

THE ATMOSPHERIC RESERVOIR

Examining the Atmosphere and Atmospheric Resource Management

THE JET STREAM

By Mark D. Schneider

High above us at altitudes between 30 and 50 thousand feet, a river of air called the jet stream flows at speeds sometimes exceeding 200 miles per hour (mph). Commercial airliners share this airspace with the jet stream and benefit from it when traveling in the same direction that these winds are blowing. This is called a "tailwind" and when airplanes fly in an opposing direction they experience what's known as a "headwind."

On February 18, a historic jet stream event occurred in the northeastern U.S. At a pressure level of 250 millibars (an altitude of approximately 30 to 35 thousand feet) jet stream winds of 230 mph were recorded over New York. These are possibly the strongest 250 millibar winds ever measured in U.S. history. As a result of this unusually strong jet stream, a commercial airliner traveling from Los Angeles to London reached a ground speed of 801 mph. Pilot Peter James tweeted that, "Never ever seen this kind of tailwind in my life as a commercial pilot." Ground speed is the actual speed that the aircraft is traveling relative to the ground, not just through the air. In even simpler terms, ground speed is the aircraft's actual speed through the air plus or minus the wind speed. This means that the airplane's actual airspeed would have been close to 571 mph (or 801 mph minus 230 mph) and this is the reason that it did not break the speed of sound (767 mph in standard atmospheric conditions).

Jet streams are normally stronger and flow faster across the U.S. during the winter months because of larger temperature variations or gradients between cold air to the north and warm air to the south. Looking at a river from above it's easier to observe both straight and curved sections, but more difficult to see that the water flows faster when there aren't obstructions, obstacles, or bends. Winds in the jet stream act in a similar way and contain water vapor, so they can be thought of as an atmospheric river. When meteorologists analyze weather maps, they're

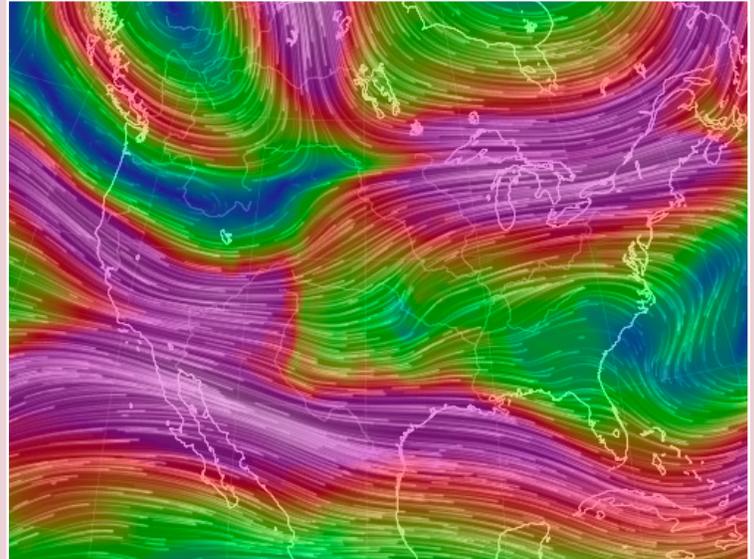


Image courtesy of earth.nullschool.net

usually focused on areas of the jet stream that bend in ridges or troughs because these areas determine the overall large-scale weather that we experience. Troughs in the jet stream are areas of low pressure that can indicate storminess. On the other hand, ridges in the jet stream can indicate high pressure and more tranquil weather conditions.

Long, straight sections of jet stream winds have the ability to accelerate quicker, much like a motorist driving their car down a straight stretch of road. The accelerated winds of the jet stream in the attached image coincide with white streaks within the straighter purple colored sections. Observe the strong band of jet stream winds over Mexico. These white streaks are actually called jet streaks which are defined as maximum winds within the actual jet stream. A jet streak was definitely responsible for the record wind event over New York on February 18.

If you're looking for something to occupy your mind the next time you fly somewhere, make a note of your scheduled enroute time and see if the actual flight was longer or shorter. Chances are the jet stream made a noticeable difference in either getting you to your destination early or possibly a few minutes late with all other factors being accounted for.