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Quasi-geostrophic models

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The QG equations incorporate the most important balances in rotating geophysical fluid dynamics, the hydrostatic and the geostrophic balance. Furthermore, they reflect some thermodynamical aspects of the fluid as well. These equations form the simplest models that contain most important dynamical phenomena of ocean and atmosphere dynamics at mid-latitude. After the systematical derivation by Charney in 1948 they were also one of the first models used for computer based weather prediction in the 50ties. Today, they are frequently used in qualitative studies and conceptional works. Mathematically, the equations are very similar to 2D Navier-Stokes in vorticity formulation, though the physical interpretation is quite different. I will derive the model formally from 3D Navier-Stokes on the sphere. Finally, I will shortly discuss results we obtained for layered versions of the model.

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