VOLVER

MESOZOIC BREAKUP OF SW GONDWANA AND BASIN FORMATION ALONG THE ARGENTINEAN ATLANTIC MARGIN

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EXTENDED ABSTRACT

The opening of the South Atlantic in the Early Cretaceous was only the final stage of a complex rifting process (Uliana *et al.*, 1989) that initiated after the Mid-Permian and Mid-Triassic Gondwanan orogeny (Hälbich, 1983). The Central Atlantic was the locus of the Triassic rifting, however intracontinental rifts also developed in Africa and South America at this time (Zerfass *et al.*, 2004). Since the Early Jurassic, rifting on Eastern Africa was triggered by the impact of the Karoo plume (Delvaux, 2001), which produced the breakup of Africa from Antarctica and India and the opening of the Weddell Sea (Ghidella *et al.*, 2002). Frizon De Lamotte *et al.* (2015) review

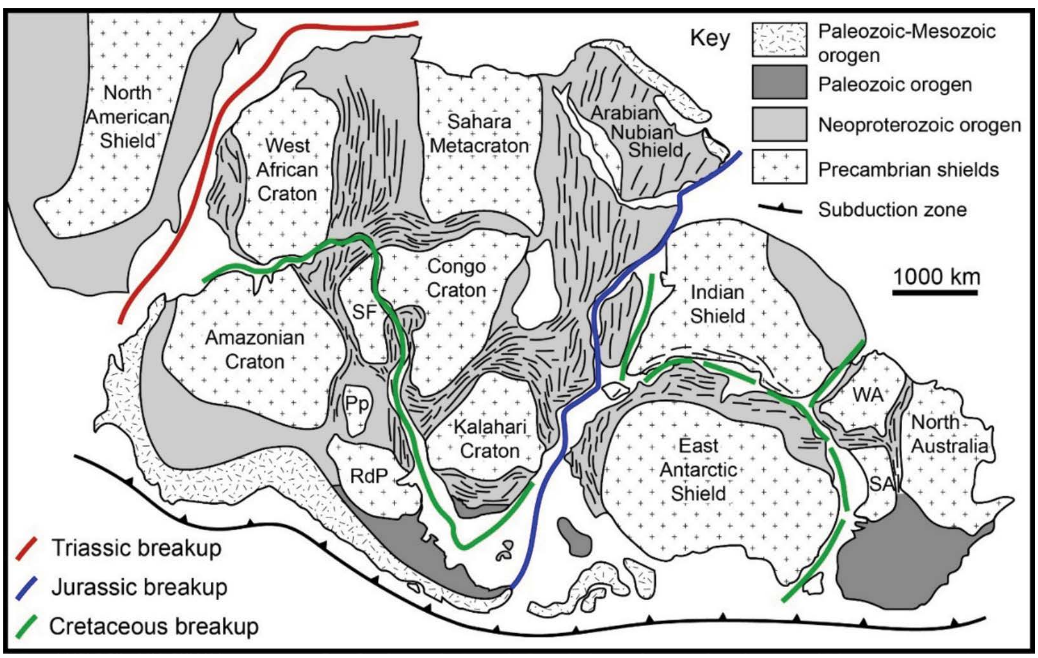

Figure 1. Gondwana view in a Pangea reconstruction at the end of the Paleozoic after Gray *et al.* (2008), showing the main breakup events modified from Moulin and Aslanian (2010) and Will and Frimmel (2018). Cratons: RdP: Río de la Plata, Pp: Paraná-Panema block, SF: Sao Francisco, WA: West Australia, SA: South Australia.

rifting processes in the Pangea breakup and suggest that, oppositely to the active Karoo rifting, the Early Cretaceous rifting (responsible for the opening the South Atlantic) was actually passive rifting. Far-field forces controlled the initiation of rifting and the Paraná plume only reached the surface after oceanization had started in the southernmost segment of the South Atlantic.

On the Argentinean South Atlantic margin, the identification of three independent rifting events in the Colorado basin area highlights the complexity of its Mesozoic rifting history (Fig. 2). A first rifting event, associated with the extensional reactivation of previously compressive thrusts of the Ventania-Cape fold belt, is transected by faults forming the main depocenters of the Colorado and possibly the adjacent Salado basin. The main rifting stage is correlated with the Early Jurassic Karoo rifting. In the Early Cretaceous WNW-ESE extension produced NNE-trending landward-dipping faults, concentrated in the outer 100-200 km of the continental crust domain, coeval with SDR emplacement. For the first time, in the southern South Atlantic area, three superimposed rifting settings are identified (Lovecchio *et al.*, 2018). The Mesozoic breakup history of SW Gondwana proves to be a process more complex than previously understood.

