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## Diagnosing the vorticity balances of the Weddell Gyre

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Antarctic Bottom Water formed in the Weddell Sea is transported by the Weddell Gyre (WG) into the Antarctic Circumpolar Current (ACC). From here, this water is exported to the world ocean and influences the global overturning circulation. Studying the dynamics of the WG could therefore improve our understanding of the Southern Ocean carbon and energy budget.

The dynamics of the WG in a NEMO global model is investigated at various resolutions. The WG transport is largest at intermediate resolution (R4) and only the low-resolution model (R1) has a transport close to observations. We attempt to identify the physical processes responsible for this difference by studying the vorticity diagnostics. These physical processes include (but are not limited to) wind stress curl, lateral friction and bottom pressure torques.

A textbook understanding of gyres relies on the idea of vorticity balance and this idea is extended to identify the physical processes spinning the WG up and down. We integrate the vorticity diagnostics outputted by NEMO over the area enclosed by the WG streamlines. These integrations are equal to the work done by separate forces on fluid parcels circulating around the gyre.

In the future we also hope to apply this analysis to an idealised model representing the Weddell Sea. This model will also use NEMO but have analytic forcing, bathymetry and a prescribed ACC.