

IC6.4: Optional Job Sheet Answer Key

Ingredients-based Method for Forecasting Heavy Precipitation

Question 1. Where geographically is Q vector convergence strongest?

Southwest and deep south Texas

Question 2. In which layer is Q vector convergence strongest across south-central Texas?

500 mb to 300 mb layer

Question 3. Where geographically is potential vorticity at a maximum?

You could say in southeast CO to west TX.

Question 4. In which level or layer is potential vorticity strongest?

850-700 mb

Question 5. Which layer is moist EPV_g at a minimum?

This is a complicated answer. At the lowest layer, EPV_g is lowest in central MX north through the four corners area. But at 700-500mb, it is lowest throughout much of TX and eastern MX.

Question 6. Where and at what level is frontogenesis strongest? If several strong areas and levels of frontogenesis, list them all.

You don't have to list all of these since there is decent frontogenesis at each of these levels somewhere in this regional-scale map. The most significant areas are in the shape of two bands at 850 mb, one extending from westcentral TX to northeast OK while another one splits off to the east from westcentral TX to central LA. These areas shift north 50-100 mi at 800mb. Meanwhile from 700-650mb, there is a significant area from eastern CO eastward into northcentral KS, and another band across the TX coastline.

Question 7. Is there potential instability above the strong areas of frontogenesis? If so, which layers are potentially unstable within 50-100 mb above the level of frontogenesis?

Some instability is present all across central, east, and south Texas within 50-100 mb of the frontogenesis. Strongest frontogenesis is at 850 mb across central Texas, there is instability across central Texas between 800 and 700 mb.

Question 8. Using the information from questions 1-4, where geographically are the frontogenetical forcing and synoptic forcing coupled?

South central Texas has the strongest coupling, but all of east, central, and south central Texas has pretty good coupling between frontogenesis and div-Q convergence.

Question 9. Circle the appropriate choices for 80% RH and negative lapse rates

800-700 mb Instability present over the eastern half of Texas? **NO**

700-600 mb Instability present over the eastern half of Texas? **YES**

600-500 mb Instability present over the eastern half of Texas? **NO**

Question 10. Where is the inferred potential for upright convection most impressive, and in which layer?

Northeast Texas, between 750-700 or 700-600 or 700-650 mb. Any of those levels are impressive.

Question 11. Where do you expect the heaviest precip to fall over the next 12 hours (through 06 UTC 25 February)?

There is not much upright instability co-located with all the other forms of forcing. The maximum frontogenesis is across central Texas (850 mb) and there is strong negative MPVg between 700-500 mb in the same region. Q-vector convergence is strongest at 400-300 mb across this region. Thus, we would say that the heaviest precipitation will fall over a region 200 miles east and west of Austin or San Antonio, TX and ~100 miles north and south.