A combined zircon LAM-ICPMS-MC U-Pb and Lu-Hf isotopic study of Variscan S-type granites from Sabugal, central Portugal

R. J. S. TEIXEIRA[1], A. M. R. NEIVA[2], P. B. SILVA[3], M. E. P. GOMES[4] AND T. ANDERSEN[5]

[1,4]Dep. of Geology, UTAD, Portugal and Geosciences Center (rteixeir@utad.pt, mgomes@utad.pt)
[2]Department of Earth Sciences and Geosciences Center, University of Coimbra, Portugal (neiva@dct.uc.pt)
[3]LNEG, National Laboratory of Energy and Geology, São Mamede de Infesta, Portugal (paulo.bravo@lneg.pt)
[5]Dep. of Geosciences, Univ. of Oslo, PO Box 1047 Blindern, N-0316 Oslo, Norway (tom.andersen@geo.uio.no)

The Sabugal area is located within the autochthonous terrane of the Central Iberian Zone. During the third deformation phase (D_3) of the Variscan orogeny, constrained between ~315 Ma and 305 Ma, large volumes of S-type two-micas granites intruded the Precambrian to Cambrian formations from the Douro Group, which mainly consist of phyllites and metagraywackes. The medium-grained porphyritic granite G1 is syn- to late-D_3, whereas the medium-grained slightly porphyritic granite (G4), a fine- to medium-grained porphyritic granite (G5) and a coarse-grained porphyritic granite (G6) are late-D_3. Some magmatic zircons from granites G5 and G6 have positive εHf_t values (up to +6), suggesting mixing of a mantle-derived magma with lower crust components or the involvement of a newly formed lower continental crust. Other magmatic zircons from granites G1, G4, G5 and G6 have negative εHf_t values (-8 to -0.1), which suggest three hypothesis for their origins: a) melting of an old crust; b) melting of a heterogeneous crust; c) contamination of mantle-derived magmas by crustal components. Alternatively, the significant variable Hf isotope compositions of the four granites can be explained by the decoupled release of zircon Hf and non-zircon Hf from single crust-derived magma sources. Furthermore, the average εHf_{300} of detrital zircons from the metagraywacke of Sabugal (ca. -25) is less radiogenic than that of magmatic zircons of granite G5 (ca. -1), suggesting that the host metagraywacke could not have been involved in its genesis. Therefore, the contribution of other sources must be considered, as it is suggested by the presence of mafic microgranular enclaves in granite G5. The inherited zircon cores of the granite G5 can be interpreted as a contaminant during ascent and emplacement, but not a source for the granitic melt. Acknowledgements: Thanks are due to Petrochron project (PTDC/CTE-GIX/112561/2009).