ATMO 489/689
Radar Meteorology

Laboratory #6
11/7/05 (Monday section) and 11/8/05 (Tuesday section)

Doppler Radar (Radial) Velocity Interpretation

Due: By beginning of next lab

(50 points)

1. (25 points) In order to gain practice in interpreting complex three dimensional flow patterns in and around precipitation from single Doppler radar data, Doppler radial velocity patterns along a plan position indicator (PPI) scan (i.e., fixed elevation angle and varying azimuth angle) have been simulated from simplified horizontal and vertical wind field patterns (Brown and Wood 1987)[1].

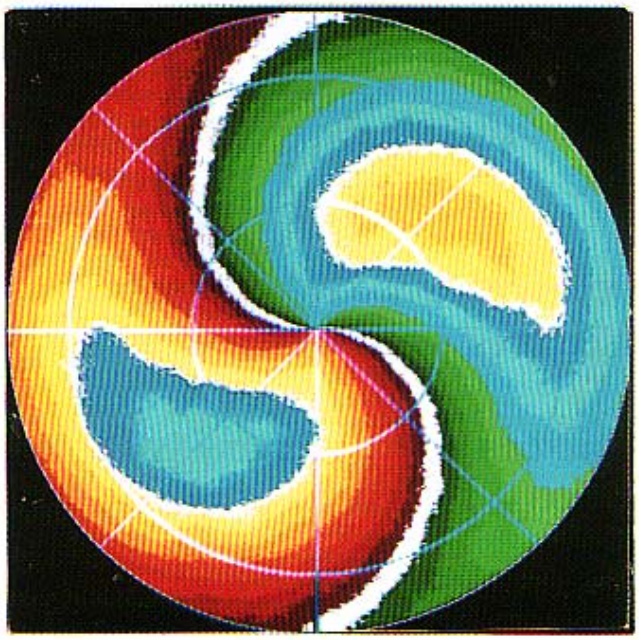
You can assume that each simulated PPI scan was taken at a low elevation angle (e.g., ≈ 1°). The radar location is at the center of the display. The light blue lines are circles of constant range. Each range ring is about 50 nm (92.6 km) from the radar. The PPI scan samples up to about 24,000 ft (7.3 km) in height and about 124 nm (230 km) in range. (See slide 14 in lab 6 notes) Unless otherwise noted (e.g., 1d), a complete PPI scan is shown (i.e., 360° in azimuth).

Negative Doppler velocities (blue-green color) in knots (kts) are toward the radar and positive (yellow-red) are away from the radar. For your reference, the radial velocity color bar for each PPI scan below is.

Qualitatively describe (in your own words) the three-dimensional wind field inferred from each PPI scan of radial velocity. You may use *approximate* vertical profiles (i.e., magnitude and direction) or sketches (i.e., wind barbs on the plane of the PPI scan) of the wind field as shown in the examples during class.

[1] Brown, Rodger & Vincent Wood, 1987: A Guide to Interpreting Doppler Velocity Patterns, NSSL, Norman OK.

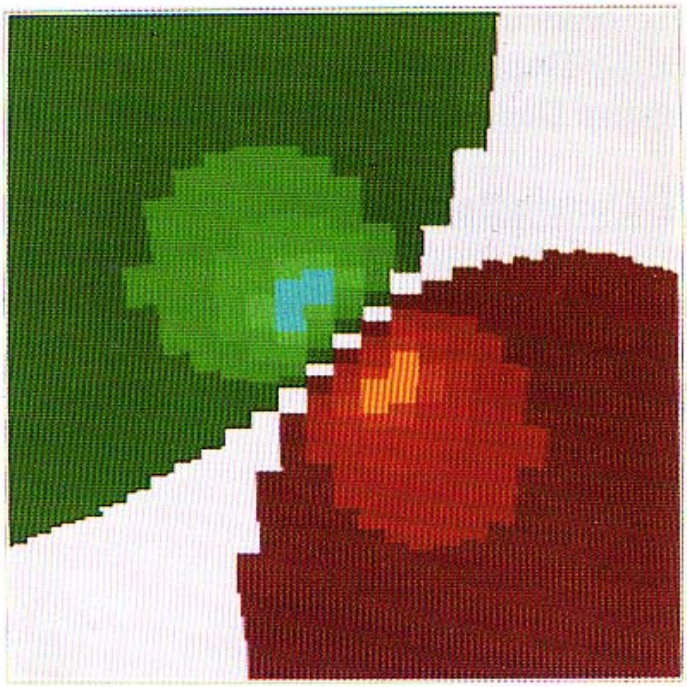
A. (5 points)



