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A Science Service Feature

? WHY THE WEATHER ?

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Tells:

WHY HIGH CLOUDS GO EAST

Why are the upper winds prevailing from the west in middle latitudes carrying the high clouds from west to east? First we may ask, what determines the direction of a wind, anyway? A wind tends to flow in accordance with the "pressure gradient," that is from a region of higher pressure, more or less slantwise, towards a region of lower pressure. Pressure gradients aloft, particularly at the level of the cirrus clouds 4 miles or more up, are controlled mainly by the temperature distribution. Where the air is cold and dense it settles closer to the earth than where it is warm and expanded. Hence, where the air is cold the air column to a height of 4 miles contains more air, and there is less left above that height than where the air is warm. The result is a lower pressure at 4 miles over a cold region than over a warm. So, in general, the pressure at such heights is lower in the colder latitudes and higher in the warmer. This results in a pressure gradient generally northward over North America.

But it is a paradox that air pushed northward, as down such a pressure slope, moves eastward. This is owing to the deflective effect of the earth's rotation, the earth turning to the left, in the Northern Hemisphere, under the moving air. So with a northward gradient the wind aloft is west. The changes in temperature with the passing weather changes usually bring about a slight modification of the direction of the general pressure gradient, and in consequence a variation of the motion of the high clouds usually from northwest to southwest, but occasionally as far as north and northeast, or even south and southeast, when contrasts between latitudes are not great.

(Tomorrow: Criss-Cross Winds)

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