Using structural analysis and thermochronology to depict the geodynamic evolution of Ribeira Belt

T. Bento dos Santos[1], P. Fonseca[1], J. Munhá[1], C. Tassinari[2], C. Dias Neto[2]

[1]Centro/Departamento de Geologia, Universidade de Lisboa, C6, 3º, Campo Grande, 1749-016 Lisboa, Portugal (tmsantos@fc.ul.pt)

[2]Instituto de Geociências, Universidade de São Paulo, Rua do Lago, 562 – Butantã, 05508-080, SP, Brazil

This study integrates thermochronological data on the central segment of Ribeira Belt (SE Brazil) with structural analysis of the Paraiba do Sul River megashear in order to constrain the thermotectonic evolution of this Panafrican granulite belt. Our new data indicate that the main regional high grade thrust deformation (D_2: 250º, 55-70º NW; stretching lineation 55-65º, 5-20º) was coeval with peak metamorphism at ~565 Ma, post-dating earlier collision related imbrication nappe thrusts at 630-600 Ma (D_1). D_1 and D_2 strain markers were mostly erased by D_3 thrusting and long-term dextral transpressional shearing (50-65º, 70-85º NW; stretching lineation 5-15º, 172-178º), simultaneous with slow-cooling (<1 to 5ºC/Ma) of the orogen until ~ 500 Ma. Brittle, extensional, tectonic event D_4 (290-320º, sub-vertical) and thermal relaxation is associated with late granite emplacement at 490 Ma, being followed by regional tectonic collapse that resulted on rapid exhumation/cooling (~30ºC/Ma) of the high grade rocks at ~470 Ma.

Results suggest that a ~35 Ma period of nearly orthogonal shortening between the San Francisco and West Congo cratons occured until 565 Ma with development of a D_2 flower thrust system, coeval with high-grade granulitic metamorphism. Afterwards, orthogonal shortening became rheologically impossible (because rocks could not absorb further shortening) and a (D_3) dextral transpressive regime became dominant, turning the flower structure asymmetric. Specific positioning within the flower structure and strong partition of deformation induced “local” antithetical sinistral kinematics within the main regional dextral regime and differential exhumation; thus, granulites in the central axis were rapidly exhumed, whereas along the lateral branches exhumation was much slower (because of the small dip angle: 5 to 10º) resulting in very slow cooling on the lateral branches, that lasted for almost 100 Ma.

FAPESP, POCA-PETROLOG (CEGUL, UI: 263; POCTI/FEDER) and SFRH/BD/17014/2004 FCT PhD scholarship co-financed by FEDER provided support for field and analytical work.