



The Evolution of cyclonic Agulhas Eddies

P.J. van Leeuwen and K.T. Frankhuizen

IMAU, Utrecht University, Princetonplein 5, 3584 CC Utrecht, Netherlands
(p.j.vanleeuwen@phys.uu.nl)

The exchange between the Indian and the South Atlantic Ocean is of crucial importance for the global thermohaline circulation. This exchange is mainly through large anticyclonic Agulhas rings that decay fast in the Cape Basin, and feed the Benguela Current that transports the water further north. In the Cape Basin their northwestward propagation paths are crossed by those of southwestward propagating cyclones, and strong interactions between anticyclones and cyclones exist. The focus of this study is on those cyclones formed on the western shelf break of southern Africa.

Altimeter data from 1992-2004 is used to follow all 22 cyclones with SSH depression of over 15 cm in detail. The mean life span of 6 months is a factor 2 larger than found previously, while one cyclone lived longer than 9 months. The cyclones disappear on a circle segment ranging from the Walvis Ridge at (30S, 0E) to the Agulhas Ridge at (42S, 13E), about 5 degrees further west than found previously. Along this circle segment the ocean bottom is deep and smooth, so that topography is not responsible for their disappearance. Their generation is not significantly correlated with season. Most are formed along the shelf break between 35S and 30S, which is an area in which the bottom slope is relaxing. The cyclones might be generated by baroclinic instability, or by barotropic instability related to the bottom slope. The latter generation mechanism is similar to that of the generation of Natal Pulses, large solitary meanders in the Agulhas Current, at the eastward side of southern Africa.

Cyclones that have little interaction with anticyclones propagate with an angle between 7 and 20 degrees from zonal, which is considered their undisturbed propagation direction. Their propagation speed is about 4.1 km/d, which is 1/3 larger than previous estimates. 17 out of the 22 cyclones had strong interaction with anticyclones, sometimes forming dipoles for a considerable length of time. Such a dipole moves almost straight westward, after which the cyclone makes a sharp southward turn along the

eastern side of the anticyclone.