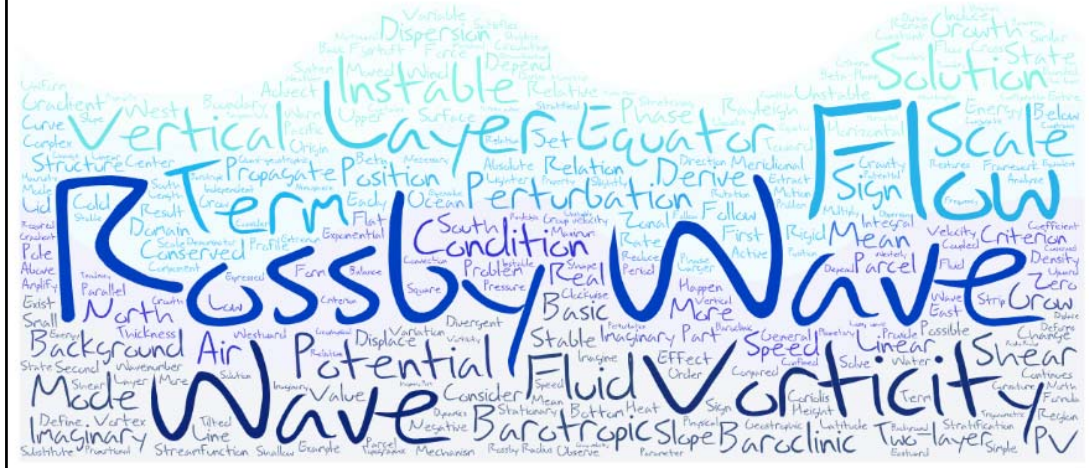


# Rossby wave and instability



## Exercise

### Question 2

**A barotropic atmospheric Rossby wave** propagates westwards at 45°N. It has global meridional scale and a zonal wavelength of 5000 km (the radius of the earth is 6400 km).

- 1) What is the phase speed relative to the prevailing wind ?
- 2) How long does the wave take to go round the world ?
- 3) Does this result depend on the latitude ?
- 4) How long would it take if the meridional scale were the same as the zonal scale ?

**In the ocean** at the same latitude, the thermocline is 500m deep and the difference in density between the thermocline water and the abyss is  $4 \text{ kg/m}^3$  (the density of sea water is  $1027 \text{ kg/m}^3$ ).

- 1) What is the westward phase speed for a Rossby wave on the thermocline with zonal and meridional wavelength of 200 km (assuming no zonal current) ?
- 2) How long would this wave take to cross the Pacific between 130°W and 150°E ?
- 3) What is the fastest possible transit time for very large scale waves ?