Winds in the Southern Hemisphere have been observed and are projected to increase in strength and shift southward. A prevailing paradigm of Southern Ocean dynamics has emerged, motivated by idealised models and zonally averaged theories: that increases in northward Ekman transport will be partially or completely balanced by increases in southward transient eddy fluxes.

Using a realistic primitive equation coupled Ocean-Sea Ice model forced by atmospheric reanalysis, we conduct what are amongst the highest resolution sensitivity experiments of the Southern Ocean to changes in winds. When eastward winds are increased and shifted southward, the Ekman transport increases. This increase can be balanced by fluxes due to the standing meander of the Antarctic Circumpolar Current rather than transient eddies. With sufficient excitation of the standing meanders, the contribution to the meridional overturning from transient eddy fluxes can shut down completely.

The dynamics of the ACCs standing meander are demonstrated to be critical to the Ocean's response to changes in Southern Hemisphere winds.