General Meteorology	Laboratory #2
Name ____________________________	Date _______________
Partners __________________________	Section ______________

Surface Observations and METAR Reports

Purpose:

Develop the ability to perform a standard surface observation.
Be able to generate and interpret a METAR report.

Equipment:

Station Thermometer	Min./Max. Thermometer
Anemometer	Barometer
Psychrometer	Rain Gauge
Psychometric Tables	Barometric Correction Tables

Background:

The goal of a standard surface observation is to quantify the following properties of the atmosphere at regular intervals.

Temperature	Sea Level Pressure	Sky Cover
Dew Point Temperature	Altimeter Setting	Cloud Height
24 hr Max. Temperature	Wind Direction	Surface Visibility
24 hr Min. Temperature	Wind Speed	Precipitation
		Weather & Obstructions

Airports routinely collect this data due to the impact that atmospheric conditions have on air travel. Surface observation are performed every hour, are coded into an aviation report, and distributed for use world wide. Although the US historically used the SA report, we have switched over to the METAR which is used world wide.

In this particular lab we will focus on measurements related to pressure and altimeter settings. We will make some of the other standard measurement; however, we will wait until later labs to discuss the finer points of visibility, and cloud type and height.

For more information about weather observations consult the Federal Meteorological Handbook at **http://www.ofcm.gov/fmh-1/fmh1.htm**.

Procedure:

I. Perform a surface observation

The following procedure will be followed to perform a surface observation. The order of the steps are not important; however, all portions must be completed and the appropriate spaces on the observation sheet must be filled in.

1. Read the station thermometer for the current air temperature. All temperatures will be measured in Fahrenheit.
2. Read the min. and max. thermometer for the extremes of temperature over the last 24 hours. Once the measurement is taken, reset the two thermometers.
3. Measure the wet bulb and dry bulb temperature using the sling psychrometer. Using the psychometric tables determine the dew point temperature. The tables are in Celsius and our measurements are in Fahrenheit. You will need to do a conversion before and after you use the tables.

4. Determine the wind speed and direction using an anemometer. The wind speed is measured in knots. We will use either the radio stations anemometer or a hand held device which gives a rough value for the magnitude of the wind speed.
   1 knot = 1.15 mi/hr = 0.51 m/s
5. Read the station pressure using a mercurial barometer and an aneroid barometer. From the mercurial barometer make a temperature correction as well as a gravity correction. Determine the sea level pressure assuming an isothermal atmosphere and the altimeter setting assuming a standard atmosphere
6. Read the rain gauge and empty it. Since we do not have a rain gauge available at this time, we will use an alternate source of information for this part of the report.
7. Observe the sky cover and estimate the cloud height. This estimate will be very crude at this time. We will say low level clouds have a height between 0 and 6,500 ft, middle level clouds have a height between 6,500 and 23,000 ft, and high level clouds have a height between 16,000 and 43,000 ft. Notice that the measurement is made in feet not in meters.
8. Check the surface visibility using landmarks in the area. Since the clear line of site on campus is limited, we will have to resort to rough estimates or alternate sources of information.
9. Record the current weather and any special occurrences.

II. Reading a Mercurial Barometer

The device we have available for determining atmospheric pressure is not a true mercurial barometer. The device we have available does not have a means of measuring the mercury height to the tenth of a mm. Also the mercury shows a certain amount of contamination near the end exposed to the open air. These factors will affect the accuracy with which we can measure the atmospheric pressure. Use the following procedure to make your pressure reading. All results should be recorded on the pressure worksheet.

1. Measure the height of mercury on each side of the barometer. Record these values below.
2. Take the difference between the height on the left and right side of the barometer.
3. Record the difference between the two sides as the height of the mercury column on the pressure worksheet.
4. Using the value of room temperature record the temperature correction.
5. Determine the gravity correction for Cedarville. The location of **Cedarville** is **83° 48' 45" E** and **39° 44' 55" N**.
6. Applying the corrections, determine the station pressure.
7. Reduce the pressure to sea level using the average temperature over the past 12 hours and the station height above sea level. The station height for **Cedarville** is **317.9 m**.

Pressure on the left side H_{left} = ______________

Pressure on the right side H_{right} = ______________

Difference between the two sides ΔH = _______________

III. The METAR Report

The aviation routine weather report is called the METAR. At the present I do not know what the letters of the acronym represent. This report is a terse representation of all the information that an observer would collect. I have included a copy of a quick reference guide. For the observations we are making this should be enough. If you would like a more comprehensive guide to the METAR go to **http://www.met.tamu.edu/class/METAR/metar.html**.

Dayton METARs for 22Z March 31 - 7Z April 1, 1998.

```
KDAY 312251Z 18019G25KT 10SM CLR 25/12 A2958 RMK AO2 PK WND 15026/2152
SLP010 T02500117=

KDAY 312351Z 18021G32KT 10SM BKN040 OVC060 25/11 A2959 RMK AO2 PK WND
16032/2346 SLP014 T02500106 10261 20228 55015=

KDAY 010051Z 19021G31KT 10SM FEW070 OVC090 25/11 A2958 RMK AO2 PK WND
20032/0012 RAB09E28 SLP008 P0000 T02500106=

KDAY 010151Z 28022G36KT 10SM -RA FEW012 OVC075 14/11 A2967 RMK AO2 PK
WND 27036/0142 WSHFT 0054 RAB12E23B48 PRESRR SLP042 P0000 T01390111=

KDAY 010251Z 26006KT 4SM RA BR OVC060 13/12 A2968 RMK AO2 PK WND
28029/0152 PRESRR SLP045 P0007 60006 T01280117 53030=

KDAY 010351Z 24012KT 3SM RA BR SCT010 OVC015 13/12 A2968 RMK AO2 PRESRR
SLP048 P0014 T01280117=

KDAY 010451Z 23010KT 7SM -RA SCT010 BKN015 OVC028 12/11 A2969 RMK AO2
PRESFR SLP049 P0024 T01220111 402610122=

KDAY 010551Z 24012KT 10SM BKN049 BKN065 OVC100 12/10 A2969 RMK AO2 RAE20
PRESRR SLP051 P0001 60046 T01170100 10256 20117 53001=

KDAY 010651Z 25013KT 10SM OVC025 11/08 A2971 RMK AO2 PRESRR SLP056
T01060083=

KDAY 010751Z 24013KT 10SM BKN017 OVC032 11/09 A2973 RMK AO2 SLP064
T01060089=
```

1. I have included a number of METAR reports from Dayton for March 31 - April 1, 1998. The reports correspond to the passage of a cold front.

   In the blanks provided record the surface conditions at the requested times.

   2251Z

Temperature	______________	Wind Speed	______________
Dew Point	______________	Wind Direction	______________
Pressure	______________	Present Weather	______________
Sky Cover	______________		

   0051Z

Temperature	______________	Wind Speed	______________
Dew Point	______________	Wind Direction	______________
Pressure	______________	Present Weather	______________
Sky Cover	______________		

2. Generate a station model for each of the following observations.

2351Z **0251Z**

3. At what time do you think the cold front passed through Dayton? (Report it both in universal time coordinate and in local time.)

4. What measured parameters changed when the front passed and how did they change? (Include at least two parameters.)

5. Generate a METAR for today's observation

6. Generate a station model for today's observation.