Title: Multiple steady solutions of a model subpolar ocean forced by localized wind

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Abstract: Lagrangian ocean floats reveal persistent, depth-integrated recirculations in the Irminger and Labrador Seas that are fast and narrow. A numerical model of an idealized subpolar North Atlantic shows that a cyclonic, seasonal wind stress applied east of Greenland creates a time-averaged circulation that resembles the float data. This circulation is sensitive to the background gradient of planetary vorticity and multiple steady states exist: the same wind stress can create closed recirculations or open boundary currents. The barotropic vorticity dynamics is governed by the Rossby and Peclet numbers. In the simplest model, a point source of wind stress curl forces an ocean in a periodic channel. Steady solutions of the barotropic vorticity equation for weak forcing resemble the classic beta plume solution with a streamfunction that diffuses westward. Stronger forcing causes the circulation to elongate and strengthen. The topology, however, does not change. A purely zonal solution is impossible and this is reflected in the numerical channel model. An open question is under what conditions closed recirculations and open boundary currents can exist in a periodic channel as they do in an idealized subpolar model.

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