IC5.7: Optional Exercise

Lake Effects

Objective: This exercise will allow you the opportunity to identify the mesoscale features that modulate lake enhanced snowfall as described in the IC 5.7 training module. This optional exercise may take 45 minutes or more.

Data: You will be examining the 25 November 2005 lake enhanced snowfall event downwind of Lake Erie and Lake Ontrario in New York within the Buffalo, NY CWA. You will be using AWIPS D2D for this exercise. Procedures are available with this case if you wish to use them. All procedures will be listed in bold in the instructions of this jobsheet.

Instructions:
This case is not included with the AWOC Winter Weather Jobsheets DVD. You should have received the IC5 Lesson7 Exercise CD in the same envelope as the Winter AWOC Simulation Guide. If you did not get one or if there is a problem, send an email to: awochelp@wdtb.noaa.gov. Install the case as described by the README file contained on the CD.

- Load the 25Nov2005 Winter Weather AWOC case on your WES machine in case review mode, using the BUF localization. Set clock to 21 UTC 24 November 2005.

<u>Assessment of Air/Water Temperature Differences:</u>

Given what was presented in the training module about air parcel modification across the Great Lakes, it is safe to apply the simplified Philips Regression equation assuming steady state conditions for this event. The temperature of Lake Erie was 45°F, while Lake Ontario was 48°F during the event. Figure 1 on the next page shows the regression lines plotted for the temperature and dewpoint of the air parcel above each of the Lakes.

The goal of this exercise is to determine the approximate surface temperature and dewpoint of the air prior to crossing the Lakes Erie and Ontario. Load the procedure "**IC5Lesson7**" and then select "**MSAS-NAM12 SFC**". This loads on the state scale 15 min METARS, 1-hr buoy and ship obs, NAM12 and MSAS surface winds, dewpoint (orange dashed) and a color image of temperatures.

Question 1. What is the temperature/dewpoint of the surface air at 21 UTC on 24 November 2005 as it crosses:

