

RESPONSE OF THE ANTARCTIC CIRCUMPOLAR CURRENT TO CLIMATE MODE VARIABILITY

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Historical hydrographic profiles, combined with recent Argo profiles, are used to obtain a **new climatology of the Southern Ocean**, and to estimate the mean geostrophic circulation. Thirteen years of altimetric sea level anomaly data are then added to reconstruct the time variable sea level, and this new dataset is analyzed to identify and **monitor the position of the two main fronts of the Antarctic Circumpolar Current (ACC)** during the period 1993–2005. The authors relate their movements to the two main atmospheric climate modes of the Southern Hemisphere: the Southern Annular Mode (SAM) and the El Niño–Southern Oscillation (ENSO). The study finds that although the **fronts are steered by the bathymetry**, which sets their mean pathway on first order, **in flat-bottom areas the fronts are subject to large meandering because of mesoscale activity and atmospheric forcing**. While the dominant mode of atmospheric variability in the Southern Hemisphere, SAM, is **relatively symmetric**, the oceanic response of the fronts is not, showing **substantial regional differences**.

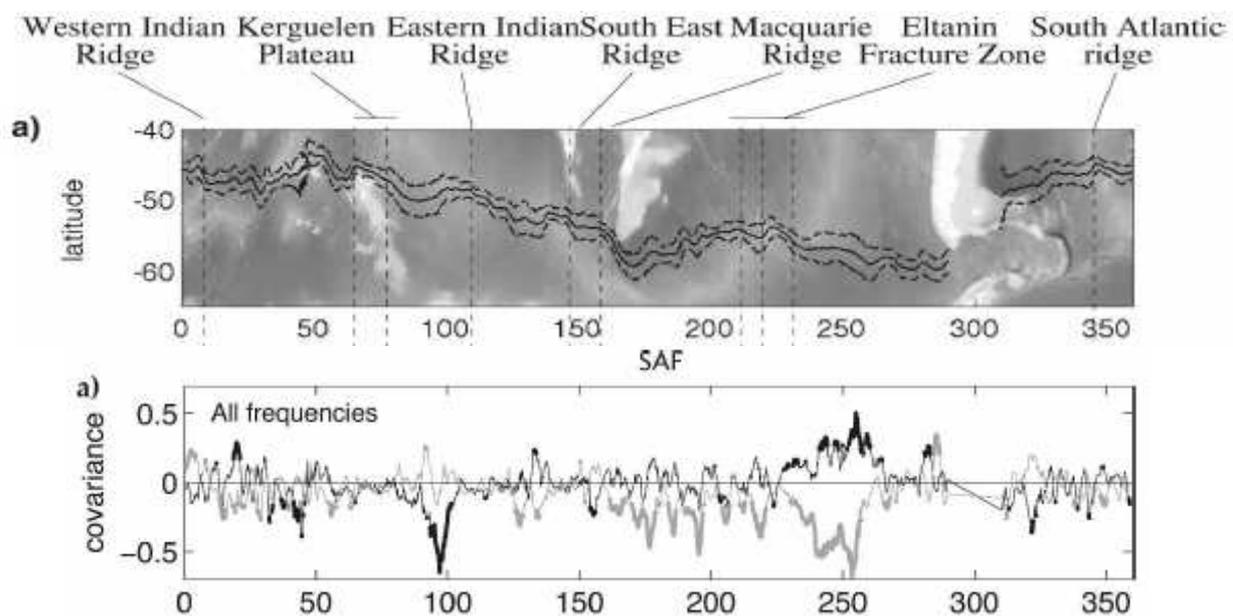


FIG. (a) Map of bottom topography in the Southern Ocean with the mean PF position superimposed (solid line black); the dashed line represents the two std dev envelopes around the mean PF position. Covariance of the meridional position of the SAF with the SAM (black) or ENSO (gray) indexes as a function of longitude. Boldface line shows values above the 95% confidence level.

Around the circumpolar belt the **fronts vary in latitude, exposing them to different Ekman transport anomalies** induced by the SAM and ENSO. Three typical scenarios occur in response to atmospheric forcing: poleward movement of the frontal structure in the Indian Basin during positive SAM events, an equatorward movement in the central Pacific, and an intensification without substantial meridional movement in the Indo-Pacific basin. The study also shows the geographical regions that are dominated by a SAM or ENSO response at low and high frequencies.

¹ Sallée, J.B. ; Morrow, R. and Speer, K, 2008. Response of the Antarctic Circumpolar Current to atmospheric variability, *J. Climate*, Vol. 21, 3020–3039.