

On the circulation over the Madagascar Ridge using Satellite and in-situ Data

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The circulation around the Madagascar Ridge is dominated by the westward flowing East Madagascar Current (EMC) and the eastward flowing East Madagascar Return Current (EMRC). However, the region experiences many mesoscale eddies (cyclonic and anti-cyclonic) which are important for the transport of water from east to west over the ridge. Daily (Aviso) satellite altimetry is employed to analyse the currents from the northern part of the Madagascar Ridge (where the Eddy Kinetic Energy is large) down towards the Walters Shoal (depth of 18 m) in the south where the Eddy Kinetic Energy (EKE) is substantially weaker. From satellite altimetry "virtual moorings" are deployed in 7 areas over the Madagascar ridge from north to south. 4 years (2011 – 2014) of satellite geostrophic velocities (every 4 days) are analysed to examine the nature of the EMC, EMRC and mesoscale eddies. Certain case studies are analysed (horizontal structure of the current field in the vicinity of the ridge) to examine the nature of the EMC, EMRC and mesoscale eddies on daily time scales. Additionally, variability is examined on daily, weekly and monthly time scales. 2 seamounts (a pinnacle in the northern region of the Madagascar Ridge and the Walters Shoal in the south) are potential "hotspots" for nutrient rich waters. Using certain dispersion methods, satellite data is used to analyse the distance and direction of a theoretical particle released at the seamount. In order to verify the analysis, the geostrophic velocities are compared to drifter data and L-ADCP current data. Additionally, cruise results (S-ADCP, L-ADCP and CTD data) from a recent cruise (November 2016) over the Madagascar Rdige are analyzed to get a deeper understanding of the processes occuring over the ridge below the surface.