Quasigeostrophic fluids and resonant interactions

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- Newtonian Dynamics
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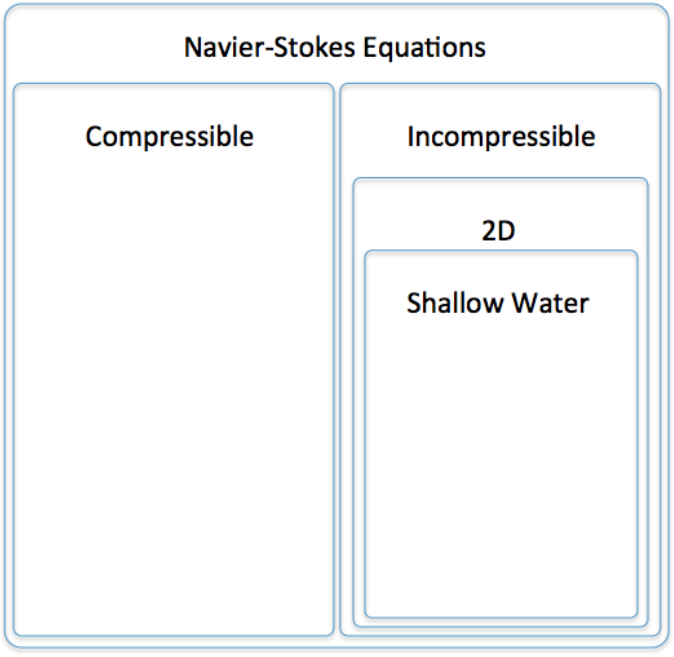
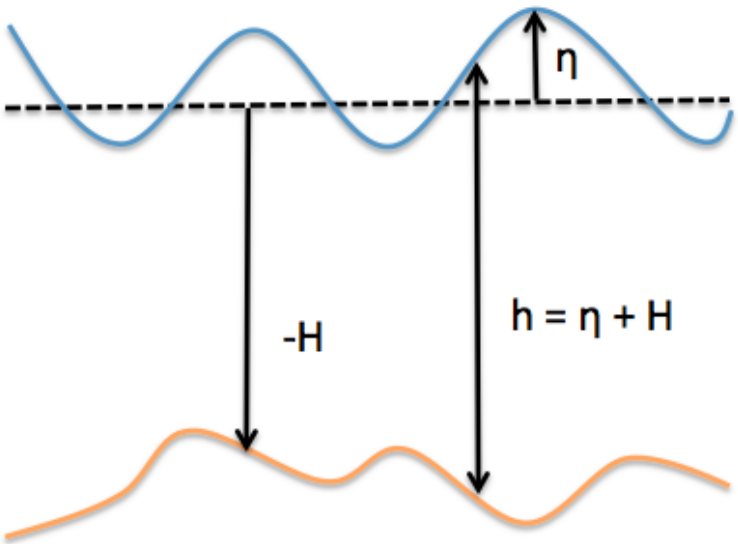
- Navier-Stokes Equations
- Solve system of coupled, non-linear, PDEs
- $\rho\frac{d\vec{u}}{dt} = -\nabla p + \rho\nabla\Pi + F$

Shallow Water Model



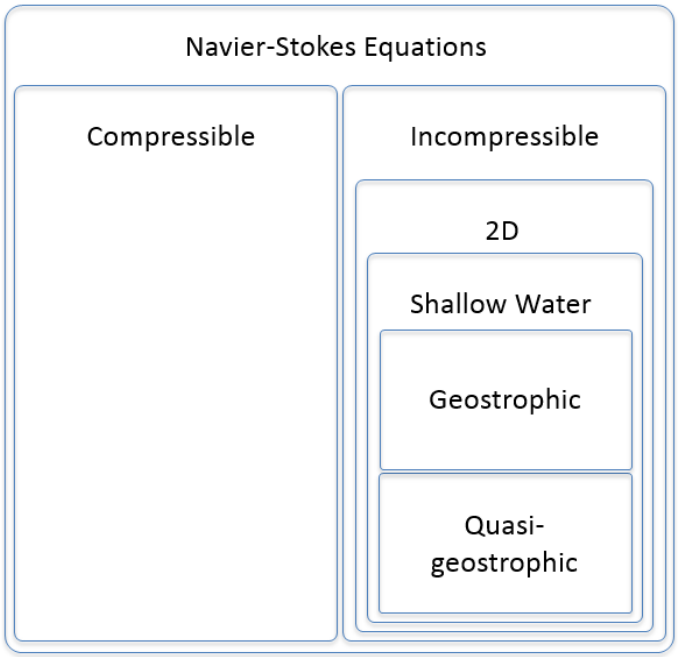
Shallow Water Model



$$0 = \nabla \cdot \vec{u}$$

$$0 = \frac{\partial h}{\partial t} + \frac{\partial}{\partial x}(hu) + \frac{\partial}{\partial y}(hv)$$

Geostrophic Model



Geostropic Model

$$\frac{d\vec{u}}{dt} + 2\vec{\Omega} \times \vec{u} = -\frac{\nabla p}{\rho} + \nabla \Pi + \frac{F}{\rho}$$

$\vec{u}$ = velocity field

$\vec{\Omega}$ = rotation vector

p = pressure

Π = scalar potential field

F = viscous forces

Quasigeostrophic Model

$$0 = \frac{\partial q}{\partial t} + J(\psi, q)$$

$$J(a, b) = \frac{\partial a}{\partial x}\frac{\partial b}{\partial y} - \frac{\partial a}{\partial y}\frac{\partial b}{\partial x}$$

References

1. Reference