IC6.4: Optional Job Sheet

Ingredients-based Method for Forecasting Heavy Precipitation

Objective: Examine AWIPS procedures designed to assist in the ingredients-based methodology of forecasting heavy precipitation, as discussed in the IC6 Lesson 4 training module. Specifically, you will be able to find areas of potential symmetric instability (PSI) or conditional symmetric instability (CSI), and determine a lifting mechanism that may release the instabilities.

Data: 24 February 2003 winter weather event across Texas. You will be using D2D for this exercise.

Background: Since CSI is almost always released by frontogenetical forcing, you'll notice in this procedure we are using divergence of vectors to assess forcing, saturated geostrophic equivalent potential vorticity to assess instability, and condensation pressure deficit and/or relative humidity to assess moisture. The main difference between CSI and PSI is the use of saturated equivalent potential temperature (CSI) vs. equivalent potential temperature (PSI). The potential in PSI is because the parcel is not saturated. At saturation PSI = CSI.

Instructions:

- Load the 24 February 2003 Winter Weather AWOC case on your WES machine incase review mode, using the FWD localization. Set the D2D clock to 24 February 2003 18 UTC. You will be examining the 24 February 12 UTC NAM 80 model initialization, and observational data. So when answering the questions below, ensure that your answers are based on the **24 February 12 UTC** initialization run.
- With these procedures, always feel free to modify and save them as your own. How to visualize D2D data is subjective, and picking colors, products, and overlays that are comfortable to you is what is most important.
- First, assess the potential for lift. Open the procedure "CSI_PSI" and load "Synoptic forcing". This loads a regional scale four panel display showing Q-vector divergence (tan contours), Geostrophic equivalent potential vorticity (blue contours), saturated geostrophic potential vorticity (image), and potential vorticity (green contours) for the 500-300 mb (top left), 700-500mb (bottom right), and 850-700mb (bottom left) layers. The upper-right panel shows the tropopause pressure and winds.

.

Question 1. Where geographically is Q vector convergence strongest?

Question 2. In which layer is Q vector convergence strongest across southcentral Texas?

__________mb to __________mb layer

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

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

_________________mb

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

__________mb to __________mb layer

- Examine areas where PV anomalies and/or Q vector convergence is coupled with frontogenesis. Load from the CSI_PSI procedure “frontogenetic Forcing, Stability”. This procedure loads NAM 40 tropopause pressure and winds, 500-300mb q-vectors in all four panels , and 2-D frontogenesis at 850 mb (upper left), 800 mb (upper right), 700 mb (lower left), and 650 mb (lower right). It also loads Saturated EPV_g (MPV_g) at levels 100mb above the frontogenesis levels.

Question 6. Where and at what level is frontogenesis strongest? If several strong areas and levels of frontogenesis, list them all. You may need to modify color enhancements or turn on frontogenesis contours to detect all of them.

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?

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

- The next step is to see if ‘upright’ convection is a concern. If the atmosphere is unstable to both upright and slantwise convection, the upright will be released first. In your uncluttered pane, load the procedure “Upright convection”. This loads NAM 40 saturated Theta-E temperature differences at 800-700, 700-600, and 600-500 mb layers. We include the mean RHs in similar layers for you to see where saturation may be occurring. You’ll be looking for RH values greater than 80%. Play with the color curves and highlights those saturated theta-E temperature differences that are negative.

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

- 800-700 mb Instability present over the eastern half of Texas? **YES/NO**
- 700-600 mb Instability present over the eastern half of Texas? **YES/NO**
- 600-500 mb Instability present over the eastern half of Texas? **YES/NO**

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

- To visualize in a plan view all the important ingredients to examine, load in a new pane the NAM 40 2-D frontogenesis levels from answer #6, NAM 80 Q-Vector divergence layers from answer #2, NAM 40 MPV_g from answer #7, and NAM 40 RH/ThetaE lapse rate from answer #10. This pane is useful because it isn’t as cluttered with product descriptions. It’s not a bad idea to load MPV_g and ThetaE lapse rate as toggle images, and shade only values less than + 0.25 PV for MPV_g, and values less than 0 K/km for lapse rates. With this pane, you should have a good idea where the strongest synoptic forcing, frontogenetical forcing, coupling between the two, andinstability reside at 18 UTC.

- Now load NAM 40 QPF in a new window. Mentally adjust the QPF towards the area where synoptic and mesoscale forcing are most in alignment.

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

An answer key is available for this job sheet. Please see your local AWOC Winter Weather facilitator to obtain a copy.