Equatorial mixed layer depth anomalies in a global ocean-atmosphere coupled system

The Met Office operational short-range global coupled numerical weather prediction (NWP) system is now fully coupled to an interactive ocean and sea-ice model, and includes weakly coupled data assimilation. Data assimilation in the ocean component can lead to spurious circulations, particularly in the equatorial region, as modifications to the temperature and salinity fields alter the density of water and consequently local pressure gradients. In order to minimise these spurious circulations, a pressure correction bias term is applied in the equatorial ocean, directly modifying the pressure gradient term in the equations of motion. In this coupled forecasting system, anomalous shoaling of the ocean mixed layer has been observed in the equatorial region where the pressure correction is applied. Alongside this, the magnitude of this pressure correction term has been slowly increasing, when it would be expected to be relatively stable. This work explores why the magnitude of this pressure correction term has been growing and how this relates to the anomalously shallow mixed layer depths in the equatorial region.

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