

1. Given the attached tephigram. The environmental temperature sounding is already plotted on it.

a) (2 points) At what pressure is the tropopause? _____ kPa

b) (2 pts) Why is the tropopause significant?

(very short answer)

c) (1 pt) The name of the atmospheric layer above the tropopause is the _____ .

2) Suppose that solar heating creates an air parcel with the following characteristics:

$(P, T, T_d) = (100 \text{ kPa}, 30^\circ\text{C}, 10^\circ\text{C})$. I've already plotted on the tephigram the marks for dewpoint and total water for this air parcel.

a) (1 pt) Plot (as a filled-in circle) the initial temperature of this parcel on the tephigram from question 1.

b) (4 pts) What is the initial relative humidity of this air parcel? _____ %.

c) (4 pts) What is the pressure at the LCL for this air parcel? _____ kPa.

d) (3 pts) Suppose that a trigger mechanism existed to get the air parcel up past its CIN area. At what pressure is the thunderstorm top (i.e. Equilibrium Level) = _____ kPa.

e) (1 pts) On the tephigram, shade (fill in) the area used for the CAPE calculation.

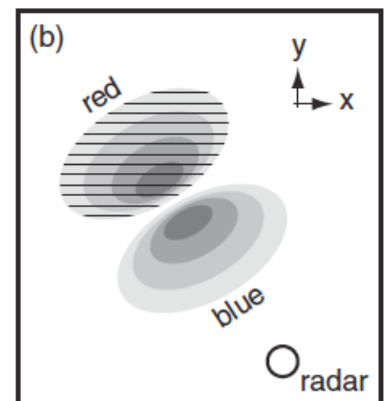
f) (3 pts) Why is CAPE significant?

(very short answer)

g) (1 pt) The approach used parts (a)-(f) of this exercise is
[Eulerian , Lagrangian (circle one)]

3) (3 pts) The Doppler radar display at right is showing what phenomenon?

(very short answer, with justification)



4) (7 pts) The pressure-gradient magnitude at sea level is 2 kPa / 400 km, and its direction is such that pressure decreases toward the northeast. Find the geostrophic wind speed (G), and state its direction. The latitude = 70°N.

(show your work, or discuss how you found your answer)

5) (6 pts) For the following idealized winds [gradient wind around a high, gradient wind around a low, boundary-layer wind, cyclostrophic wind], which one(s) is/are slower than geostrophic, and why?

(very short answers)

6) (6 pts) For thunder in air of temperature 35°C, what is the value of the index of refraction, and how does it relate to thunder?

(show your work, or discuss how you found your answer)

7) (6 pts) How much lower must the core pressure be in a tornado relative to the ambient air outside the tornado, in order to drive tornadic winds that cause damage at EF5 intensity? Assume air density = 1 kg m⁻³.

(show your work, or discuss how you found your answer)

Optional Bonus Question. (8 pts) Give one variable or index that quantifies the strength of each condition needed for Tstorm formation.

	Condition	Name of variable, index, or mechanism
(1)		
(2)		
(3)		
(4)		

