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A weak role for Southern Ocean nutrient drawdown in low latitude marine export production

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The low-latitude ocean regions spanning 30°S-30°N are thought to account for more than 50% of the global export production. However, previous analyses of paleo-proxy records and modeling studies strongly suggest contradictory evidence as to whether low latitude nutrient cycling and export production is locally or non-locally controlled. Here we address this question through the new application of observational (PACIFICA) and modeling (NEMO-PISCES) tools and show that low latitude recycling of nutrients within the thermocline overturning structures is largely responsible for sustaining low latitude export production (60%) for the mean state, with only second-order controls from the injection of new (preformed) nutrients from the Southern (16%) and northern (9%) oceans. The implications for understanding controls on long-term changes under sustained anthropogenic climate perturbations is investigated using CMIP6 Earth system models under idealized 4xCO₂ forcing, where significant reductions in low-latitude export production and net primary production over 30°S-30°N are investigated.