

Homework 5

1. A vertical sounding at 43°N reveals isothermal conditions with $T = 0^\circ\text{C}$ below 700 hPa, but vertical shear characterized by the following wind profile:

$$\bar{u} = \begin{cases} 10 & \text{m/s from the south at 950 hPa,} \\ 10\sqrt{2} & \text{m/s from the south-west at 850 hPa,} \\ 10 & \text{m/s from the south at 750 hPa.} \end{cases}$$

- (a) Calculate the mean horizontal temperature gradient in the layers between 950 hPa and 850 hPa and between 850 hPa and 750 hPa.
- (b) Estimate the rate at which the preceding layers would warm/cool locally through temperature advection.