1 Objectives

- Correctly use a sling psychrometer to measure dry-bulb and wet-bulb temperature.
- Convert the above measurements to dewpoint and relative humidity using several methods.
- Gain additional experience with taking and recording standard weather observations.

2 Materials

- Sling psychrometers
- Bottle of distilled water
- Skew-T diagram
- Textbook (for tables and equations)
- MF1-10 form (printed 11x17 if possible)
- Access to web browser

3 Introduction

Temperature and humidity are important not only because they have a strong effect on human comfort, agriculture, etc., but also because of their importance for atmospheric dynamics and energetics. Without temperature differences, there would be no pressure differences and thus no wind. Without atmospheric moisture there would be no clouds or precipitation.

4 Procedures

1. Important: If you break a sling psychrometer, you will get an ‘F’ for this lab exercise! Keep your distance from people and objects while swinging the psychrometer, and handle it carefully, especially when picking it up and putting it down.

2. If necessary, review pp. 212–217.

3. Using one of the sling psychrometers provided in class and carefully following the instructions given, observe the dry-bulb and wet-bulb temperature of the air in the classroom. Record the values in your lab writeup and inform the instructor of your values. If they differ too much from what he/she thinks you should have gotten, you might be asked to repeat the measurements.

4. Go to the rooftop and take TWO complete standard weather observations on an MF1-10 form as you did one for one of our earlier labs. Refer to the earlier lab instructions if you need to refresh your memory.

   - The first observation should be taken as soon as you are able after completing the previous step. Be sure to record the observation time, which is take to be the time at which you observe the sky condition and visibility.
• The second should be approximately one hour later (aim for more than 50 minutes, less than 1 hour and 10 minutes).
• For ONE of the two observations, you will use the sling psychrometer to obtain temperature and humidity at the same time as your observation (but don’t record it on your MF1-10 – see below). Record your dry-bulb and wet-bulb observations in your lab writeup along with the time they were taken.
• Be sure to make your psychrometer measurements in a shady area but with adequate exposure to the breeze, if at all possible.
• Return to the classroom and tell the instructor what your wet-bulb and dry-bulb readings were for the rooftop.

5. Determine the dewpoint and relative humidity, using each of the following methods:

• Thermodynamic diagram
• Table E.5 in the book
• Equations (7.57) and (7.58). Record your work on your lab writeup.
• The rooftop tower automated recording equipment.

6. Use the tower values of temperature and dewpoint in both of your MF1-10 observations.

7. Record all of your above temperature and humidity results in your lab writeup along with the time of the observation. If there are large differences between your results obtained using the different methods, then go back and check your procedure. Differences in dewpoint should normally not be more than a degree or two. Differences in RH should not exceed a few percent. If they are greater, consult with the instructor for advice.

8. Turn in your writeup, your MF1-10, and your Skew-T diagram.