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Thermal history and evolution of the Rio de Janeiro – Barbacena section of the southeastern Brazilian continental margin

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The transect between the Brazilian cities of Rio de Janeiro and Barbacena (22°54'S, 43°12'W and 21°13'S, 43°46'W, respectively) runs through a segment of a complex range of N-NE/S-SW trending basement units of the Ribeira Belt and southern Sao Francisco Craton, intensely reworked during the Brasiliano-Pan-African orogenic cycle. The ortho- and paragneisses in the area have metamorphic ages between 650 and 540 Ma and are intruded by pre-, syn- and post-tectonic granitic bodies. The transect, perpendicular to the strike direction of the continental margin, crosses the Serra do Mar escarpment, where the sample density is higher in order to better constrain occasional significant age changes. For logistical reasons, the 40 samples collected were processed in two separate batches for apatite fission track (AFT) analysis. The first batch comprised 19 samples, from which 15 produced fission track ages. Analyses were carried out at University College London (UCL), following standard procedures. Preliminary results for the study show AFT ages between 85.9±6.3 and 54.1±4.2 Ma, generally with younger ages close to the coast and progressively older ages towards the continental interior. The highest area sampled, around the city of Teresopolis, ranges from 740 to 1216 m above sea level and shows ages between 85.9±6.3 and 71.3±5.3 Ma. There is no evident lithological or structural distribution control. Medium track length values range from 12.57 to 13.89 μm and distributions are unimodal.

Thermal history modelling was done using software QTQt. Individual sample model cooling curves can be divided into two groups: a dominant one, showing a single, slower cooling trend, and a second one with a rapid initial cooling curve, which becomes less steep around 65 Ma. In both groups the maximum paleotemperatures are around 110 Ma. The thermal history model for the first batch of samples is compatible with a single cooling event for the area following continental rifting and formation of the Atlantic Ocean.

The preliminary results add to the growing thermochronological data base for the southeastern Brazilian continental margin and to deciphering the complex evolution of the region, as well as to the knowledge about the development and evolution of divergent continental margins in general. In a regional setting, AFT ages from this study, though not broadly variant locally, are distinct from basement rock AFT ages for adjacent areas produced by other authors along the southeastern continental margin. Similar ages are found at the southern Bocaina Plateau, for example, where structural control of age distribution is evident. Such regional thermal age difference has been previously attributed to continental scale structural compartmentalization throughout the continental passive margin, related to Late Cretaceous and Cenozoic reactivation of the E-W fracture zones linked to rifting of the South Atlantic. The present AFT results are compatible with Late Cretaceous reactivation but show no relation with younger events.