

# Comparison of the 29–30 June 2012 and 11 July 2011 Derechos: Impact of the Appalachians

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## Motivation:

- The 29–30 June 2012 derecho was one of the most destructive severe weather events in recent history. Beginning as elevated convection over Iowa at 1200 UTC 29 June, the area of convection quickly moved east, becoming a dangerous MCS over the Ohio Valley. By 0000 UTC 30 June, the derecho had made its way into West Virginia and toward the east coast by 0600 UTC.
- The Storm Prediction Center (SPC) had difficulty forecasting this derecho downstream of the Appalachians due to uncertainty if elevated terrain would impede the derecho from progressing to the coast.
- The 11 July 2011 derecho developed in similar synoptic conditions and shared a similar path to the 29–30 June 2012 derecho. Upon encountering the Appalachians, the derecho rapidly dissipated.

Why was the 29–30 June 2012 derecho able to sustain itself after crossing the Appalachians while the 11 July 2011 derecho was not?

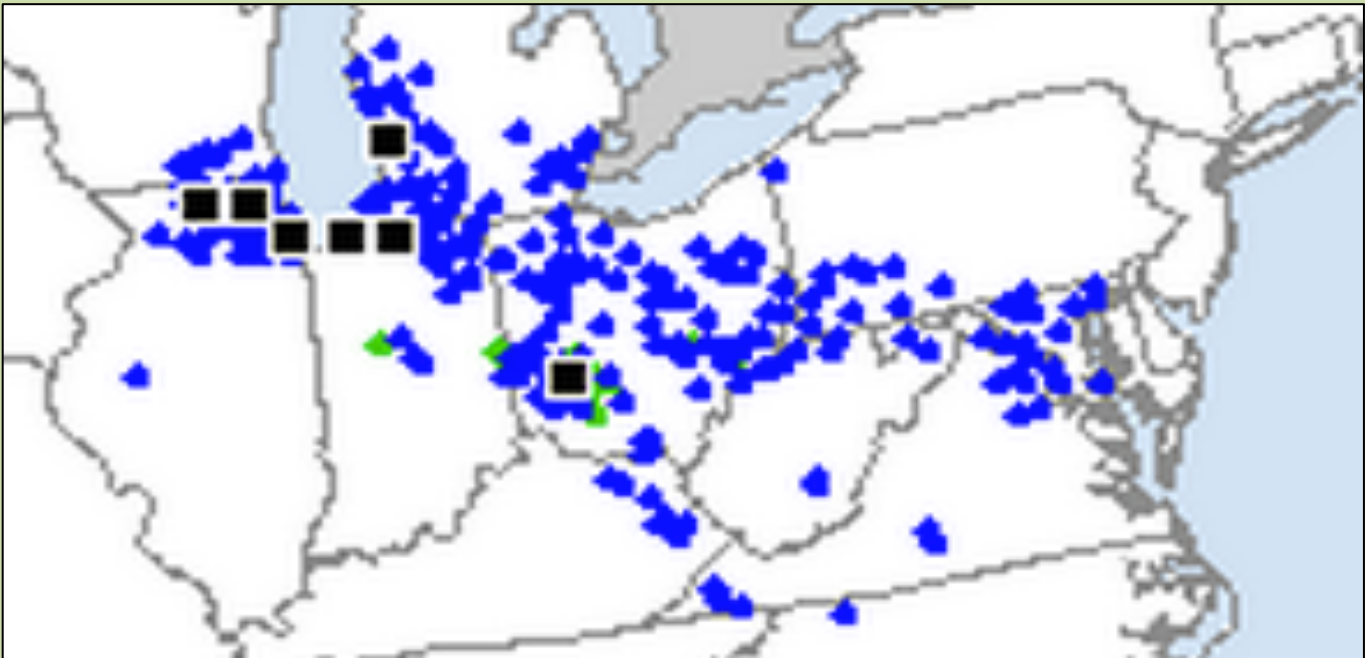


Fig. 1: SPC storm reports for 11 July 2011

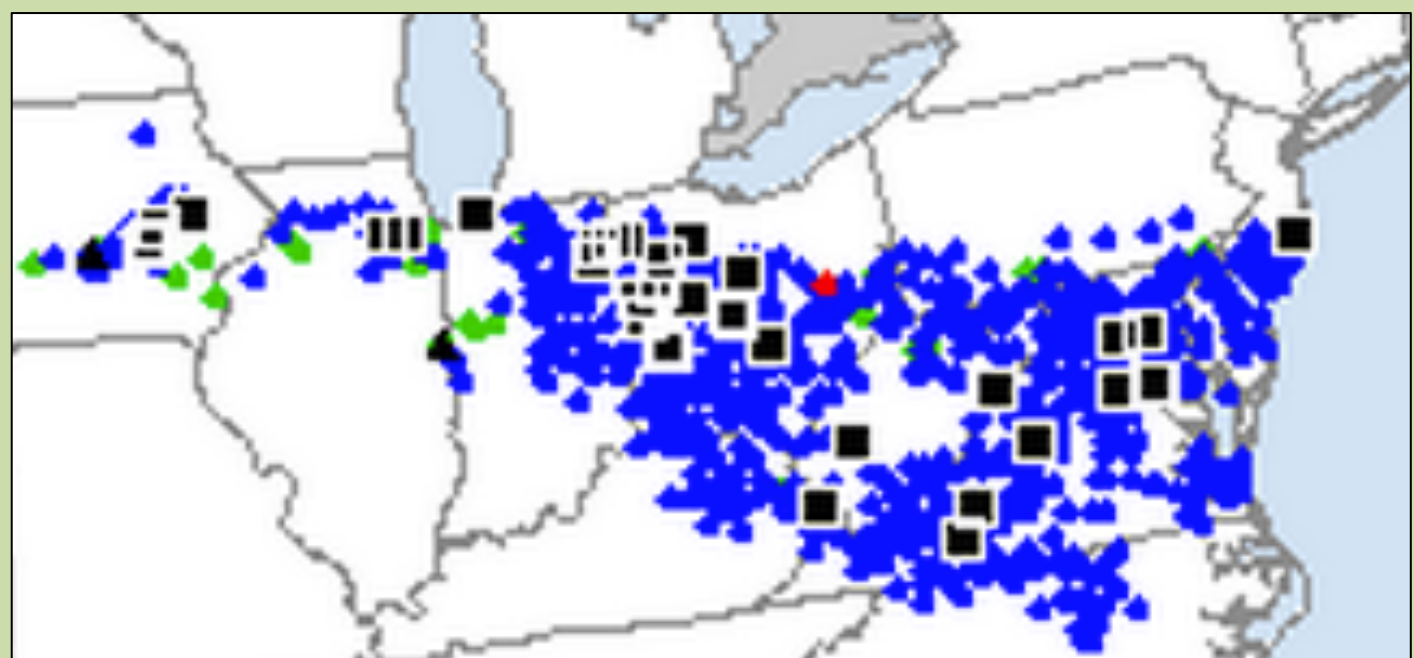


Fig. 2: SPC storm reports for 29 June 2012

## Synoptic Similarities:

- Anticyclone to the southwest advected moisture from the Gulf of Mexico.
- Moderate west-northwesterly mid-level flow across the Ohio Valley and into West Virginia.
- Flow perpendicular to Appalachian Mountains led to the development of a pressure trough in the lee of the mountain range.
- Thermodynamically unstable airmass lee of the Appalachians.

### Appalachian lee trough:

- Adiabatically heats the air in the lee of the mountains and steepens low-level lapse rates.
- Enhances lower-tropospheric convergence and moisture along the trough axis.
- Alters surface wind direction to increase low-level shear.

