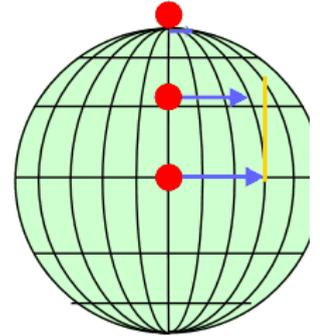


The Jet Stream

Jet streams are relatively narrow bands of strong wind in the upper levels of the atmosphere. The winds blow from west to east in jet streams but the flow often shifts to the north and south. Jet streams follow the boundaries between hot and cold air. Since these hot and cold air boundaries are most pronounced in winter, jet streams are the strongest for both the northern and southern hemisphere winters.

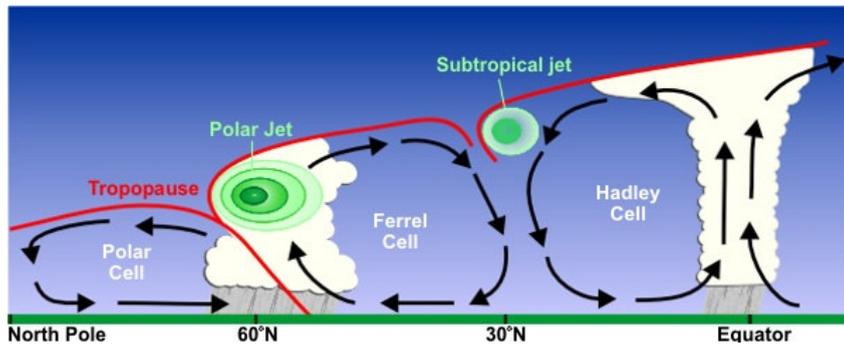


Why does the jet stream winds blow from west to east? Recall from the previous section what the global wind patterns would be like if the earth was not rotating. (The warm air rising at the equator will move toward both poles.) We saw that the earth's rotation divided this circulation into three cells. The earth's rotation is responsible for the jet stream as well.

The motion of the air is not directly north and south but is affected by the momentum the air has as it moves away from the equator. The reason has to do with momentum and how fast a location on or above the Earth moves relative to the Earth's axis.

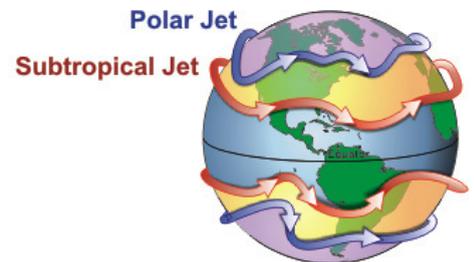
Your speed relative to the Earth's axis depends on your location. Someone standing on the equator is moving much faster than someone standing on a 45° latitude line. In the graphic (above right) the person at the position on the equator arrives at the yellow line sooner than the other two. Someone standing on a pole is not moving at all (except that he or she would be slowly spinning). The speed of the rotation is great enough to cause you to weigh one pound less at the equator than you would at the north or south pole.

The momentum the air has as it travels around the earth is conserved, which means as the air that's over the equator starts moving toward one of the poles, it keeps its eastward motion constant. The Earth below the air, however, moves slower as that air travels toward the poles. The result is that the air moves faster and faster in an easterly direction (relative to the Earth's surface below) the farther it moves from the equator.

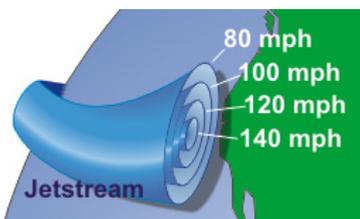


In addition, with the three-cell circulations mentioned previously, the regions around 30° N/S and 50°-60° N/S are areas where temperature changes are the greatest. As the difference in temperature between the two locations increase, the strength of the wind increases. Therefore, the regions around 30° N/S and 50°-60° N/S are also regions where the wind, in the upper atmosphere, is the strongest.

The 50°-60° N/S region is where the **polar jet** located with the **subtropical jet** located around 30°N. Jet streams vary in height of four to eight miles and can reach speeds of more than 275 mph (239 kts / 442 kp/h).



The actual appearance of jet streams result from the complex interaction between many variables - such as the location of high and low pressure systems, warm and cold air, and seasonal changes. They meander around the globe, dipping and rising in altitude/latitude, splitting at times and forming eddies, and even disappearing altogether to appear somewhere else.



Jet streams also "follow the sun" in that as the sun's elevation increases each day in the spring, the average latitude of the jet stream shifts poleward. (By Summer in the Northern Hemisphere, it is typically found near the U.S. Canadian border.) As Autumn approaches and the sun's elevation decreases, the jet stream's average latitude moves toward the equator.

Also, the jet stream is often indicated by a line on maps and by television meteorologist. The line generally points to the location of the strongest wind. Jet streams are typically wider and not as distinct but a region where the wind increase toward a core of strongest wind.

One way of visualizing this is to consider a river. The river's current is generally the strongest in the center with decreasing strength as on

approaches the river's bank. It can be said that jet streams are "rivers of air".

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