

PRE-GONDWANA GEOLOGIC FRAMEWORK OF NORTHEAST BRAZIL

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A major aspect of trying to understand tectonic cycles during the Precambrian is to define configurations and histories of the components that amalgamated to form supercontinents. This talk will focus mainly on the history of the central part of West Gondwana, in and around northeastern Brazil, prior to the 650-500 Ma Brasiliano and Pan-African orogenies. In the last two decades considerable interest has been generated by hypotheses relating to the formation and breakup of several Paleoproterozoic to late Mesoproterozoic paleocontinents, including Atlantica, Columbia (Nuna), and Rodinia, that may have evolved into Gondwana and Laurasia. It is not yet clear, however, to what extent these proposed paleocontinents were major factors in the history of NW Gondwana.

The paleocontinent Atlantica was proposed to encompass the four major Archean to early Paleoproterozoic cratons of NW Gondwana (West Africa, Amazon, São Francisco, and Congo), along with large regions of Brasiliano and Pan-African mobile belts (Brasiliano-Trans Sahara: BTS) connecting these cratons. The mobile belts, themselves, also contain extensive amounts of Paleoproterozoic crust and Atlantica formed as a paleocontinent about 2000 Ma. The geologic record in NW Gondwana is fully compatible with and in some instances strongly supports this hypothesis, but there are several weaknesses related to subsequent tectonic events, particularly after 1100 to 1000 Ma. The northern part of Atlantica (Amazon and West Africa cratons, and especially the Amazon craton) has been integrated into many models of Columbia/Nuna and Rodinia. The geologic evidence for these associations is strong, although there are still many details to resolve. On the other hand, there is little evidence that the southern part of Atlantica (São Francisco and Congo cratons plus the BTS belts) was an integral part of either paleocontinent. Since there is also little evidence to the contrary, it is also permissible to have southern Atlantica attached to northern Atlantica as recently as 1200 Ma.

After ca. 1000 Ma there is strong evidence that southern Atlantica was separated from northern Atlantica by a significant (major?) ocean running from the eastern edge of the West Africa craton to the western edge of the Borborema block through the Brasilia belt and farther south. In particular, convergent plate tectonic process occurred between the bordering continental blocks as this ocean closed, with the accretion of exotic terranes and formation of juvenile crust 900 to 600 Ma. Closure of this ocean and collision of northern Atlantica with southern Atlantica about 620 to 580 Ma was one of the defining features in the formation of West Gondwana. In the BTS deformation, metamorphism, and magmatism were dominantly intracratonic. There is also strong evidence for intracratonic magmatism, sedimentation, and deformation about 1000 to 950 Ma within the BTS (notably the Cariris Velhos belt of NE Brazil). Thus, if Atlantica ever existed as a whole unit, it must have undergone breakup and reconvergence (a Wilson cycle) such that the component parts reassembled close to their original configuration.