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Plate tectonics of the Scotia Sea

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The opening of the Scotia Sea ended a period of direct terrestrial connection between Antarctica and South America that had started with the amalgamation of Gondwana, and inaugurated the more recent period during which high latitude oceanic circulation between the Pacific and Atlantic oceans increased. The consequences of these changes have been suggested to include the end of terrestrial biogeographic communication across the region in Paleogene times, and the subsequent onset of southern polar isolation, bottom water formation, and Antarctic glaciation by early Neogene times. These events, responding to the configuration of land and sea, would ultimately have been governed by the configuration of continental crustal units around the margins of the Scotia Sea, which in turn responded primarily to plate motions and the associated plate boundary processes. This presentation will put forward a model for the region's tectonic development that is derived largely from marine and satellite-derived geophysical data within it, and surrounding it. In this model, the Scotia Sea develops by extension of existing continental crust and accretion of new oceanic crust around the margins of a core of Jurassic-Cretaceous oceanic crust that formed and was abandoned within the region as a result of large-scale rotation of the South American plate around the northern end of the Antarctic Peninsula in Cretaceous times. The later extension and accretion happened in response to the westwards (since $\sim$50 Ma) and eastwards (since $\sim$17 Ma) motions of southernmost South America and the subduction-related ancestral South Sandwich Trench away from its western and eastern edges. Whilst these events are broadly consistent with what is known about disruption of the biogeographic 'Scotia Portal' in the region, they imply that the onset of Pacific to Atlantic oceanographic connectivity pre-dated, and thus cannot have directly influenced, the onset of Antarctic glaciation.