

Discovering a current in the 21st century with altimetry

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The use of an altimeter-derived data set of absolute geostrophic surface velocity (Aviso Rio05) allowed the discovery of a current named the Subtropical South Indian Ocean Countercurrent between 22° and 26°S (Siedler et al, 2006). It turns out to be a narrow current confined to planetary wave trains which propagate from east to west in the South Indian Ocean. The current intensity decreases moderately in Austral winter while the eddy kinetic energy varies strongly with season. Multi-year averaging leads to a well-defined current band between southeastern Madagascar and 80° E and with lower intensity between 90° and 100°E. The countercurrent coincides with the northern limit of Subtropical Underwater subduction. Comparison with geostrophic currents obtained from three WOCE sections show a close correspondence of surface patterns and eastward transports. The current cores sometimes reach down through the surface layer and the Subantarctic Mode Water to 800 dbar. The surface current pattern south of Madagascar implies a partial retroflection of the East Madagascar Current into the Subtropical South Indian Ocean Countercurrent. The East Madagascar Current itself is fed by a narrow branch of the westward South Equatorial Current which brings its water towards the Madagascar slope near 18°S. Altimeter-derived geostrophic surface currents are averaged over varying periods, providing evidence of the persistency of flow patterns in the extension of the southern East Madagascar Current (Siedler et al, 2009). Good agreement is found between long-term mean patterns of observational and model dynamic heights. Two basic modes are identified in the SEMC extension, with anticyclonic motion favouring retroflection in the northern Mozambique Basin and cyclonic motion furthered in the case of the SEMC flowing westward along the southern Madagascar slope. Almost half of the SEMC volume transport contributes to the Agulhas system, and about 40% of SICC water originates from the SEMC.

Siedler, G; Rouault, M, Lutjeharms, J R. E. 2006 Structure and origin of the subtropical South Indian Ocean Countercurrent *Geophys. Res. Lett.*, Vol. 33, No. 24, L24609 doi: 10.1029/2006GL027399

Siedler G, M Rouault, A Biastoch, B Backeberg, C J.C. Reason, and J R. E. Lutjeharms 2009 Modes of the southern extension of the East Madagascar Current, *JGR Ocean*, VOL. 114, C01005, doi:10.1029/2008JC004921

