

Streamlines

Advantages of streamlines

- 1) Good picture of instantaneous air motion.
- 2) Helps identify areas of meteorological interest. Specifically, streamlines can identify:
 - a. Neutral points
 - b. Areas of confluence and diffluence
 - c. Regions where winds are not geostrophic
 - d. Troughs and ridges
 - e. Low-level jets, the subtropical jet, and the polar jet, especially in conjunction with isotachs
- 3) Streamlines are the only reasonable alternative where the pressure gradient is weak, especially in the tropics or in summertime air masses.
- 4) Streamlines are helping in identifying ocean wave fetch generation regions.

Properties of a good streamline analysis

- 1) If you believe the observation is correct, wind direction should be everywhere parallel to streamlines (exactly!) Sometimes one can make an exception for very light and variable wind. In general this exception should be avoided.
- 2) Streamlines should be evenly spaced away from singular points and asymptotes.
- 3) Asymptotes should correctly depict area of confluence and diffluence.
- 4) Streamlines *never* cross.
- 5) The sense of rotation must be correct. Air should flow clockwise away from an anticyclone (in the Northern Hemisphere), and air should flow counterclockwise away from a cyclone (in the Northern Hemisphere)
- 6) Anticyclones should be labeled with a small blue “A”. Cyclones should be labeled with a small red “C”.
- 7) In general, streamlines around anticyclones (cyclones) should reflect diffluence (confluence), especially at the surface.
- 8) Arrowheads are placed at beginning and end of each streamline.
- 9) Since streamlines are a continuous feature, they must begin or end at the edges of the chart, or at *singular points*.
- 10) When enough streamlines have been drawn, a complete and continuous representation of wind direction and wind flow should exist which represents a “snapshot” of the atmosphere at that level.
- 11) Neutral points must *always* be located between adjoining circulations of the same rotating sense. They will also be located near cyclones and anticyclones which are imbedded in a uniform flow feature. For example, a neutral point can be located south of a cyclone located in easterly flow.
- 12) Wind tends to be light or calm near neutral points.
- 13) Winds will almost always be calm at the center of an anticyclone.
- 14) Streamlines should look “pretty”, not messy. Consider water vapor satellite imagery – it depicts beautiful fluid flow, not ragged circulation.
- 15) If data is missing, looking at satellite loops can help fill in the flow gaps.
- 16) On the equator where the Coriolis force is zero, regions of divergence and convergence should look like a “starburst” with no rotation.