Post-Gondwana break-up evolution of the South Atlantic passive margins in eastern Brazil and the western Democratic Republic of the Congo unravelled by low-temperature thermochronology

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Abstract

Gondwana was one of the major supercontinents that made up a part of Pangaea since the Permian. Its break-up during the Mesozoic and the Cretaceous disintegration of Western Gondwana in particular, gave rise to different types of continental margins. The Gondwana continent itself was built up of a number of cratons, separated by orogenic belts. The São Francisco-Congo craton formed a large portion of Western Gondwana, enclosing the Araçuaí-West Congo Orogen (AWCO) in the west, the north and the east. This orogenic belt formed as a result of a number of extension and compression events of which the latest is known as the Pan-African – Brasiliano orogeny (late Neoproterozoic). During the break-up of Gondwana, and specifically the opening of the South Atlantic, the AWCO became separated, with the Araçuaí orogen as the South American witness (Brazil) and the West Congo Belt as the witness on the African continent (Democratic Republic of the Congo, Congo Brazzaville, Gabon and Angola). The complex history of this area resulted in two different passive margins with a range of older inherited structures predating the break-up event. This makes this region ideally suited to increase our understanding of 'passive' margins and the role of reactivation of pre-existing structures (inheritance) and post-burial exhumation (e.g. Japsen et al., 2015). For this purpose it is essential to place the tectonic movements in an absolute timeframe. Multi-method low-temperature thermochronology lends itself as an ideal tool for this task.

For this study we collected samples from N-S and E-W profiles in eastern Brazil (Minas Gerais and Espirito Santo states: Caparáo – Vitória – Governardor Valadares transects) for investigation with the apatite fission track (AFT) and apatite (U-Th-Sm)/He methods. These geothermochronometers are sensitive for the temperature window between 120°C and 60°C. In a later phase of the project samples from similar profiles in the D.R. Congo will be investigated by the same methods (e.g. Kimpese – Boma – Tshela). Preliminary results for the Brazilian margin indicate Late Cretaceous – Paleocene basement cooling in a gradual trend, interpreted as the effect of basement denudation with the evolving rift and passive margin setting.

Keywords: *Thermochronology, apatite fission tracks, passive margin, Araçuaí, West Congo Belt, continent break-up, western Gondwana*