Abstract View

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How Predictable are the Geostrophic Currents in the Recirculation Zone of the North Atlantic?

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ABSTRACT

POLYMODE data is used to produce a new analysis of multilevel streamfunctions in a $(500\ km)^2$ domain during July 1977–August 1978. The analysis is used to define initial and lateral boundary conditions, and verification fields for six predictability experiments. These experiments are designed to determine the accuracy of current techniques of forecasting and hindcasting the circulation in a limited domain and to define the sources of error.

A forecast based on persistence is shown to be reasonably accurate only for ten days. A quasi-geostrophic model with persistence boundary conditions can maintain the same accuracy in the inner $(125\ km)^2$ to 23 days. If the boundary information is updated, the mot-mean-square error can be maintained below 60% throughout the $(500\ km)^2$ region for at least 120 days. The initial state of the circulation only influences the first 30 days of a hindcast.

The instabilities in the circulation and inaccuracies in the specification of the boundary conditions place a lower bound on the error of streamfunction predictions of 35%. Thus a doubling of the accuracy of hindcasts and even greater improvements for forecasts appear to be possible if the accuracy of the model and boundary data can be improved.