Blending dynamic and static estimates of error covariance to enable successful ocean data assimilation

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We are interested in global ocean data assimilation for the purpose of initializing climate models. We consider ensemble-based data assimilation in the context of the POP (Parallel Ocean Program) OGCM and ask the specific question of whether there is a state of the modelled ocean circulation that is compatible with observations of the ocean as represented in the World Ocean Database when the OGCM is forced by CORE v2 (Coordinated Ocean Reference Experiment version 2) estimate of the atmosphere.

A frequent problem that plagues ensemble-based ocean data assimilation is filter divergence wherein poor or collapsed ensemble spread is interpreted by the filter as high certainty in the model forecast forcing it to neglect observations—in turn leading to increased RMS error—and an eventual failure of the assimilation. A blending of the dynamically estimated, ensemble-based error covariance with a static background estimate of the error covariance allows us to circumvent the above problem and enables successful data assimilation. Results from a successful assimilation experiment will be discussed.