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Drilling the Agulhas Plateau and Transkei Basin to reconstruct the Cretaceous - Paleocene Tectonic and Climatic evolution of the Southern Ocean Basin

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The transition from the Cretaceous "Supergreenhouse" to the Oligocene icehouse provides an opportunity to study changes in Earth system dynamics from a time when climate models suggest CO_2 levels may have been as high as 3500 ppmv (parts per million by volume) and then declined to less than 560 ppmv. During the Supergreenhouse interval meridional temperature gradients were very low and oceanic deposition was punctuated by episodes of widespread anoxia, termed Oceanic Anoxic Events (OAEs) resulting in large scale burial of organic carbon reflected in positive delta 13C excursions. High CO2, greenhouse climate conditions are envisioned for the near future calling for action to get a better understanding of their potential impacts and dynamics.

Climate models have identified significant geography-related Cenozoic cooling arising from the opening of Southern Ocean gateways, pointing towards a progressive strengthening of the Antarctic Circumpolar Current as the major cause for cooler deep ocean temperatures. Analogous arguments point to an important role for deep circulation in explaining Late Cretaceous climate evolution. The Agulhas Plateau is located in a key area for retrieving high-quality geochemical records to test competing models, e.g. to what extent and exactly when the opening of Drake Passage contributed to cooling of the deep ocean. The proposed drill sites on Agulhas Plateau and Transkei Basin are at high latitudes (65°S-58°S from 100 to 65 Ma) and within a gateway between the newly opening South Atlantic, Southern Ocean and southern Indian Ocean basins. Recovery of expanded and stratigraphically complete pelagic carbonate sequences from this region, and comparison with drilling results from Naturaliste Plateau (760-Full), will provide a wealth of new data to significantly advance the understanding of how Cretaceous temperatures, ocean circulation, and sedimentation patterns evolved as CO_2 level rose and fell, and the breakup of Gondwana progressed.