



From the Indonesian Throughflow to the Agulhas Current leakage

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The Agulhas Current (AC) is the major western boundary current of the Indian Ocean. It is thought to regulate the leakage of warm and salty water from the Indian into the Atlantic Ocean, which could be an important connection to the Atlantic Meridional Overturning Circulation.

We will present a model study of the dynamical relations between the Indonesian Throughflow, the circulation in the Indian Ocean, the AC and the leakage. For these experiments the Hallberg Isopycnal Model (HIM) is used in different idealized configurations. The ocean is forced by an analytical zonal wind stress whose magnitude is the control parameter. We compare the relation between AC transport and leakage for intermediate-resolution (0.25°) and high-resolution (0.1°) models. It is shown that when the Agulhas Current System is in the geostrophic turbulent regime, the magnitude of the leakage becomes independent of the AC transport. There are two phases in these results: first the leakage increases together with the AC transport and then it reaches a maximum in an asymptotic regime. This new result is intriguing and its physics will be analyzed in detail.

In another experiment we close the Indonesian Throughflow. The transport through the Mozambique Channel decreases and leads to a weakening of the Agulhas but the impact on the leakage appears not significant.

This model experiment also suggests that in the geostrophic turbulent regime, there is no simple relation between the transport of the AC and the amount of Agulhas leakage.