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Tectonic control of the early Cretaceous South Atlantic magmatic province (SAMP) and its relationship to the endorheic rift and salt basin

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The Early Cretaceous South Atlantic Magmatic Province (SAMP), which includes the Parana-Etendeka LIP, produced about 8 million km3 of tholeiitic basalt and diabase over an area of 4 million km2. The SAMP borders the Central Atlantic Magmatic Province (CAMP) to the southwest but is 66-88 Ma younger (135-113 Ma), marking the next step in the successive breakup of Pangea. The SAMP lies opposite to and is nearly simultaneous with the SW Pacific Ontong Java plateau. The time span of both includes the start of the Cretaceous Normal Superchron (CNS) at 121 Ma that reflects a major change in the thermal structure and circulation pattern of the outer core. The productivity of SAMP strongly increases southward. Only thin transversal dike swarms occur in the north, near South America's NE tip, while thick dike swarms and lava flows characterize the Parana-Etendeka LIP in the south. Further south, from the Rio Grande FZ to the Cape basin, wide zones of SDRSs lie along both sides of the South Atlantic. Long diabase dike swarms transversal to the rift cut deep into the South American continent witnessing its rotation; the largest of these, the Ponta Grossa dike swarm, continued in the proto-Walvis Ridge that separated the central South Atlantic endorheic rift basin from the sea in the south. Hydrothermal activity supplied Ca, Mg, and SiO_2 for the deposition of non-marine carbonates and authigenic clays in the endorheic basin. Basalt flows intercalated with carbonates nearly until salt deposition about 113 Ma. The thickness and E-W width of non-marine pre-salt carbonates in the endorheic rift basin and of the overlying salt seal both increase southward together with the basaltic flows and dikes, as does the size of giant oil reserves in the carbonates estimated at more than 45 billion barrels. The southward increase of volcanism, carbonates, salt and oil reserves all result from the clockwise rotation of South America away from Africa, about a pole in or adjacent to South America's NE corner, that created the southward widening, wedge-shaped South Atlantic rift.