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A Full Plate Topological Animation for the Neoproterozoic: a requirement for understanding the feedback between the solid Earth and the greater Earth System

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We present the first full plate topological construction for the Neoproterozoic-Cambrian amalgamation of the supercontinent Gondwana. The reconstruction uses GPlates and incorporates the limited well-constrained palaeomagnetic record for the Neoproterozoic as well as considerable geological information as to the nature and evolution of the plate margins. Here we have expanded the continental plate-margin record (such as continent-continent collisions, intra-continent rifts and continent-margin subduction zones) with extensive geochemical and geochronological data from Neoproterozoic intra-oceanic subduction zones; the volcanic arc products of which occur, often highly deformed and metamorphosed, within the Gondwana-forming orogens that lace Africa, India, Antarctica and South America.

Here we present new U-Pb, O and Hf zircon and Nd whole rock isotopic data from Ethiopia, Egypt, Oman, Madagascar, Saudi Arabia and India that, along with published data from other workers, constrain the subduction history of the Mozambique Ocean, and from that the nature of the plate boundaries between Neoproterozoic India, Azania and both the Congo-Tanzania-Bangweulu Block and Sahara Metacraton of Africa. These form the core of our global plate topological reconstruction. The reconstruction forms an imperfect early version. More complementary data will enhance the reconstruction and we encourage the collection and publication of these data to improve this model.

The production of full-plate topological reconstructions now allows tectonic and geographic controls on other earth systems to be investigated, such as the possible role of volcanism on the initiation of the Cryogenian, or the nature of mantle convection in the Neoproterozoic.