



On the connection between the South Atlantic and Indian oceans subtropical fronts

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The locations of the southern boundaries of the south subtropical gyres of the Atlantic and Indian oceans are characterized by the subtropical fronts (STF) of both oceans, themselves influenced by the zero wind-stress curl line. Since the latter passes well south of Africa, it has been surmised that the STF might continuously connect both gyres into one inter-ocean super gyre. However, the high mesoscale activity which prevails south of Africa makes this connection highly variable, and difficult to investigate through in-situ measurements.

Using a database of weekly, 1/3 degree maps of absolute sea-surface height (SSH) spanning more than 12 years, we investigate the positions of the STF in each ocean basin. We study the temporal variability of these fronts focusing on their connection south of Africa and the involved mechanisms.

We first characterize the mean fronts of both subtropical gyres using a 12-year averaged SSH map. A method based on the search of geostrophic velocities maxima is developed, which reveals the presence of three major fronts: the Southern and Northern STF in the Atlantic (SSTF, NSTF: Belkin and Gordon, 1996), and the SSTF and Agulhas Return Front (AF) in the Indian Ocean. The SSTF is clearly continuous from the Atlantic to the Indian Ocean in this average pattern.

Transposing to weekly maps, all three fronts are consistently present, with different ranges of latitudinal variability. However, the SSTF is discontinuous south of Africa, with a statistical presence of only 40% locally. A modification of the search method allowing to account for the role of eddies (which average out in the mean SSH) in the detection of the SSTF, yields a statistical presence above 90%, yet with a high latitudinal variability at the Indo-Atlantic transition. The temporal continuity of the SSTF is further discussed.