EGU22-4313
https://doi.org/10.5194/egusphere-egu22-4313
EGU General Assembly 2022

Improving High Resolution Ocean Reanalyses Using a Smoother Algorithm

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We present a post-hoc smoothing algorithm for use with sequentially generated reanalysis products, utilizing the archive of "future" assimilation increments to update the "current" analysis. This is applied to the Lorenz 1963 model and then to the Met Office GloSea5 Global ¼° ocean reanalysis during 2016. A decay time parameter is applied to the sequential increments which assumes that background error covariances remain spatially unchanged but decay exponentially away from analysis times. Only increments are smoothed so the reanalysis product retains modelled high-frequency variability, e.g., from atmospheric forcing. Results show significant improvement over the original reanalysis in the 3D temperature and salinity variability, as well as in the sea surface height (SSH) and ocean currents. Spatial gap filling from future data is particularly beneficial. The impact on the time variability of ocean heat and salt content, as well as kinetic energy and the Atlantic Meridional Overturning Circulation (AMOC), is demonstrated.