

Name _____

Homework 3, Dynamics, MET 341

- 1) An air parcel at 30°N moves northward conserving absolute vorticity. If its initial relative vorticity is $5 \times 10^{-5} \text{ s}^{-1}$, what is its relative vorticity upon reaching 60°N ?
- 2) Assume there is uniform convergence of $-5 \times 10^{-6} \text{ s}^{-1}$ in a cloud cluster between 1000 and 300 mb. Also assume ω at the surface is zero. Using the kinematic method, calculate ω at 950 mb, 900 mb, 700 mb and 300 mb.

- 3) $R = +10$ deg at 45°N latitude. For $|\vec{V}_g|$ of 45 and 80 knots, compute the actual (gradient) wind $|\vec{V}|$. Use this equation: $|\vec{V}| = \frac{|\vec{V}_g|}{0.5 + \sqrt{0.25 + \frac{|\vec{V}_g|^2}{Rf}}}$. Note that $1 \text{ deg} \approx 111 \text{ km}$, and $1 \text{ knot} \approx 0.5 \text{ ms}^{-1}$

$R = -10$ deg at 45°N latitude. For $|\vec{V}_g|$ of 45 and 80 knots, compute the actual (gradient) wind $|\vec{V}|$, if there is an answer.

Why are $|\vec{V}_g|$ and $|\vec{V}|$ different? (Hint, explain the balance of forces).

4) The thermal wind “blows” parallel to what meteorological quantity?

How is it oriented with respect to warm and cold air?

Draw an example of wind veering with height.

Is veering associated with warm or cold air advection in a layer?