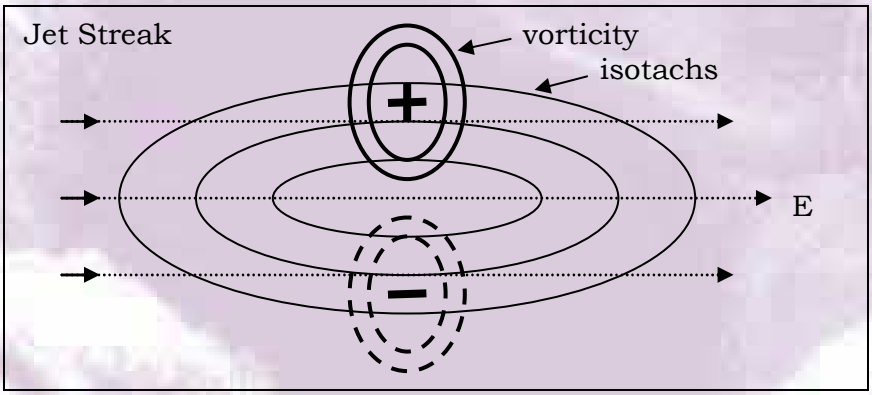
## Jet Streak Circulation

The best way to visualize a jet stream is to draw isotachs (lines of constant wind speed) and locate the approximate west to east axis of greatest wind speeds. The **jet axis** can be either straight, cyclonically curved (through a trough), or anticyclonically curved (through a ridge).

Along the jet axis are regions of even greater wind speed, called **jet streaks**. In these regions, isotachs are elliptical, and are extended along the jet axis. Examples of a jet streak superimposed upon three different jet stream orientations are shown below in figure 1 (Moore and VanKnowe, 1992).

Significant vertical motion is usually associated with a jet streak, and is determined by the orientation of the jet axis. With a straight jet stream, vertical motion should be as shown in figure 2a (Moore and VanKnowe, 1992). Ascent is shown in the left front and right rear quadrants, and descent is shown in the other two quadrants.

These results can be inferred from the following diagram,




and the large-scale vorticity equation,

$$\frac{d}{d\,t}\,(\zeta + f) \;=\; -\left(\frac{\partial\, u}{\partial\, x} \;+\; \frac{\partial\, v}{\partial\, y}\right) f\,,$$

which needs to be solved for the horizontal divergence,

$$\left(\frac{\partial\, u}{\partial\, x} \;+\; \frac{\partial\, v}{\partial\, y}\right) \;=\; -\;\frac{1}{f}\;\frac{d}{d\,t}\;(\zeta + f). \qquad (1)$$

Since air parcels move east faster than the jet streak, they move through the vorticity pattern. A parcel approaching the jet streak in the left rear quadrant, will experience an increase in absolute vorticity, and there must be convergence according to equation (1). Since jet streaks are an upper troposphere phenomena, upper level convergence implies descent. Similarly, ascent should occur in the left front quadrant. And the other two quadrants follow these examples.