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A Science Service Feature

? WHY THE WEATHER ?

Dr. Charles F. Brooks,
of Clark University,
discusses:

THE AIR AS A GREAT HEAT ENGINE

The winds come from differences in pressure, and differences in pressure come ultimately from differences in temperature. In the last analysis, the prevailing winds blow in accordance with the prevailing distribution of temperature. The trade winds, the prevailing westerlies of our latitudes, and the polar easterlies are the ultimate result of general equatorial heating and polar cooling. These winds are the surface components of the great atmospheric heat engine driven by the sun.

The general features of this engine would be simple enough if the earth did not rotate, for the air would circulate directly from hot to cold regions aloft and from cold to hot at the surface, just as in a closed room with a hot stove. But the deflective effect of the earth's rotation turns eastward the overflow of expanded air from the heated, equatorial regions, thus preventing most of it from reaching a distance of over 2,000 to 2,500 miles from the equator. The resulting accumulation of air at latitudes 25 to 35 degrees, the "horse latitudes", causes the return flow of air, the trade winds.

For the same reason, the polar cooling, while depressing the layers of air in high latitudes and thereby favoring inflow aloft, can not draw this inflow from a great distance, or from beyond sub-polar latitudes. This removal of air from the vicinity of cold regions makes the surface pressures low, usually at latitudes 50 to 65, and favors both a surface outflow of cold air from the polar regions and of warm air from the high pressure belts of the horse latitudes. Deflection makes these winds polar easterlies and prevailing westerlies just as it makes the trade winds easterly. The dynamic action of these wind systems encircling the globe in different belts modifies the pressure distribution, tending always toward a balanced state.

(Tomorrow: Polar Easterlies Invade U.S.)

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