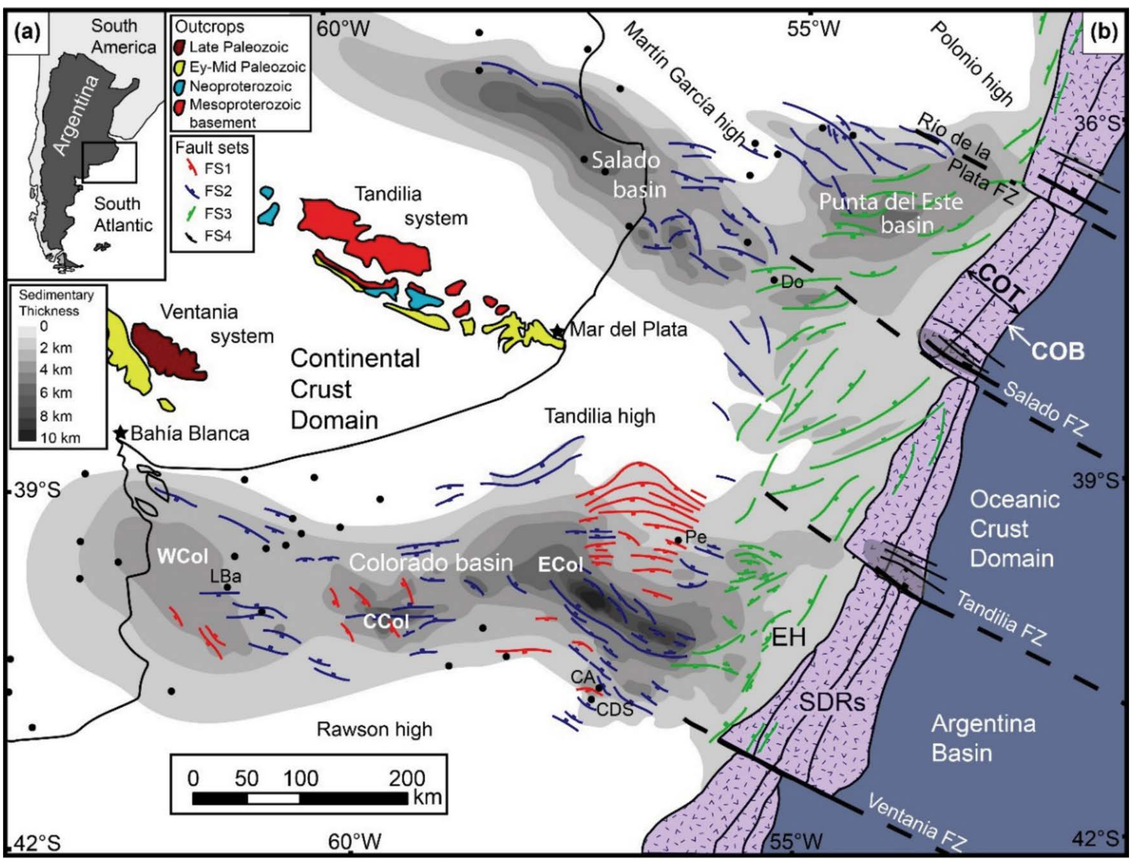

Figure 2. Structural map of the Colorado and Salado basins (offshore Argentina) and the Punta del Este basin (offshore Uruguay). (a) Map showing the location of the study area. (b) Total sedimentary thickness on the continental crust domain (CCD). Colorado basin depocenters: WCol (western), CCol (central), ECol (eastern). Faults have been gathered into four fault sets (FS) according to their relative chronology. SDR wedges (mapped after Franke *et al.*, 2007, and Soto *et al.*, 2011). COT: continent-ocean transition, COB: cont.-ocean boundary, OCD: Oceanic crust domain, FZ: fracture zone, EH: External High. Black dots show the location of the exploration wells.

The opening of the South Atlantic in the Early Cretaceous was only the final stage of a complex rifting process of SW Gondwana. The rifting chronology reappraisal forthe main Mesozoic basins in southern South America and Africa, and their integration into the long-term breakup history of the Gondwana supercontinent is presented in this contribution. Triassic rifting history is associated with the Central Atlantic breakup (Karoo I), as well as retro-arc extension on the SW-margin of Gondwana (Fig. 3a). In the Early Jurassic, rifting on Eastern Africa was triggered by the impingement of the Karoo plume, which produced the Karoo II depocenters in Africa

