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Results from an ensemble prediction study of the East Australian Current (EAC)

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We present results from an ensemble prediction study of the East Australian Current (EAC) with a specific focus on the examination of the role of dynamical instabilities and flow dependent errors of the day. We frame our experiment in an operational setting utilizing the Australian Bureau of Meteorology's Ocean Model Analysis and Prediction System (OceanMAPS) comprising both global and nested regional ocean forecast models based on MOM4p1 initialized by the Bluelink Ocean Data Assimilation System (BODAS). The forecast ensemble perturbations are generated using the method of bred vectors allowing the identification of those perturbations to a given initial state which grow most rapidly. We consider a 6 month period spanning the Australian summer beginning in mid November through to mid May which corresponds to the period of maximum eddy variability. We find that the bred vector structures align with and anticorrelate with the forecast errors and that these structures typically occur in known areas of instability and in particular where the EAC boundary current separates. The forecast error for the ensemble average are substantially reduced, even for very small numbers of realizations, and in many cases the vertical extent of the forecast error is reduced by an order of magnitude. Our results suggest that one may augment the static background error covariances typically used in operational ocean data assimilation systems with flow dependent background errors from a relatively cheap ensemble prediction system.