

More About Inversions

Background

Inversions occur in fluids when a more dense fluid lies beneath a less dense fluid. In the atmosphere, the density is linked to temperature variations with warmer air lying atop colder air.

Sounding Analysis - Inversions (Activity)

Objective

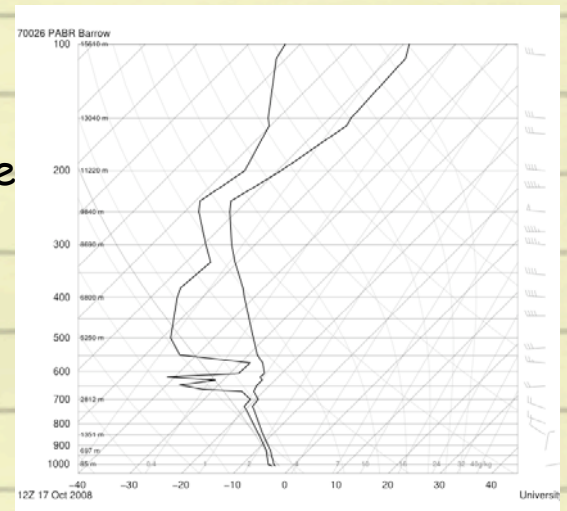
To evaluate radiosonde soundings for inversions.

Materials

☐ Soundings for the same date and synoptic time (provided or obtained online)

Important Points to Understand

The soundings here appear on a Stüve diagram. Because the temperature scale (degrees Celsius) runs horizontally (increasing from left to right) and has vertical lines, it is easy to see temperature inversions. The Skew-T diagram has slanted temperature lines and should not be used for this activity.



Sounding data for Barrow, Alaska. Use the following link to see other data.

<http://weather.uwy.edu/upperair/sounding.html>

The vertical scale is atmospheric pressure (millibars*) that decreases with increasing altitude (shown along the left margin in meters). The right-most plotted line is temperature; the left-most plot is dew point temperature.

Procedure

1. Print out the radiosonde soundings.
2. Examine the soundings and find inversions. List the inversions, noting the pressure value at the bottom and top of the inversion.
3. Compare the inversions found for the three locations.

*average alobal sea level pressure is 1013.25 millibars or 29.92" of mercury

Questions

Where is the tropopause highest, i.e., at lowest pressure?

NOTE: If no tropopause inversion is evident, then the tropopause is located at a pressure less than 100 millibars.

2. Which location has the most intense inversion near the ground?

Why do you think this is so?

3. Which site has the thickest inversion?

4. Which location has the greatest temperature change through the inversion layer?

Extension Activity

1. If you have Internet access, repeat the activity using soundings for a week or so. Are findings repeated or different?

2. Compare soundings for the three locations (or other similar locations) for a date in each of the 4 classical astronomical seasons. You can select dates at random or use a specific date.

Observing Inversions (Activity)

Objective

To look for inversions in the atmosphere.

Materials

- camera
- drawing paper
- crayons, pens, pencils and/or paint

Important Points to Understand

Clouds, smoke, and other things in the sky tell us about inversions.

Procedure

1. Observe the sky at a specific time each day or when you can.

2. If you see layered clouds, thunderstorm clouds with flat tops, smoke or pollution layers, or anything that indicates an inversion, document your findings. Cameras provide the easiest approach but drawing or sketching the scene works too.

3. Post pictures with date and time and discuss as a class.

4. If you can't do steps 1 to 3, use the images provided with this CEU to discuss visual clues to inversions.

Questions

1. Was the inversion layer easy to see?

2. Did it last for a while or did it break apart quickly?

3. How often do you see similar inversions?