



Intra-thermocline eddies in the southern Indian Ocean

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In 2001, two relatively saline intra-thermocline eddies (ITEs) were observed southeast of Madagascar in the upper main thermocline at 200 m depth. They were characterized by a subsurface salinity maximum of over 35.8 at a potential temperature between 18° and 22°C and slightly elevated oxygen concentrations. The horizontal extent of the cores was about 200 km, several times the Rossby radius of deformation, while their thickness was about 150 m. The observed circulation around the ITEs was anti-cyclonic and the maximum velocity of 20 to 30 cm/s was observed at 200 m depth, the same level as the high salinity cores. The cores displayed a relatively low vertical gradient in the density anomaly and consequently had a low planetary potential vorticity. Their hydrographic properties were distinctly different from those of the surrounding thermocline water, and especially from the much fresher water mass in the East Madagascar Current. The distant formation area of the water mass in the ITEs was identified as the subtropical southern Indian Ocean east of 90°E and south of 25°S, where Subtropical Underwater (STUW) is formed with similar characteristics. A section near 20°S displayed qualitatively similar high salinity cores as the ITEs near Madagascar. They were also found in the thermocline around 200 m depth all the way from 100°E. Small differences between these cores and the ITEs near Madagascar may be explained by large variations of the atmospheric conditions over the formation area and turbulent erosion during transport towards Madagascar.