

Geophysical Research Abstracts
Vol. 15, EGU2013-11921, 2013
EGU General Assembly 2013
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New U-Pb zircon ages for Early Ordovician magmatism in Central Portugal

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The Mundão anatectic complex is located in the axial zone of the Iberian massif of Central Northern Portugal (Central Iberian Zone). It consists of lenticular bodies of felsic gneisses and stromatic metatexites derived from metasedimentary protoliths of Neoproterozoic-Lower Cambrian age, both showing evidence of incipient to extensive partial melting during the Variscan orogeny. Although the precise age of the migmatization event is still unknown, field and structural evidence show that the partial melting conditions were reached in the last stages of crustal thickening (D1), continued during subsequent extensional deformation (D2) and culminated with the emplacement of large volumes of S-type granite magmas in a transcurrent tectonic regime (D3). The upper limit for crustal melting is provided by the Late Carboniferous age of the S-type granitoids (312.4 ± 2.7 Ma) intruding the Mundão anatectic complex.

Due to their transitional contacts with the stromatic metatexites, the felsic gneisses were previously interpreted as diatexites resulting from anatexis of the same pelitic and/or metagreywacke protolith. However, new U-Pb dating by ID-TIMS show that the zircon fractions from one sample of the leucocratic gneisses are concordant and yield a $^{206}\text{Pb}/^{238}\text{U}$ weighted average age of 474.5 ± 1.5 Ma. The results obtained reveal that these rocks correspond to orthogneisses instead of sedimentary-derived diatexites and provide a good estimate for the crystallization age of their magmatic protolith. In contrast, the monazite fractions show distinct $^{207}\text{Pb}/^{235}\text{U}$ ages of 341.8 ± 2.1 Ma and 453.4 ± 2.0 Ma and may therefore have lost Pb to different extent during Variscan deformation and metamorphism.

The preservation of inherited ages of the igneous protolith in the Mundão leucocratic gneisses suggests that zircon was mainly incorporated as restitic material, with only minor precipitation and/or recrystallization during crustal anatexis.

The new age of the Mundão orthogneiss brackets the so-called Early Ordovician Sardinian unconformity, characteristic of the Central Iberian Zone.

Funding: PETROCHRON PTDC/CTE-GIX/112561/2009 and PEst-C/CTE/UI4035/2011