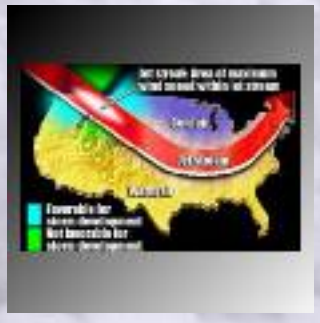
What is the Jet Stream?



What is the jet stream?

The jet stream is a river of fast flowing air at high altitudes above the earth that generally flows from west to east over the mid-latitudes. To be called a "jet stream" the winds should be faster than 57 mph, but the term is often wrongly used for all upper-level winds. Usually, the jet stream separates cold polar air to its north from warmer air to its south. During major cold outbreaks over the USA, the jet stream often dives south, sometimes moving well over the Gulf of Mexico. During unusually mild winter weather and during the summer, the jet stream retreats northward into Canada. Often, the jet stream contains "jet streaks" of wind speeds faster than the surrounding regions. These jet streaks can play a very important role in precipitation and storm formation. Imagine you're in a jet flying along in a jet stream in an area away from any curves in the stream's flow. The area ahead and to the left of the airplane and the area behind and to the airplane's right are favorable for precipitation and storm development. Depending on atmospheric conditions, air motions in both of these areas tend to enhance upward motion of air from the ground below. Rising air can lower the air pressure at the Earth's surface. In the areas to the high-flying airplane's left rear and right front, the air tends to sink, which can increase the air's pressure at the earth's surface, depending on other factors.

The earth's atmosphere contains two major 'jet streams' (one in each hemisphere). They have considerable impact on human affairs. As we often hear during the weather segment of the nightly news, the jet streams are related to weather patterns of high and low pressure. And airline pilots are well aware of the consequences of being in or

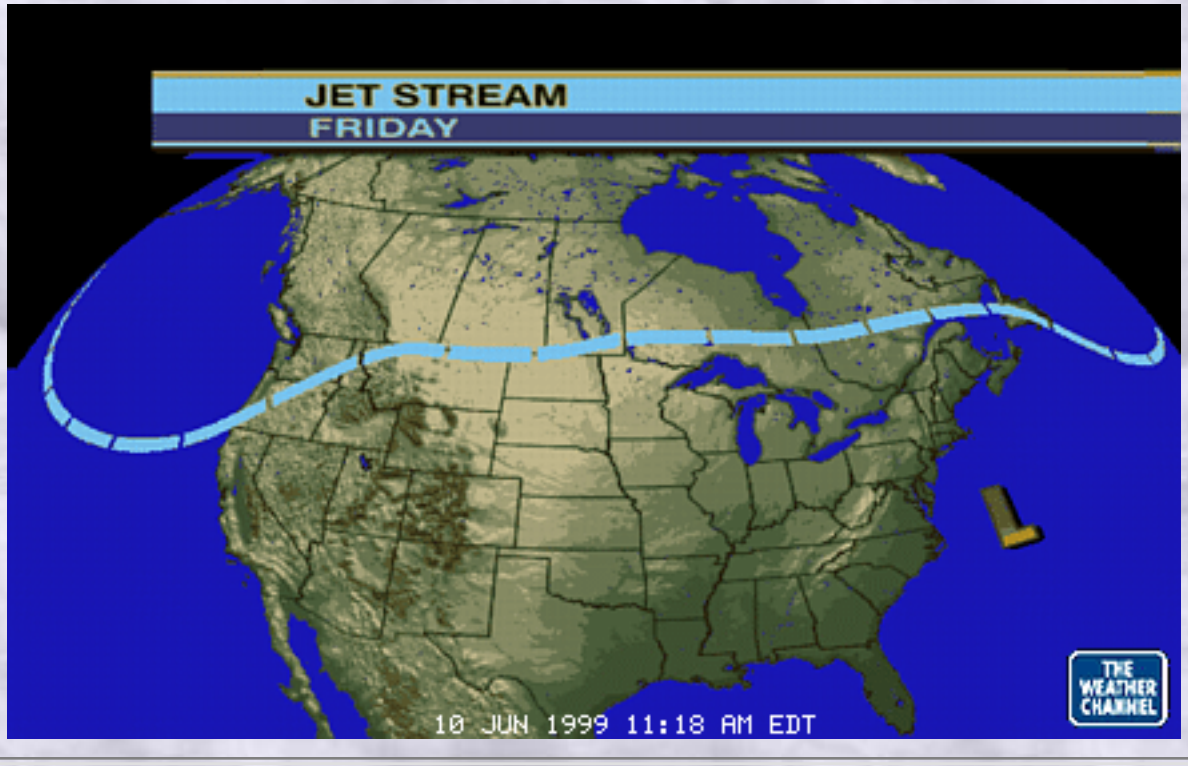
near the jet stream in an aircraft. Detailed knowledge of the jet stream--its location, altitude and strength--is therefore critical to modern-day weather forecasting, as well as to more specific applications such as the safe and efficient routing of aircraft.

