



Central structure of a Mozambique Channel mesoscale eddy-ring dipole

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Located in the southwest Indian Ocean, between Madagascar and the African continent, the Mozambique Channel is a western boundary current system characterized by an intense eddy activity (Halo et al. 2014). Large anticyclonic rings, reaching up to 300 to 350 km in diameter and 2000 m of vertical extension, are structuring the marine ecosystems from phytoplankton to top predators (de Ruijter et al., 2002; Ternon et al., 2014, Weimerskirch et al., 2004). They impact the environmental conditions on the Mozambican shelves by promoting the upwelling of nutrient rich deeper waters (Lamont et al., 2010; Malauene et al., 2014). Coastal waters, generally rich in plankton and nutrients, can be also be transported offshore along the edges of the rings. The occurrence of an eddy dipole with the anticyclonic ring in the northern side of the cyclonic eddy can enhance the processes (Roberts et al., 2014). Mesoscale eddy flux is supposed to be the dominant source of nutrients for the central Mozambique Channel (José et al., 2016). The first leg of the RESILIENCE (fRonts, Eddies and marIne Life in the wEstern iNdian oCEan) multidisciplinary oceanographic cruise on board R/V Marion Dufresne II in April-May 2022 was focusing on the central structure of a dipole composed by a Mozambique Channel Ring and a cyclonic spiral eddy. The goals were here to observe at high resolution the mesoscale and submesoscale structures in the core of the dipole, their origins and evolution, and their potential implications for biogeochemical and ecological processes in the Mozambique Channel. To do so we crossed several times the eastern side of the dipole, towing a moving vessel profiler in addition to SADCPC continuous observations and multidisciplinary stations and trawls at regular intervals. The dipole event commenced on 24 April 2022 and endured for 24 days. Existence of strong currents, reaching speeds of 150 cm/s, leads to the prevalence of horizontal stirring as the dominant process. This results in an efficient and fast transport of material from the shelf to the central Mozambique Channel. The Omega equation was used to show the dominance of a smaller scale meander for the vertical velocities. Layering is evident in the frontal structure. This first documentation of the in-situ central structure of a dipole, formed by the convergence of a Mozambique Channel Ring and a spiral eddy, lays the foundation for subsequent ecological investigations.