Mesoscale eddy energy transport: Theory and idealized experiments

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We review recent work by the authors on mesoscale eddy energy transport. First a multiscale asymptotic model is developed that predicts that the energy budget of mesoscale eddies is not locally closed by a balance between generation and dissipation, but includes significant horizontal transport. This prediction is then assessed within an idealized baroclinic quasigeostrophic wind-driven gyre, where it is found that mesoscale eddy energy transport is significant. The way that mesoscale eddy energy is transported horizontally is then investigated in a series of idealized experiments using a barotropic fluid. It is found that eddy energy transport is well approximated by a combination of mean advection plus diffusion. The diffusion is isotropic on the f-plane, with a diffusivity coefficient 75% of the tracer transport coefficient. On the β-plane the diffusion becomes anistropic.