Homework 4

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

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

   (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.