International Meeting

July 1st, 2021 (*online*)

THE PANAFRICAN AND CADOMIAN OROGENIES IN NORTH AFRICA AND WESTERN EUROPE

J. Javier Álvaro, Martim Chichorro and Gabriel Gutiérrez-Alonso (eds.)

(cover photo: panorama of microbial-Cloudina reefs in Villarta de los Montes, Central Iberian Zone)

Álvaro, J.J., Chichorro, M. and Gutiérrez-Alonso, G. 2021. The Panafrican and Cadomian orogenies in North Africa and Western Europe. IGEO ed., Madrid.

Aims of the meeting

The scientific sessions will be focused on the Pan-African and Cadomian Orogenies recorded in North Africa and western Europe across the Ediacaran-Cambrian transition and its bearing in the assembly and demise of Pannotia. Contributions dealing with structural, magmatic, provenance sources, palaeomagnetic, sedimentary, chronostratigraphic and radiometric constraints are particularly welcome.

Meeting date

July 1st, 2021 (online)

Organizing Committee

J. Javier Álvaro, Instituto de Geociencias (CSIC-UCM), Spain

Martim Chichorro, Universidade Nova de Lisboa, Portugal

Gabriel Gutiérrez-Alonso, Universidad de Salamanca, Spain

Contributions to IGCP Projects

648 - Supercontinent Cycles and Global Geodynamics

683 - Pre-Atlantic geological connections among northwest Africa, Iberia and eastern North America

Evolution of a Neoproterozoic suture in the Iberian Massif, Central Portugal: igneous and metamorphic events at the Ossa Morena Zone/Central Iberian Zone boundary

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The existence of the late Neoproterozoic supercontinent Pannotia (ca. 650-540 Ma) is controversial. Several proxies for supercontinent assembly and break-up have been recognized. Global orogeny and granitoid magmatism, detrital zircon and monazite age peaks and extreme conditions of metamorphism are some of the proxies pointed out for supercontinent assembly. The amalgamation of Pannotia was accompanied by the Pan African-Cadomian-Baikalian orogeny that generated several collisional belts. We present a sequence of magmatic and tectonometamorphic events for the Cadomian belt that can be interpreted as proxies of supercontinent assembly.

In the Iberian Massif (Western Europe, Central Portugal) a Neoproterozoic suture is exposed. It is located at contact between the Ossa-Morena Zone and the Central Iberian Zone, where a well preserved Cadomian basement crops out.

The Cadomian arc magmatism generated calc-alkaline magmas of acid composition and peraluminous character at 692 + 77/-60 Ma, 569 ±3 Ma and 548 ± 4 Ma. Their trace element contents are identical to the bulk continental crust which suggest a mature continental arc. Their isotopic signatures indicate partial melting of metasedimentary and meta-igneous crust in different crustal levels: $(^{87}Sr/^{86}Sr)_I$ = 0.7057-0.7117; εNd_t = -5.2 to -8.1. Old crustal sources are indicated by the negative εNd_t values and old T_{DM} model ages (1.53-1.69 Ga), which is a common feature observed in Cadomian type-terranes. Inherited zircons of Paleoproterozoic and Neoarchean age (1.9–2.8 Ga) suggest a West African craton provenance.

The last magmatic pulse (544.2 ± 1.7 Ma; 544.3 ± 2.5 Ma; 544 ± 2 Ma) is represented by calc-alkaline magmas of basic to intermediate compositions with intraplate and active continental margin affinities. Their isotopic signatures indicate partial melting of meta-igneous lower crust and mantle: $(^{87}Sr/^{86}Sr)_I$ = 0.7053-0.7084, εNd_t = -2.9 to-3.4. They display old T_{DM} model ages (1.22-1.81 Ga).

Evidence for a major metamorphic event near the Late Neoproterozoic-early Cambrian boundary (ca.540 Ma) is preserved in metamorphic monazite (540 ± 3 Ma; 540 ± 5 Ma; 539 ± 2 Ma) and in metamorphic zircon (539 ± 3 Ma). *P-T* phase equilibria modelling indicates metamorphism under amphibolite facies conditions, near the transition to the granulite facies (P = 7-8 kb, T = 640-660 °C). This is interpreted as the continental arc accretion of the Ossa Morena Zone with the Iberian Autochthon passive margin (future Central Iberian Zone). This major metamorphic event is broadly coeval with metamorphic events related to collision observed in other areas of Gondwana (e.g. Damara Belt, Kaoko Belt and Ribeira Belt).

The Iberian Neoproterozoic suture records indicators of supercontinent assembly: a peak of granitoid magmatism at ca.569 Ma that is correlated with a second major period of intermediate to granitic magmatism in Cadomia (ca. 580-570); an increased continental arc activity, in a short time span at ca.548-544 Ma, with partial melting of different crustal levels and mantle; metamorphism near the transition to the granulite facies at ca.540 Ma as a result of collision between two peri-Gondwanan terranes.

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