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Use of Aneroid Home-Type Barometers

Purdue University Cooperative Extension Service
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A barometer measures atmospheric pressure or weight of the atmosphere overlying a horizontal unit area. It measures atmospheric pressure in terms of inches of mercury in the English system or millimeters of mercury and millibars in the metric system. This measurement is derived from the mercurial-type barometer.

Types

There are two basic types of barometers, the aneroid and the mercurial. Virtually all commercially available barometers are of the aneroid type because of its smaller size, portability, and more rugged design.

The mercurial barometer is simply a glass tube, a little over 30 inches long, sealed at one end and filled with mercury. The open end of the tube is placed in an uncovered cup of mercury. The mercury in the tube falls until its weight is balanced by the air pressure on the surface of the mercury in the cup. The height of the column of mercury in the glass tube is measured in inches. Sea level pressure, for example, will on the average read about 30.00 inches.

At 3,000 feet above sea level, the mercury drops to approximately 27.00 inches. This indicates less atmospheric pressure on the surface of the mercury in the cup as one goes to higher altitudes. Atmospheric pressure as shown on weather maps is reduced to sea level. Lines, called isobars, are drawn through points of equal pressure on such weather charts.

Aneroid barometers come in a variety of decorative cases and mountings, but the principle of operation is the same for all aneroids. A small, bellows-like metal chamber is sealed after most of the air inside has been evacuated. This air-tight chamber reacts to the rise or fall of outside atmospheric pressure by contracting or expanding. The needle of the instrument is linked to one side of the metallic bellows, and the needle moves as the bellows contracts or expands.

The dial of the aneroid barometer is graduated to correspond to the range of inches of mercury in the glass tube of a mercurial barometer. Thus, if the needle of the aneroid points to 30.00, this means that

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1/ Prepared from several sources including ESSA, Weather Bureau, scientific papers and popular articles by James E. Newman, and Lester H. Smith, Department of Agronomy, Purdue University, Lafayette, Indiana 47907.
atmospheric pressure is about normal sea level pressure or 30.00 inches. Readings below 30.00 indicate less than normal sea level pressure; above 30.00, above-normal pressure. Normal mean sea level pressure is approximately 29.92 inches.

Weather Predictions

A barometer can only measure atmospheric pressure. It does not indicate the character of the weather that exists at any place or time, nor does it, by itself, forecast the weather. However, barometric readings, taken at suitable intervals each day and considered in conjunction with observations of clouds, temperature, and winds, can be useful in making short range weather predictions.

Low Pressure Stations

When the pressure in one region is less than the pressure in surrounding areas, that region is generally occupied by a low-pressure system. In a low-pressure system, winds circulate in a counter-clockwise direction and tend to flow spirally toward the center (near the surface in the Northern Hemisphere). The passage of a low-pressure system is usually attended by inclement weather, cloudiness, and other conditions of a stormy nature, such as shifting winds.

High Pressure Systems

When the pressure in one region is greater than the pressure in surrounding areas, this region is generally occupied by a high-pressure system, in which the winds circulate clockwise and flow spirally outward from the center (near the surface in the Northern Hemisphere). A high-pressure system usually brings fair weather; but on its periphery, there may be some cloudiness or precipitation. In the summer, however, hot humid conditions can manifest local disturbances such as showers or thunderstorms in areas of high pressure.

Pressure Changes

A rapid and relatively large drop in atmospheric pressure signals the approach of a low-pressure system and/or the movement away of a high-pressure system. Conversely, a large and rapid rise in atmospheric pressure indicates the approach of a high-pressure system and/or the departure of a low-pressure system. The rate of rise or fall of pressure depends on such factors as the speed of movement and intensity of the systems and the spacing and direction of the isobars.

Cold Front

A trough of low pressure is often associated with a cold front, along which a mass of relatively cold air is advancing like a wedge and pushing against a receding mass of warmer, more moist air. In this event, the wind will shift, and pressure will fall as the trough approaches and will rise as it moves away.

