Atmospheric Thermodynamics 2023

Class Activity 3

Due time: 2023/03/22 23:59

1. Virtual Potential Temperature（虛位溫）：$\theta_v = T(1 + 0.608q_v)\left(\frac{P_0}{P}\right)^{\frac{R_d}{Cp}}$, plot and discuss it.

2. Please plot $\Gamma_d - \Gamma$ **in height coordinate**, try to determine tropopause with it and discuss what you see. (You can smoothen the profile by using moving average.)

3. The hypsometric equation describes the relationship between pressure and height. Please use the hypsometric equation to finish the question below. Notice that the ideal gas law is $P = \rho R_d T_v$, so you should use T_v in the hypsometric equation. Calculate the physical depth (in meter) of a 10-hPa-thick air column for every 50hPa (1000 hPa – 990 hPa, 950 hPa – 940 hPa, ..., 150 hPa – 140hPa). Also, calculate the result with the virtual temperature profile 10 K warmer. Plot the profile of the depth difference (**pressure for vertical, Δz(warm)−Δz for horizontal coordinate**) and make a brief discussion.(Hint: You may choose the closest data point to calculate, or interpolate the data.)

- No plagiarism.
- Notice that you can use any (computer) language to finish class activities.
- Upload to NTU COOL before the due time.
- Upload file in .pdf format.
- Type your student ID and your name in the file.