Verification of decadal forecasts: Generation of bred vectors for the Atlantic Decadal Oscillation using the NASA/GMAO GEOS-5 AOGCM

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In this study, the breeding method developed by Global Modeling and Assimilation Office (GMAO) at NASA/GSFC to generate optimal initial perturbations for ensemble near-term climate prediction is presented. To detect the bred vector (BV) related to the decadal oscillation, two sets of breeding with 1- and 5-yr rescaling intervals are applied. The rescaling norm is defined as the monthly-mean heat content averaged from surface to 500m over Atlantic (90°W-20°E, 20-70°N). Rescaling of the BV magnitude is based on the RMS difference in the norm from two-sided BVs. The BV magnitude is restored to 10% of natural variability. The dominant mode of both 1- and 5-yr BV using EOF analysis show the dipole patterns over the North Atlantic similar to the dominant mode of observed Atlantic decadal oscillation. It is also found that the 5-yr BV shows stronger variability over the deeper ocean below 300m than the 1-yr BV even though both have similar horizontal pattern. The preliminary results of the decadal prediction skill using BV is also shown, and compared to that with the Lagged Averaged Forecast (LAF) method that uses atmospheric initial perturbations separated by 6 hours.