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Building up Gondwana at 183 Ma – the methodology behind the reconstruction of the new Gondwana geological map

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ABSTRACT: Gondwanabreak-up initiatedat ca.183 Maduring the Jurassic, in the region between Madagascar and East Africaand went continuously until ca. 80 Ma, when Australia and Antarctica separated. The actual configuration of the southern hemisphere continents, plus Greater India, is a direct product of this global event. The reconstruction using the actual oceanic crust is quite accurate until ca. 80 Ma. The remaining 100 m.yto rebuildGondwana is more complicated, especially when dealing with hyperextended continental margins, microcontinents, oceanic plateaus and intraplate deformation.Present day continental plates have not been rigid since Gondwana break-up started, and intraplate deformation is registered throughout, mainly, the major continental plates (i.e. South American and African plates). In this work, we reconstruct Gondwana for its best pre-breakup position at 183 Ma. This model is applied to the new Gondwana geological map (IGCP-628). Our methodology starts with analysingthe latest published data on the reconstruction of these fragments and the geological data of the Gondwana Geological Map Project database (UFRJ-PETROBRAS), which includes tectonic and structural information.The reconstruction was calculated with the support of the plate tectonic reconstruction and interaction software, GPlates. South American and African plates were subdivided into smaller rigid blocks. This action is required to minimize gaps and overlaps caused by the continents intraplate deformation. When the continental fragment can't have its position precisely determinedbecause no information can be taken from the formation of an oceanic crust (i.e. both New Zealand fragments moved relative to each other, but no oceanic crust can tell the story), continental geology is required to work as piercing points. The continental piercing points were also used as an important tool for linking the continental transform margins (i.e. Equatorial Atlantic –Transbrasiliano-Kandi lineament). In addition, the complex reconstruction of Madagascar, India, Sri Lanka and East Antarctica is based on a comparison of geological structures and tectonic domains.When no information relative to oceanic crust and precise piercing points are available, the tectonic history was the main evidence to reconstruct the fragments (i.e. Malvinas/Falkland Islands and East Antarctica terranes). This method made possible to re-assemble the best Gondwana fit for the Jurassic,justbefore its break-up according to the geological, tectonic and structural data. The northern Gondwana margin in the Jurassic certainly did not have the Himalayan orogeny. Therefore, the polygons of the greater India units are shown, although deformed, without the Cenozoic metamorphism legend. The contribution of some of the peripheral terranes at the northern margin of Gondwana are still a matter of controversy to its configuration, mostly due to the divergence of accurate data regarding their time of rifting and shape of the terranes. Thus, they are drafted on the edge to the main continental blocks according the most recent available data, e.g. Florida and Afghanistan.

KEYWORDS: GONDWANA, PLATE RECONSTRUCTION, GEOLOGICAL CORRELATION.