By way of definition, a jet in fluid dynamics is simply a core (or 'stream') of fluid moving at a higher velocity than the surrounding fluid. Although they are complicated to describe mathematically, the jet streams in the atmosphere are a straightforward, natural result of the meridional (that is, equator-to-pole) temperature gradient in the earth's atmosphere. Analogous flows exist on other planets with substantial atmospheres having similar temperature gradients.

Home

- Types Of Jet Streams
- How The Jet Stream Influences The Weather
- Polar Front Determines Jet Stream Position & The Coriolis Explained Why Winds Don't Blow Straight

Types of Jet Streams



ARCTIC JET

The jet stream that is situated high in the stratosphere in and around the Arctic or Antarctic Circles. It marks the boundary of polar and arctic air masses.

LOW LEVEL JET (LLJ)

Strong winds that are concentrated in relatively narrow bands in the lower part of the atmosphere. It is often amplified at night. The southerly wind over the US Plains states during spring and summer is a notable example.

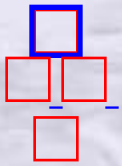
POLAR JET

Marked by a concentration of isotherms and strong vertical shear,

this jet is the boundary between the polar air and the subtropical air . It often divides into two branches, the north and the south, and marks the high speed core of the prevailing westerlies. It is associated with the location and motion of the high and low pressure areas of the middle latitudes, and therefore, is variable in position, elevation, and wind speed. Its position tends to migrate south in the Northern Hemispheric winter and north in the summer , and its core winds increase during the winter and become less strong in the summer.

SUBTROPICAL JET

Marked by a concentration of isotherms and vertical shear, this jet is the boundary between the subtropical air and the tropical air. It is found approximately between 25Â° and 35Â° North latitude and usually above an altitude of 40,000 feet. Its position tends to migrate south in the Northern Hemispheric winter and north in the summer.



- What is the jet stream
- How the jet stream influences the weather
- Polar Front Determines Jet Stream Position & The Coriolis Explained
Why Winds Don't Blow Straight

How The Jet Stream Influences The Weather

Source: USA TODAY research by Chad Palmer

The jet stream is a river of fast flowing air at high altitudes above the earth that generally flows from west to east over the mid-latitudes. To be called a "jet stream" the winds should be faster than 57 mph, but the term is often wrongly used for all upper-level winds. Usually, the jet stream separates cold polar air to its north from warmer air to its south. During major cold outbreaks over the USA, the jet stream often dives south, sometimes moving well over the Gulf of Mexico. During unusually mild winter weather and during the summer, the jet stream retreats northward into Canada.

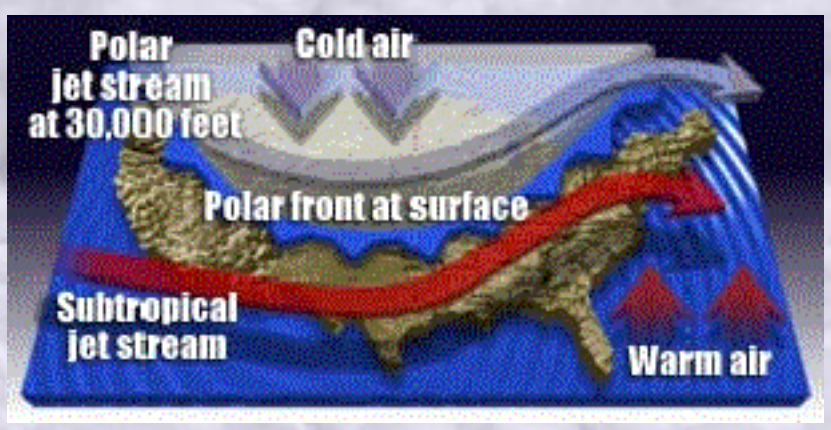
Often, the jet stream contains "jet streaks" of wind speeds faster than the surrounding regions. These jet streaks can play a very important role in precipitation and storm formation. Imagine you're in a jet flying along in a jet stream in an area away from any curves in the stream's flow. The area ahead and to the left of the airplane and the area behind and to the airplane's right are favorable for precipitation and storm development. Depending on atmospheric conditions, air motions in both of these areas tend to enhance upward motion of air from the ground below. Rising air

can lower the air pressure at the Earth's surface. In the areas to the high-flying airplane's left rear and right front, the air tends to sink, which can increase the air's pressure at the earth's surface, depending on other factors. A text and graphic explain what happens at the earth's surface in areas of low and high pressure. Rising motion and the associated low pressure favor precipitation and storm formation. Sinking motion tends to inhibit precipitation and storm formation. This does not mean that storms and precipitation always form in the favorable quadrants or that storms and precipitation can not form in the unfavorable quadrants. Many other factors besides the position of the jet streak influence storm and precipitation formation. For a jet streak in curved flow, the quadrant rules discussed above do not apply. You have to take the effects of curvature into account if the jet stream isn't flowing in a straight line.

