



Contents lists available at ScienceDirect

Precambrian Research

journal homepage: www.elsevier.com/locate/precamres

Late Ediacaran geological evolution (575–555 Ma) of the Djanet Terrane, Eastern Hoggar, Algeria, evidence for a Murzukian intracontinental episode

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ARTICLE INFO

Article history:

Received 18 September 2009

Received in revised form 25 February 2010

Accepted 5 May 2010

Keywords:

Hoggar

Murzuq craton

Murzukian intracontinental event

U–Pb zircon

Sr–Nd isotopes

Metacraton

ABSTRACT

The Eastern Hoggar is by far the least well known part of the Tuareg Shield. It is composed, from west to east, of the Aouzegueur, Edembo and Djanet Terranes. The Djanet Terrane is the easternmost Hoggar terrane and comprises a greenschist-facies clastic sedimentary sequence, the Djanet Group, intruded by granitoids. Laser ablation (LA-) ICP-MS U–Pb zircon ages of detrital zircons from these sediments yield a large range of ages similar to ages known in Central and Western Hoggar; the youngest is 590 ± 10 Ma (2σ), which is the maximum age of deposition of the Djanet Group. The Djanet Group is intruded by the Djanet Batholith (571 ± 16 Ma), by high-level subcircular plutons such as the Tin Bedjane Pluton (568 ± 5 Ma) and finally by the felsic Tin Amali Dyke Swarm (558 ± 5 Ma), all ages being SHRIMP U–Pb zircon. The deposition and metamorphism of the Djanet Group thus occurred between 590 Ma (the age of the youngest detrital zircons analyzed in the Djanet Group) and c. 570 Ma (the age of intrusive granitoids). Nd T_{DM} two-stage model ages (1.30–2.03 Ga), initial $^{87}\text{Sr}/^{86}\text{Sr}$ ratios (0.7035–0.7095) and ε_{Nd} (–3 to –11) of the three intrusive suites, all being high-K calc-alkaline in composition, indicate mainly an old, Rb-depleted continental source. Migmatization in the adjacent Edembo Terrane is dated at 568 ± 4 Ma (U–Pb zircon SHRIMP age), contemporaneous with the intrusion of the Djanet plutons. Rocks and events in the Edembo and Djanet Terranes are all intracontinental. We propose that the Djanet Terrane lies on the boundary of a craton located to the north-east, that we defined here as the Murzuq craton. The existence of the Murzuq craton is supported by sedimentary and geophysical data. We suggest that the deformation of Eastern Hoggar occurred 575–555 Ma, due to the indentation of the Murzuq craton and has no link with the older convergence with the West African craton as was the case for the central and western parts of the Tuareg Shield. This determines a late Ediacaran intracontinental Murzukian event that probably also occurred to the east in the Tibesti area.

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1. Introduction

The Tuareg Shield (500,000 km²) is a Cenozoic dome composed of Precambrian lithologies unconformably overlain by subhorizontal Palaeozoic sediments (Fig. 1A). Most of it lies in Algeria (Hoggar)

and extends SW into Mali (Adrar des Iforas) and SE into Niger (Air mountains). The Tuareg Shield comprises abundant Archaean and Palaeoproterozoic terranes (e.g. Peucat et al., 1996, 2003; Bendaoud et al., 2008) sometimes well-preserved (In Ouzzal terrane; Ouzegane et al., 2003) and sometimes reactivated during the Pan-African orogeny (630–580 Ma; LATEA metacraton, Liégeois et al., 2003; Bendaoud et al., 2008). Neoproterozoic juvenile oceanic or continental terranes are also common, generally predating the main c. 600 Ma collision period, with ages ranging from 870 to 650 Ma (Caby et al., 1982; Caby and Andreopoulos-Renaud, 1987; Liégeois et al., 1987, 1994; Henry et al., 2009).

The Tuareg Shield has been subdivided into 23 terranes (Black et al., 1994) superimposed on the former three-folds structure

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