Lake Erie: T ~_____^{o}F T_d ~_____^{o}F

Lake Ontario: T ~_____^{o}F T_d ~_____^{o}F

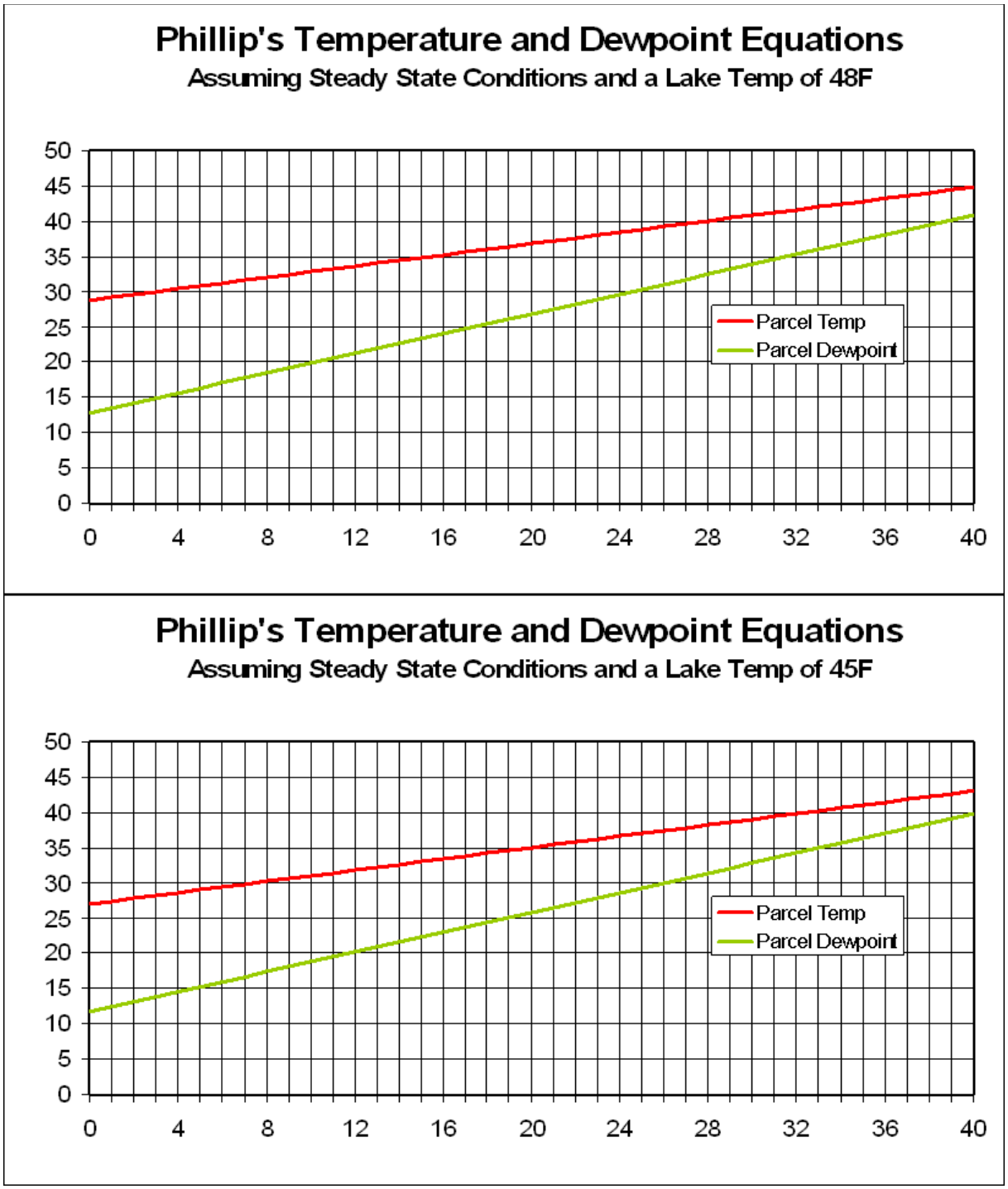

Figure 1: T/T_d for an air parcel just off the surface of a Lake Ontario at 48°F (top) and Lake Erie (bottom) at 45°F.

Question 2. Based on your answers in Question 1 and the graphic above, what is a good approximation for the T/T_d of a parcel above the surface of each lake? (input answers on the next page)

Lake Erie Parcel: T ~_____^{o}F T_d ~_____^{o}F

Lake Ontario Parcel: T ~_____^{o}F T_d ~_____^{o}F

Load 2 NAM 12 soundings: one downwind of Lake Erie and the other downwind of Lake Ontario. Using the interactive Skew-T in AWIPS, edit the appropriate soundings at **21 UTC on 24 November 2005** with the modified T/T_d based on your answers in Question 2 above. Next, overlay the Buffalo, NY sounding from 12 UTC 24 November 2005 sounding for comparison. Modify the BUF RAOB as you wish but keep in mind the data are 9 hours old.

Question 3. How much Convective Available Potential Energy (CAPE) is there with the modified sounding?

CAPE off Lake Erie: _____J/kg

CAPE off Lake Ontario: _____J/kg

Question 4. What is the modified equilibrium layer height?

EL off Lake Erie: _____ kft

EL off Lake Ontario: _____ kft

Snow Band Morphology:

Load in a new window the "**NAM12 Div METAR Topo"** Procedure from the set **IC5Lesson7**. This loads 15 min METARS, 1-hr buoy and ship obs, a high res topo map, and NAM12 surface winds, and an image of surface wind divergence at the state scale.

Question 5. Do you expect thermal convergence along either Lake Erie or Ontario to be the primary contributor to the snowband? Why or why not?

Question 6. Relative to each of the 2 lakes, where is the convergence setting up? Explain why convergence is setting up in these regions.

Question 7. Based on the wind direction at 21 UTC, which New York counties downwind of each lake do you think will see enhanced snowfall due to orographic effects?

Load the procecure from **IC5Lesson7** named "**VIS Radar**", which loads a satellite/radar image at the state scale.

Question 8. At 21 UTC, is the snow single banded or multiple banded (circle one) downwind of Lake Erie? What is the primary reason for this?

Question 9. Same as question 8, but for Lake Ontrario.

Now load baselines into the radar/satellite image and position Baseline A such that it is perpendicular to the snow band(s) and shorelines of Lake Ontario, and Baseline B is perpendicular to the shorlines of Lake Erie. For baseline A, place it from eastern Wayne County extending north into Ontario, Canada. For Baseline B, place it roughly from southern border of NY across Lake Erie into extreme southern Ontario, Canada. Swap panes and load from **IC5Lesson7** the procedure named "**A Xsection**", and then in another window load the procedure named “**B Xsection**”. This loads a cross section of NAM12 omega, vertical circulation streamlines, divergence, and temperature.

Question 10. At 21 UTC, how well does the vertical motion field fit the radar observations for each Lake?

Question 11. Unfortunately, NAM12 does not allow ageostropic plots with this case, but the vertical circulation should show a similar wind field perpendicular to the orientation of the band as described in the training module on slide 34. Does the NAM12 have a reasonable depiction of the vertical circulation at 21 UTC on 24 November? Explain your answer with regards to each Lake.

Question 12. Given your answers to Question 11 and all previous questions, how would you modify the NAM12 QPF based on the model's depiction of the location and intensity of the snow bands? Focus on the next 6 hours (through 03 UTC 25 November 2005).