Home

- What Is The Jet Stream?
- Types Of Jet Streams
- Polar Front Determines Jet Stream Position & The Coriolis Explained
- Why Winds Don't Blow Straight

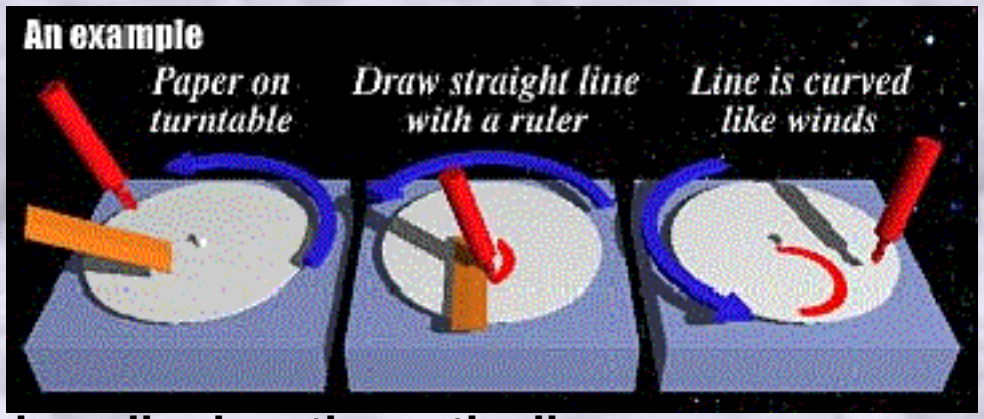
Polar Front Determines Jet Stream Position & The Coriolis Explained Why Winds Don't Blow Straight



The polar front is the cold front that separates the main body of colder, drier air to the north from warmer, moister air to the south. The polar front is strongest during the winter and weakest during the summer. Air movements associated with it lead to the formation of the polar jet stream, a stream of high-altitude winds. During major cold outbreaks, the polar front dives south over the country. Consequently, the polar jet stream also dives south in response. The polar jet stream often aids in the development of storms and it also tends to steer the storms. Another jet stream, called the subtropical jet stream, tends to develop during the winter season. It is formed by air movements in the tropical and subtropical regions. The subtropical jet stream can also help develop and steer storms and disturbances. Another graphic and text explain how the jet stream can influence weather at the Earth's surface.

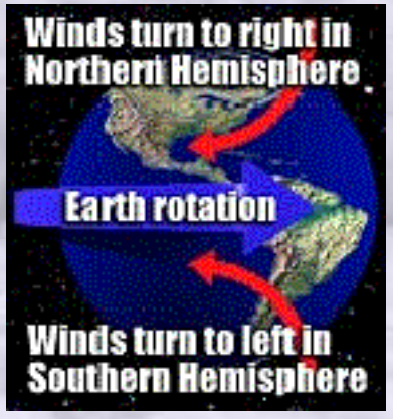
Winds begin with differences in air pressures. Pressure that's higher at one place than another sets up a force pushing from the high toward the low pressure. The greater the difference in pressures, the stronger the force. The distance between the area of high pressure and the area of low pressure also determines how fast the moving air is accelerated. Meteorologists refer to the force that starts the wind flowing as the "pressure gradient force." High and low pressure are relative.

There's no set number that divides high and low pressure. The graphic here ignores the effects of friction and other forces on the wind. A couple of related graphics will help you understand the wind. The first explains what's going on in high and low pressure areas at the Earth's surface. Once the wind begins blowing the Earth's rotation changes its direction. This is known as the Coriolis effect.



Pressure differences tend to push winds in straight paths. Yet winds follow curved paths across the Earth. In 1835, Gustave-Gaspard Coriolis, a French scientist, first described mathematically

what's going on, giving his name to the Coriolis effect. Sometimes it's called the Coriolis force. In simple terms, what's going on is similar to what would happen if you used a ruler to draw a "straight" line on a piece of cardboard on a rotating turntable. The line would turn out curved. As air begins flowing from high to low pressure, the Earth rotates under it, making the wind follow a curved path. In the Northern Hemisphere, the wind turns to the right of its direction of motion.



Home

- What Is The Jet Stream?
- Types Of Jet Streams
- How The Jet Streams Influences The Weather