



## **Orogenic development of the Adrar des Iforas (Tuareg Shield, NE Mali): new geochemical and geochronological data and geodynamic implications**

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Laser-ablation U-Th-Pb analyses of zircon and allanite from magmatic and metamorphic rocks of the Adrar des Iforas (Northern Mali) allow re-examining the relationships between the different crustal units constituting the western part of the Tuareg Shield, as well as the timing of magmatic and metamorphic events in the West Gondwana Orogen. Granulite-facies metamorphism in the Iforas Granulitic Unit (IGU) and at In Bezzeg occurred at  $1986 \pm 7$  Ma and  $1988 \pm 5$  Ma respectively. This age is slightly younger, but consistent with that of the HT granulite facies event characterizing the In Ouzzal granulitic unit (IOGU), thereby substantiating the view that these units once formed a single granulitic belt of c. 800 km long. High-grade metamorphic basement units of the Kidal terrane surrounding the IGU contain Paleoproterozoic magmatic rocks crystallized between  $1982 \pm 8$  Ma and  $1966 \pm 9$  Ma. Inherited components in these rocks (2.1 Ga and 2.3-2.5 Ga) have ages similar to that of detrital zircons at In Bezzeg and to that of basement rocks from the IGU. This is taken as evidence that the Kidal terrane and the IGU formed a single crustal block at least until 1.9 Ga. East of the Adrar fault, the Tin Essako orthogneiss is dated at  $2020 \pm 5$  Ma, but escaped granulite facies metamorphism. During the Neoproterozoic, the Kidal terrane underwent a long-lived continental margin magmatism. To the west, this terrane is bounded by the Tilemsi intra-oceanic island arc, for which a gneissic sub-alkali granite was dated at  $716 \pm 6$  Ma. A synkinematic diorite extends the magmatic activity of the arc down to  $643 \pm 4$  Ma, and, along with literature data, indicates that the Tilemsi arc had a life span of about 90 Ma. Backward docking to the western margin of the Kidal terrane is documented by migmatites dated at  $628 \pm 6$  Ma. Subduction related processes and the development of the Kidal active margin was responsible for the development of a back-arc basin in the Tafeliant area, with deposition of sediments intruded by basaltic and dacitic lavas, one of which was dated at  $623 \pm 6$  Ma. East of the IGU, in the Tamaradant domain, metagabbros and meta-anorthosites emplaced within greywackes have geochemical characteristics typical of subduction-related environments (enrichment in LILE and HFSE depletion). A metadiorite intruding the Tamaradant sediments gave an age of  $630 \pm 6$  Ma, which is tentatively taken as evidence for a Pan-African age for the subduction processes that took place east of the IGU. Collision of the Kidal terrane with the eastern margin of the West African Craton is best dated by a syncollisional tonalite, which provides an age of  $604 \pm 5$  Ma. Late kinematic processes shortly followed at  $599 \pm 4$  Ma as exemplified by the emplacement of a monzogranite belonging to the complex Central Batholith. The geochronological and geochemical evidences provided by this study allow proposing that the Kidal terrane, the IGU and Tamaradant domain of the Adrar des Iforas once belonged to a single terrane, which probably extended northward to include the IOGU, and which was later dissected by major lithospheric scale faults during the late Pan-African orogenic phases