



Observed chlorophyll trends in the Southern Ocean over 1997-2012 and associated mechanisms

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An up-to date 16-year time series of satellite chlorophyll from the ocean color climate change initiative (OC-CCI), was used together with its drivers (MLD and winds) to assess and explain recent trends in chlorophyll in the Southern Ocean. The evaluation of trends using linear regression analysis reveals a regionally varying chlorophyll increase. MLD deepens in a circumpolar band in the Subantarctic front regions and extends further to southeastwards in the Pacific sector. The regions of chlorophyll increase are located to the north of that, in the subtropical zone. These regions of MLD deepening have over the last two decades experienced intensification in zonal wind and a positive trend in northwards Ekman transport. We propose that increased northward Ekman transport of nutrient-rich (iron, silicate and nitrate) upwelled water is the main physical process that drives the change we observe in chlorophyll north to these regions.

These findings suggest that Southern Ocean biology is changing in response to recent change in circulation in that region, partly induced by the positive trend in the Southern Annular Mode (SAM) index.