



Strengthened Indonesian Throughflow Drives Decadal Warming in the Southern Indian Ocean

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Remarkable warming of the Southern Indian Ocean during the recent two decades is assessed using a heat budget analysis based on the Estimating the Circulation and Climate of the Ocean version 4 release 3 model results. The annual mean temperature averaged in the upper-700 m Southern Indian Ocean during 1998-2015 has experienced significant warming at a rate of $1.03 \times 10^{-2} \text{ } ^\circ\text{C}/\text{year}$. A heat budget analysis indicates that the increase is mostly driven by decreased cooling from net air-sea heat flux and increased warming from heat advection. Increased Indonesian Throughflow advection is the largest contributor to warming the upper 700 m of the Southern Indian Ocean, while the reduction of surface turbulent heat flux is of secondary importance. These results expand our understanding of the decadal heat balance in the Indian Ocean and of Indo-Pacific decadal climate variability.