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TÍTULO: RECONSTRUCTION OF OROGENIC ARCHITECTURE USING THERMOCHRONOLOGY: AN EXAMPLE FROMTHE RESTORED GRENVILLE COLLISION BELT BETWEEN AMAZONIA AND LAURENTIA

AUTOR(ES): ERIC TOHVER[1], WILSON TEIXEIRA[1], BEM VAN DER PLUIJM[2], MAURO CESAR GERALDES[3] AND JORGE SILVA BETTENCOURT[1]

INSTITUIÇÃO: 1 INSTITUTO DE GEOCIÊNCIAS, UNIVERSIDADE DE SÃO PAULO - 2 DEPARTMENT OF GEOLOGICAL SCIENCES, UNIVERSITY OF MICHIGAN - 3 FACULDADE DE GEOLOGIA, UNIVERSIDADE DO ESTADO DO RIO DE JANEIRO

We present a new method for determining the degree of exhumation for an ancient mountain belt based on the observed cooling rate. The cooling rate is determined from geochronological determinations on metamorphic minerals (e.g., monazite, allanite, titanite, hornblende, muscovite, biotite) with different thermal closure temperatures, i.e., the temperature at which the radiogenic daughter product effectively ceases to diffuse out of the sample mineral. The temperature range of our study varies from ~750 to 730oC, the closure temperature for monazite with respect to radiogenic lead (Pb) to ~300 to 730oC, the closure temperature for radiogenic Ar (40Ar*) in biotite. This temperature range is typical of the ductile regime of the middle crust (15-40 km), which is characterized by an uniform geothermal gradient with minimal effects from topography. We apply this technique to the restored Grenville belt that marks the collision between Laurentia and the SW Amazon craton of Rondônia and Mato Grosso. The degree of exhumation recorded on opposite plates of this mountain belt indicates an asymmetric orogenic structure. Thrust faults and crustal imbrication predominate on the ancestral North American plate, whereas the Amazon lithosphere was deformed more heterogeneously, principally by strike-slip faults. The larger degree of exhumation in the Laurentian Grenville Province implies a longer period of post-orogenic stabilization, in contrast with the excellent preservation of syn-collisional structures in the SW Amazon craton. We suggest that this asymmetry may reflect the geometry of subduction, or even the different thermal structure of the Laurentian (hotter, softer) and Amazon (colder, more rigid) lithospheres before the collision.

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