Jobsheet

GOES-R Convective Development Nearcasting Model

ANSWER KEY

Question 1: What areas show an increase in 900-700 mb PW in the 4 hours since the analysis cycle began?

Most regions of the eastern U.S. show an increase in PW coverage, except around the Ohio River and West Virginia area.

Question 2: Where does the PW increase most rapidly?

On the Oklahoma-Texas border and along the Florida-Georgia border.

Question 3: Is the increase in PW over central OK and NE TX due to transport of previous observations into this area or new observations?

This is due to new data because the values of data points transport into the area by previous cycles of the NearCast cannot increase, any change in maximum values must be due to the presence of new observations.

Question 4: What is the magnitude of the change in PW across the 'dryline' forming in north-central TX?

Around 10mm or 0.394 inches

Question 5: What is the magnitude of the change in θe across the 'dryline' forming in north-central TX?

Around 20 degrees

Question 6: Even though the PW that moved into eastern AR between 1300 and 1800 UTC was notably larger than that in north-central TX, how much greater or less is the θe here compared to in TX?

Sampling around eastern Arkansas yields a value of 338K vs. 342K in Texas. So around 4 degrees less.

Question 7: What is the θe in the area ahead of this convection in MO/IA (look at the IR product to find this area)? What would you expect to happen to these storms if they continue to move farther east?

Around 320K -- As they move east, these storms would lose their moisture and θe support, leading to a decrease in intensity.

Question 8: From 1800 – 2330 UTC, what is the θe of the air mass moving across Lake Erie into PA?

Around 315K

Question 9: What is predicted to happen to the band of high θe that extended south-to-north across central TX in the 1800 UTC analysis?

It moved to the east and northward, becoming stretched farther in a south-to-north arc through the 1800UTC time.

Question 10: Where is the dryline located at 2200 UTC?

The dryline is crossing through Central Oklahoma.

Question 11: How have the values of θe across the dryline changed between 1800 UTC and 2200 UTC? How has the gradient changed?

Even though the values of θe on either side of the dryline remain the same, the gradient has increased due to stretching.

Question 12: What is predicted to happen to the area of enhanced θe initially in western NE?

It becomes more organized and rotates cyclonically.

Question 13: Where should the area of cool-dry air (low values of θe) over the Great Lakes moved between 1800 and 2200 UTC? Should the threat for convective storm development be increasing or decreasing across northern PA and why?

Southeastward. The threat of convection should be less because

supply of low-level moisture and heat is being removed.

Question 14: Is the lower-level supply of warm-moist air (represented by higher values of θe) over eastern IA and western IL likely to support continued growth and movement of the storms moving into the area from MO and IA?

No, because the storms are moving into an area of lower θe.

Question 15: Where are the two major sources of mid-level dry air (low θe) located in the 1800 UTC analysis?

Over eastern New Mexico and north of the Great Lakes.

Question 16: How do these areas of mid-level dry air change between 1800 and 2200 UTC?

The area over eastern NE rotates cyclonically and moves over western NE and western OK. The northern minimum moves eastward, but the slightly less dry air to the south of the minimum moves east-south-eastward.

Question 17: Are the areas of mid-level dryness in general moving faster or slower than the areas of lower-level moisture we investigated earlier?

Faster

Question 18: Are the areas of mid-level dryness in general moving in the same or different directions than the areas of lower-level moisture we investigated earlier?

In general, slightly different, with backing of winds with height in areas of cold advection.

Question 19: Looking at GOES Vertical θe difference, what 2 areas are showing the greatest destabilization throughout the NearCast period?

Along the band of low-level moisture extending from eastern TX, through OK and into Kansas – and over western Kansas/northwest

Nebraska.

Question 20: Looking at GOES Vertical θe difference, at what time is the Convective Instability near OKC largest? How does this compare with when the area of instability reaches Dallas?

The area of instability reaches OKC by between 2200 and 2300 UTC, while the area of increasing Instability reaches Dallas at about 2330 UTC.

Question 21: What effect does the intrusion of mid-level dry air from the Great Lake over the decreasing lower-level moisture over PA have on the likelihood of convection in this area?

It removes almost all likelihood of convection.

Question 22: Why is the destabilization over western KS more pronounced than that over OK and eastern TX?

Although there is less moisture present at lower-levels, the strength of the cold/dry air aloft is much greater than that farther to the east. This cold/dry air is related to an area with a lowered tropopause. When the instability was released in this area, it produced numerous low-top super-cell storms.

Question 23: What can be inferred from the rapid transition from very stable to very unstable environments occurring over northeast KS at the end of the NearCast period?

Rapid change from clear skies (and ample surface heating until sunset) followed by rapid movement of storms into the area from the west.