Very often the advance of the cooler air which attends the passage of a cold front brings with it shower-type precipitation and temperature drop.

Warm Front

When a mass of relatively warm air advances against a receding wedge of cold air, it constitutes a warm front. The passage of a warm front is generally accompanied by a temperature rise, and by certain associated changes in air pressure, wind and cloudiness. Very frequently cloudiness and precipitation, often of a steady character, precede the movement of a front of this type over a given location.

Adjust Barometer

Adjust the barometer to give you sea level readings, not local station pressure. To obtain a current corrected sea level
pressure reading call a local radio, TV, or newspaper office that has the special weather wire service. Sea level corrected readings are reported every six hours from the Indiana Weather Center at Weir-Cook Airport, Indianapolis. Adjust your current barometer reading to the current sea level reading which will be approximately correct for your area.

Barometric Weather Chart

The following is a Barometric Weather Chart which may be used in weather forecasting when the barometric pressure and action and wind direction are known.
### BAROMETRIC WEATHER CHART FOR WEATHER FORECASTING
(BAROMETER READING MUST BE ADJUSTED TO SEA LEVEL)

<table>
<thead>
<tr>
<th>Barometric pressure action</th>
<th>Wind Direction</th>
<th>Wind Direction</th>
<th>Wind Direction</th>
<th>Wind Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>N W quadrant I</strong></td>
<td><strong>S W quadrant II</strong></td>
<td><strong>S E quadrant III</strong></td>
<td><strong>N E quadrant IV</strong></td>
</tr>
<tr>
<td>30.20 or higher Rising</td>
<td>Contd. fair 24 hr Lower temp. 1</td>
<td>Contd. fair 12 hr 2</td>
<td>Fair 3</td>
<td>Clear Cool 4</td>
</tr>
<tr>
<td></td>
<td>5 or Steady Rising</td>
<td>Little temp. chg. 6</td>
<td>Rain in 24-48 hr 7</td>
<td>Contd. fair Lower temp. 8</td>
</tr>
<tr>
<td></td>
<td>9 or Falling</td>
<td>Slowly rising t. 9</td>
<td>Rain within 12 hr Rising temp. Wind increasing 11</td>
<td>Rain in 24-48 hr 12</td>
</tr>
<tr>
<td>30.20 to Rising</td>
<td>Fair 48 hr Lower temp. 1</td>
<td>Fair 48 hr Lower temp. 2</td>
<td>Fair 3</td>
<td>Clear Colder 4</td>
</tr>
<tr>
<td>29.80</td>
<td>5 or Steady</td>
<td>Little temp. chg. 6</td>
<td>Rain in 12-24 hr 7</td>
<td>No change 8</td>
</tr>
<tr>
<td></td>
<td>9 or Falling</td>
<td>Rain probable</td>
<td>Rain in 6-12 hr Rising temp. Wind increasing 11</td>
<td>Rain within 12 hr 12</td>
</tr>
<tr>
<td>29.80 or lower Rising</td>
<td>Clearing, few hr Lower temp. 1</td>
<td>Clearing by 6 hr 2</td>
<td>Clearing 3</td>
<td>Clearing, Cooler 4</td>
</tr>
<tr>
<td></td>
<td>5 or Steady</td>
<td>Contd. stormy</td>
<td>Contd. rain or no change 7</td>
<td>Rainy, clearing in 12-24 hr. 8</td>
</tr>
<tr>
<td></td>
<td>9 or Falling</td>
<td>Increasing rain, Clearing by 12 hr 9</td>
<td>Severe storm imminent, Clearing by 24 hr 10</td>
<td>Heavy rain, Severe N E gale, 12</td>
</tr>
</tbody>
</table>

**EXPLANATION:** To find the weather prediction look to the right of the barometric pressure and action into the square beneath the wind direction.

Example: C7 means: "Continued rain or no change" because the square with this prediction was found from the barometric pressure "29.80 or lower", "Steady", and wind from the "southeast quadrant".

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