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Exhumation history along the South Scotia Ridge revealed by geo- and thermochronological Data

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The Elephant Island Group and South Orkney Microcontinent are two of several continental fragments whose vertical and horizontal movements were responsible for opening of the Scotia Sea and for stirring important oceanic currents such as the Antarctic Circumpolar Current and the Weddell Sea Deep Water. Here we reconstruct the Cenozoic evolution of these crustal fragments by means of U/Pb zircon dating and thermal history modelling based on apatite fission track and (U-Th)/He thermochronology. Our results show that the South Orkney Microcontinent remained attached to the Antarctic Peninsula until at least ∼40 Ma. The Elephant Island Group and the South Orkney Microcontinent experienced differential exhumation from at least the Oligocene onwards. In the Eocene-Oligocene, the Scotia Arc region underwent extension, causing the South Orkney Microcontinent to migrate to the east. Contemporaneous convergence at the active Pacific margin caused arc-related magmatism in the Elephant Island Group (Clarence Island). Pronounced Oligocene exhumation of the Elephant Island Group was presumably associated with sea floor spreading of the adjacent Powell Basin and may have produced a topographic obstacle which forced ocean circulation to the area further to the north. Subsequent Late Miocene exhumation of Elephant Island may have been related to both, the opening of the Bransfield Basin and uplift along the Shackleton Fracture Zone, which may have caused a topographic barrier slowing the abyssal circulation of the Antarctic Circumpolar Current.