthenospheric component; (iii) the tholeiitic magmatism of the CAMP extends far into the African continent, as previously shown in the Taoudenni basin, and is controlled by hercynian and older structures in the region. In Algeria, the eastern boundary of the CAMP seems to coincide with the Pan-African suture zone.

Our new results support a passive model for the CAMP magmatism in southwestern Algeria. This magmatism was probably related to: (i) mantle global warming under the Pangaea supercontinent, and (ii) edge-driven convection between the thick Reguibat craton and adjacent Pan-African mobile belts.

Keywords : CAMP (Central Atlantic Magmatic Province) - $^{40}Ar/^{39}Ar$ dating – Geochemistry – Dolerites - Algeria.