

Dealing with lithospheric structures and reconstruction in the Gondwana geological map

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Abstract

The Gondwana Map 2017 (pre-1st edition) is an improved version of the Gondwana Map 2016 (draft 2.0), in which geological and geophysical data were upgraded and a new plate reconstruction was generated. Geophysical maps were created to support geological data, for instance, especially in regions where the geological contacts were covered. Two indirect methods were chosen as geophysical base, magnetometry and gravimetry. For magnetometry data five maps (major continents) were made from EMAG2_V3 – Earth Magnetic Anomaly Grid (2-arc- minute resolution), with the exception for Antarctica with data from ADMAP_1 - A Digital Magnetic Anomaly Map of the Antarctic. The maps were produced in both geographical and projected coordinates. Each continental map had two versions: one with original data and no interpolation; one with interpolated data. The following filters were tested to highlight certain features and improve/enhance the collected data: a) analytic signal, b) reduction to the pole and c) differential reduction to the pole. For the gravimetric data only Free Air Sandwell v23-1 map was made, also in both geographical and projected coordinates, using Oasis Montaj 9.2 software. The data was gridded by minimum curvature algorithm. Several geophysical features corroborated and improved the Gondwana geological map regarding mostly structures and geological contacts. Crustal scale shear zones were enhanced on magnetic maps and used as piercing points in the reconstruction of Gondwana, especially on the Atlantic Ocean. In the actual continental margins COB lines were better traced. Regarding the reconstruction, using GPlates software, South America and Africa continents were subdivided in platelets, following intracontinental features in part corroborated by magnetic and gravimetric maps. One of the most important lineaments is the Transbrasiliano-Kandi shear zone connecting NE Brazil and West Africa. The reconstruction model presented on this pre-1st edition version is a hybrid model using rotation poles from C. Reeves for eastern Gondwana blocks, including Madagascar, from M.Moulin for African blocks and from Richetti et al (submitted) a new proposal for South American blocks. As on version draft 2.0 the southern blocks in Antarctic region and Patagonia followed partially Dalziel model. The fragmentation of western Gondwana continents is fundamental to accommodate the intraplate deformation observed especially on Cretaceous intracontinental rift systems. The disadvantage is the overlap of some blocks in the geological map of Gondwana that compromise the clarity in these contact regions. Finding a solution for this consequence on assuming a better reconstruction is still a challenge.

Keywords: Jurassic reconstruction, Gondwana geological map, magnetic anomalies, crustal scale structures