



Instabilities and multiple equilibria of the Atlantic subpolar gyre

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We propose an idealized four-box model representing the convective basin of the Labrador Sea and its boundary current system. The simulated circulation of the subpolar gyre (SPG) shows instabilities with regard to local and remote freshwater fluxes. A hysteresis of the circulation exist for a large part of the parameter space and potentially present day climate. This nonlinearity is due to a positive feedback of increased eddy salt flux for a stronger SPG circulation, not unlike salt advection in Stommel-type models of the thermohaline circulation. The idealized model is compared with simulations of general circulation models of past and present climates. Potential consequences for decadal predictability and future climate changes are discussed.