Paper Number: 2432

Chemical zoning, pseudosections and P–T path of well preserved eclogites from the Adrar Izzilatène area (Egéré-Aleksod terrane, Central Hoggar, South Algeria)

Doukkari S.A.[1], Ouzegane, K.[1], Diener, J.F.A.[2], Godard, G.[3], Arab, A.[1] and Kienast, J.R.[3]

[1]LGGIP, FSTGAT, U.S.T.H.B., B.P. 32 El Alia, Dar el Beida, 16111-Algiers, Algeria; Sidali.doukkari@gmail.com
[2]Department of Geological Sciences, University of Cape Town, Private Bag X3, Rondebosch 7701, South Africa
[3]IPGP, 1 rue Jussieu, 75238 Paris Cedex 05, France

The Tuareg shield is known for the presence of eclogite facies metamorphism that occurred during the assembly of west Gondwana, and which has mostly been described in the Central Hoggar. The Egéré-Aleksod terrane of Central Hoggar is considered to have been a passive margin during the Neoproterozoic before it was subducted during the convergent stage of the Pan-African orogeny. The area of Adrar Izzilatène, in the Egéré-Aleksod terrane, exposes one of the best-preserved examples of eclogitefacies metamorphism in Hoggar. The area is characterized by the superposition of two units with distinctly different lithologies and metamorphic history. First, The Arechchoum unit is composed of foliated orthogneiss, with lenses of garnet-bearing metagabbros that are crosscut by tonalites. Second, the Egere unit is remarkable for the occurrence of mafic eclogites surrounded by metasediments (metapelites, marbles and quartzites), representing a former passive margin prior to undergoing high-pressure metamorphism. The lack of penetrative deformation in mafic eclogite lenses can be explained by location within the enveloping marbles, which would have provided a locus for exhumation-related deformation, limiting the extent of fluid infiltration. The geochemistry of the mafic eclogites indicates that their protoliths are tholeitic basalts with E-MORB affinity that formed in a rift-related environment.

Doukkari et al. [1] constrained three distinct development stages in the eclogites, namely a pre–peak stage (M1; defined by garnet, amphibole, epidote, quartz and rutile), the peak eclogite–facies stage (M2; defined by omphacite, garnet, edenite, epidote, quartz and rutile), and a retrograde stage (M3), where initial decompression resulted in the appearance of plagioclase, followed by the development of pargasite + plagioclase kelyphites and finally the formation of anhydrous plagioclase + diopside coronas after amphibole. Omphacite has jadeite contents of up to X_{Jd} = 0.36, which is the highest yet observed for eclogites from the Tuareg Shield. Garnet zoning patterns are characterized by flat profiles in the cores (X_{Alm} = 0.55–0.60; X_{Prp} = 0.12–0.16; X_{Grs} = 0.26–0.30), with a decrease in almandine to X_{Alm} = 0.45, coupled to an increase in pyrope to X_{Prp} = 0.29 and decrease in grossular to X_{Grs} = 0.26 occurring at the rims. Inclusions within garnet crystals are limited to amphibole, epidote, rutile and quartz. Calculated *P–T–*M_{H2O}pseudosections used to interpret the garnet zoning and inclusion assemblages show that prograde M1 metamorphism occurred at 13–14 kbar and 580°C, before pressure and temperature increased to a maximum of 19 kbar and 650-700°C during M2. Such a prograde path can be achieved during oceanic or continental subduction. The M3 stage isconstrained to have occurred at 8–9 kbar and 700–750°C, at H_2O-undersaturated conditions, and is related to the exhumation of the Izzilatène eclogite, during the latter stages of the Pan-African orogeny.

Reference:

[1] Doukkari S, et al. (2015) Lithos 226 : 217–232.