



On the Circulation of Water Masses across the Mascarene Plateau in the South Indian Ocean, and Impacts on the Atlantic

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The South Equatorial Current (SEC) is the major westward current in the South Indian Ocean. It crosses the Mascarene Plateau, an extensive range of Banks and islands, near 60° E, but how this occurs has until now been unclear. Here, we present the results of a recent survey (in 2002) and provide, for the first time, a detailed examination of this process, and the water masses involved. We also make a connection between the warm, salty water masses observed here and those entering the South Atlantic. In more detail, the SEC carries 50-55 Sv upstream of the Plateau. This passes between certain critical passages in the ridge system, and emerges on the downstream side of the Plateau as two cores, a northern core between 10-14°S (25 Sv), and a southern core between 17-20° S (20-25 Sv). On reaching Madagascar, these cores may then form the North-East and South-East Madagascar Currents. The SEC also forms a sharp boundary between upper and intermediate level water masses. Subtropical Surface Water (STSW), Sub-Antarctic Mode Water (SAMW) and Antarctic Intermediate Water are present on the southern side of the SEC, whereas Red Sea Water, and other northern water masses, are found on its northern side. At deeper levels, North Indian Deep Water passes southwards below the SEC on the western side of the Plateau, and while there is no indication of North Atlantic Deep Water, Antarctic Bottom Water is present west of the Plateau. There is evidence of significant mixing in the deeper waters on the eastern side of the Plateau above deep, rough bottom topography. Finally, we propose the possibility that the STSW and SAMW observed near the Plateau may eventually contribute to the warm, saline waters flowing into the South Atlantic in the form of Agulhas eddies.