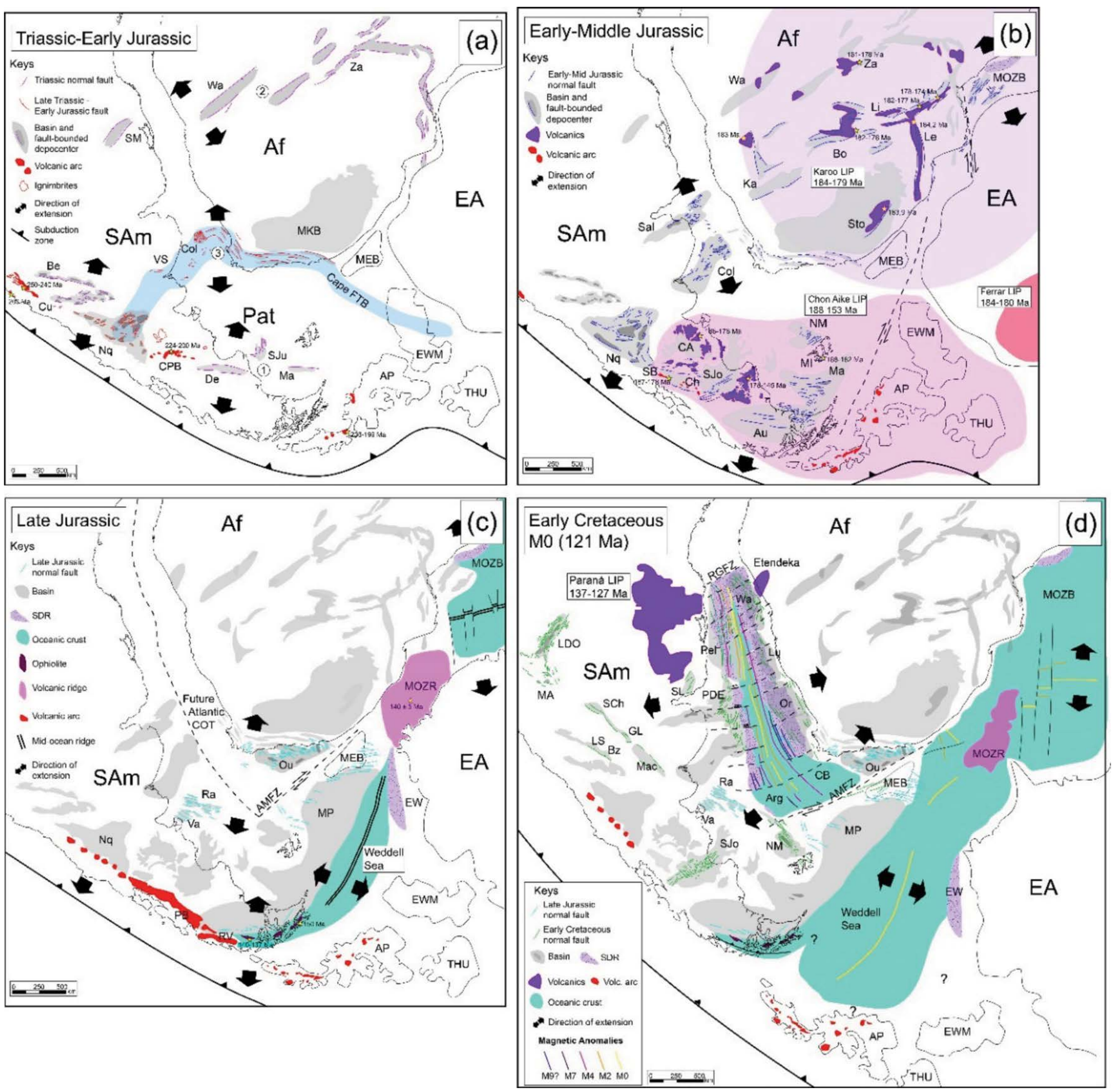

Figure 3. Mesozoic riftng evolution of SW Gondwana. (a) Triassic-Early Jurassic rifting stage, characterized by intracratonic rifting in central Africa (Karoo I), retroarc extension in western South America, and the extensional reactivation of the Late Permian-Early Triassic Ventania-Cape foldbelt. (b) Early-Middle Jurassic rifting stage, characterized by the Karoo rifting in Africa and the impingement of the Karoo plume. Retroarc extension and the development of the Chon Aike LIP characterize the evolution of Patagonia at this stage. (c) Late Jurassic rifting stage, characterized by the opening of the Mozambique Channel, the Weddell sea and Rocas Verdes back-arc basin. Rifting of this age is also responsible for the formation of the Outeniqua basin in southern Africa and possibly the Rawson/Valdés basin. (d) Early Cretaceous rifting stage, depicting the opening of the South Atlantic Ocean, shown at an evolved stage (Aptian). SDR characterize the continent-ocean transition. Intracratonic rift basins also develop in the limits between basement domains (e.g. between the Río de la Plata craton and the Pampia terrane).

(Fig. 3b). The Colorado and Salado basins on the Argentinean shelf formed during this stage. Rifting in East Africa ultimately produced the breakup of Eastern from Western Gondwana in the Middle Jurassic. In Patagonia, the Austral, Malvinas, and possibly the southern rift of the North Malvinas (Falkland) basin formed, associated with the silicic Chon Aike magmatic province in the Patagonian retro-arc. In the Late Jurassic the Rocas Verdes back-arc basin opened as an ultimate consequence of retroarc extension in southernmost South America (Fig. 3c). Oblique rifting in the orogenic core of the former Gondwanides orogen produced the Outeniqua and Rawson/Valdés basins. The South Atlantic rift initiated in the Early Cretaceous associated with present-day E-W extension. Rifting occurred diachronically from south to north, initiating in the previously thinned Rawson/Valdés-Outeniqua segment. The presence of an older possibly continuous rifting in this segment could explain the lack of SDRs south of the Colorado-Cape fracture zones. To the north, rifting and SDR emplacement occurred progressively to the north, producing strongly asymmetric conjugate margins (Fig. 3d).

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