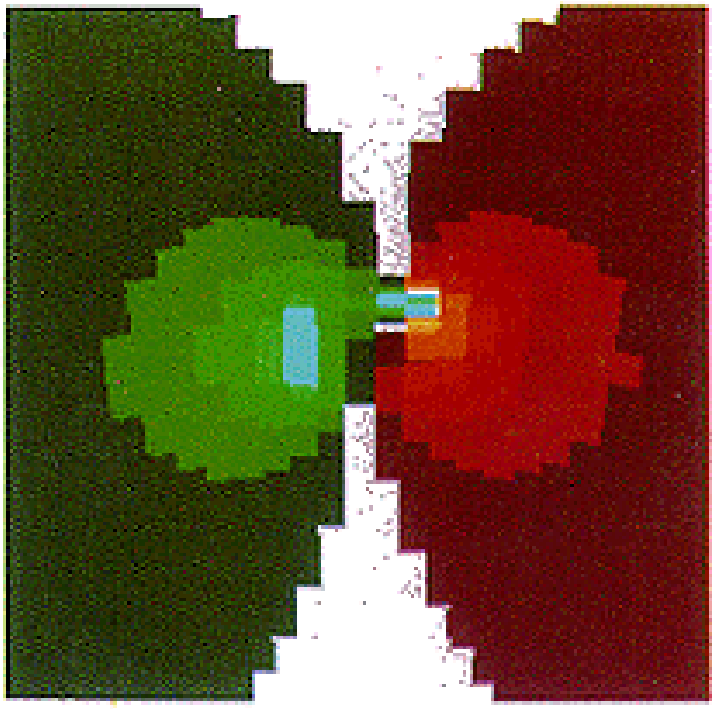
B. (5 points)

C. (5 points)

D. (5 points) The following image is a small portion (27 nm x 27 nm) of a low level PPI scan that is zoomed in on a particular velocity feature of a severe convective storm that is to the north of the radar (see slide 14 in lab notes).



E. (5 points) The following image is a small portion (27 nm x 27 nm) of a low level PPI scan that is zoomed in on a particular velocity feature of a severe convective storm that is to the north of the radar (see slide 14 in lab notes).



2. (25 points) A fatal tornado occurred around 2 AM (~ 08 Z) on Sunday, November 6, 2005 along the border of southwestern Indiana (e.g., Evansville, IN or EVV) and northwestern Kentucky (e.g., Henderson, KY or EHR).

Use *garp or the NCAR-RAP Real Time Weather Data web* site for viewing Weather Surveillance Radar – 1988 Doppler (WSR-88D) data –

NCAR RAP:
http://www.rap.ucar.edu/weather/radar/ .

Select End date: 6 Nov 2005
Select End time: 1000 UTC
Select Loop duration: 3 hours

Note – This NCAR-RAP archive maintains the WSR-88D data for 6 days and then it is gone. Please plan accordingly for completing this lab!

To run garp on LINUX machines for this case type in "Nov0605" and simply type "garp" on the command prompt. Composite radar reflectivity images (*LEVEL III*) and radar reflectivity and Doppler velocity are available for selected WSR-88D (*NIDS*) (e.g., KHPX). Within, NIDS "N0R" refers to radar reflectivity and "N0V" refers to Doppler velocity from the lowest elevation angle PPI (Plan Position Indicator) scan available. "N0RL2" and "N0VL2" refer to the 2nd level (i.e., next available elevation angle) reflectivity and Doppler velocity, respectively (etc).

a. (5 points) Select 0.5° PPI reflectivity for KHPX (Fort Campbell/Trenton, KY) WSR-88D and loop all PPI images. Describe what you see on both the large and small scale.

b. (5 points) Select 0.5° PPI (radial) velocity for KHPX (Fort Campbell/Trenton, KY) WSR-88D and loop all PPI images. Describe what you see on the large scale.

c. (5 points) When looping the velocity PPI data, the purple areas are marked by RF (range folding). Define and describe range folding. Explain the impact of RF on interpreting the Doppler velocity data and short-term prediction of severe convective weather.

d. (10 points) Select 0.5° PPI (radial) velocity for KHPX (Fort Campbell/Trenton, KY) WSR-88D and manually loop through PPI images one frame at a time. Pay particular attention to small scale radial velocity features in the general vicinity of EVV and EHR. Determine the volume time, approximate location, and brief qualitative description of any mesocyclone signatures during the two hour period (07-09Z)

Extra Credit (3 points): Using WSR-88D VWX radial velocity data from the 0.5° PPI on garp, name the small (i.e., convective) scale velocity feature in vicinity of the tornado around 0810 UTC and describe the type of flow.