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# Impact of the Indonesian Throughflow on the Atlantic Meridional Overturning Circulation

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Understanding the mechanisms controlling the strength and variability of the Atlantic Meridional Overturning Circulation (AMOC) is one of the main topics of climate science and in particular physical oceanography. Current simple representations of the global ocean overturning separates the surface return flow to the Atlantic basin into a cold water path through the Drake Passage and a warm water path through the Indonesian Throughflow and Agulhas leakage. The relative importance of these two paths has been investigated in non-eddying ocean models. In these models the Agulhas retroflection cannot be modelled properly, which leads to an important overestimation of the Agulhas leakage. Furthermore, it seems that the in these models the relation between the meridional density gradient and the overturning strength is greatly simplified and changes significantly when eddies are resolved (Den Toom et al. 2013). As a result, the impact of the Pacific-Indian Oceans exchange through the Indonesian Throughflow on the AMOC is still unknown.

To investigate this question we run a state-of-the-art ocean model, the Parallel Ocean Program (POP), globally, at eddy resolving resolution (0.1º). Using climatological forcing from the CORE dataset we perform two simulations of 110 years, a control experiment with realistic coastlines and one in which the Indonesian Passages are closed. Results show that, for a closed Indonesian Throughflow, the Indian Ocean cools down but its salinity increases. The Agulhas leakage reduces also by 3Sv (Le Bars et al. 2013) and the net effect on the south Atlantic is a cooling down and decrease salinity. The anomalies propagate slowly northward and a significant decrease of the AMOC is found at 26ºN after 50 years.

This decrease AMOC also leads to reduced northward heat flux in the Atlantic. These processes are investigated with a detailed analysis of the heat and freshwater balances in the Atlantic-Arctic region and in the region south of 34ºS where Drake Passage waters meet Indian Ocean waters and influence the density filed of the whole Atlantic basin.

Den Toom, M., H. Dijkstra, W. Weijer, M. Hecht, M. Maltrud, and E. van Sebille, 2013: Response of a Strongly Eddying Global Ocean to North Atlantic Freshwater Perturbations. J. Phys. Oceanogr. doi:10.1175/JPO-D-12-0155.1, in press.

Le Bars, D., Dijkstra, H. a. and De Ruijter, W. P. M.: Impact of the Indonesian Throughflow on Agulhas leakage, Ocean Sci., 9(5), 773–785, doi:10.5194/os-9-773-2013, 2013.