Baroclinic eddy life cycles and the potential role for mid latitude climate.

Various observational studies suggest that changes in synoptic scale eddy momentum fluxes are central to the dynamics of the leading modes of variability in midlatitudes: the North Atlantic Oscillation and the Annular Mode. In addition, there is evidence that momentum fluxes play an important role in the response of midlatitudes to external forcing. Examples include the effects of the stratosphere, ENSO, and midlatitude SST on midlatitude dynamics.

Observational and model studies have shown that there are various types of nonlinear wave life cycles, which differ in the way in which the eddies exchange momentum with the mean flow. Modeling studies also suggest that the transition from one type of life cycle to another entails a large change in eddy momentum flux, for a relatively small change in the basic flow.

It is therefore of great potential importance to understand what determine the type of life cycle an eddy will go through. We will present some results which suggest the wave life cycle is determined by the wave geometry of the mean flow during the linear growth stages, with the most important parameter being the phase speed of the waves. This raises the need to understand what controls the phase speed of baroclinically unstable waves.