Strain partitioning in a collapsing hot orogeny

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Large, hot orogens are characterized by an orogenic plateau supported by a zone of weak ductile flow. During the collision phase, the magnitude of the belt and the temperature increase as radioactive crustal material is accreted, buried and heated. After convergence ends, no material is added to the orogenic system and the orogen undergo gravitational (or extensional) collapse that results from the lateral flow of the hot orogenic infrastructure. In the Araçuaí-West Congo orogen (AWO), the high temperatures, slow cooling, and excessive amount of melt in the hinterland, in the northern part of the belt, imply that a high temperature was maintained for a long time. Geochronologic results suggest that this internal domain was hot for a long time, cooling at < 3°/Myr since 600 Ma until 500 Ma, and cooling through the Ar/Ar retention temperature for biotite occurred around 470 Ma. In the south the collapse of the orogen is marked by the widespread intrusion of bimodal, composite plutons at ~500 Ma. Here we use the magnetic fabric (i.e. low-field anisotropy of magnetic susceptibility) of intrusions in the north and south sectors to track the kinematics and rheological changes across the belt. In the northern part of the AWO we studied the Padre Paraiso Charnockite and the southern part of the AWO we studied the Conceição de Muqui and Santa Angélica plutons. The Padre Paraiso charnockite has a coherent magnetic fabric, with magnetic foliations trending N-S, following the general structure of the belt in that sector. In turn, Conceição de Muqui and Santa Angélica plutons show a concentric distribution of foliations and lineations, in stark contrast with the general NE-SW trend of the belt in the south. This contrasting structural pattern for coeval plutons along the AWO belt reveal the strain partitioning at the scale of the orogenic belt during the cooling of the AWO. At 500 Ma the hot northern sector remains warm enough to allow a coherent deformation of intrusions and host rocks. At the same time, more material was being added to the margins of the hot orogen, which already cold, with the diapire-like plutons structure being dominantly controlled by the forces of magma ascent and emplacement.