## July 2011

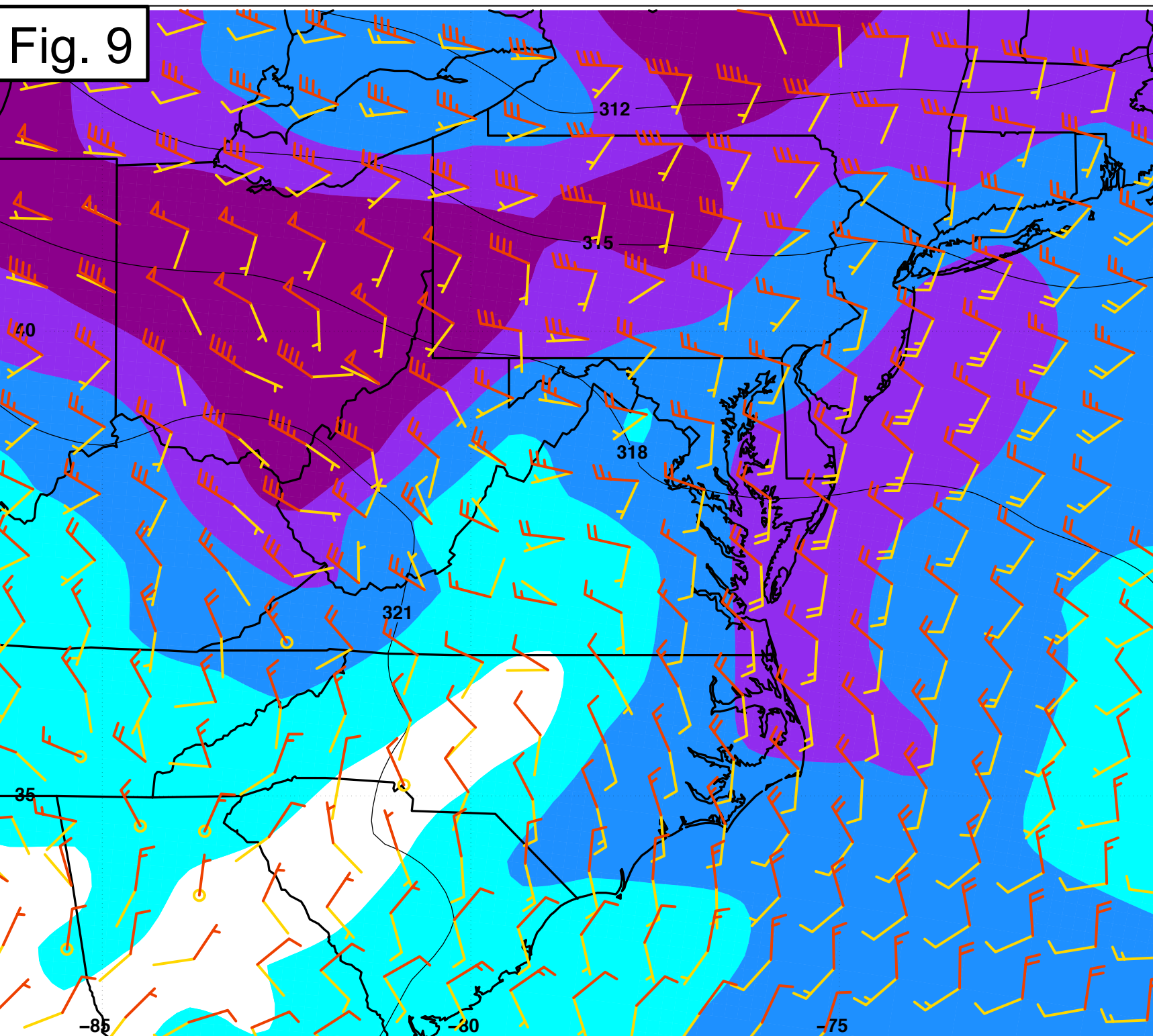
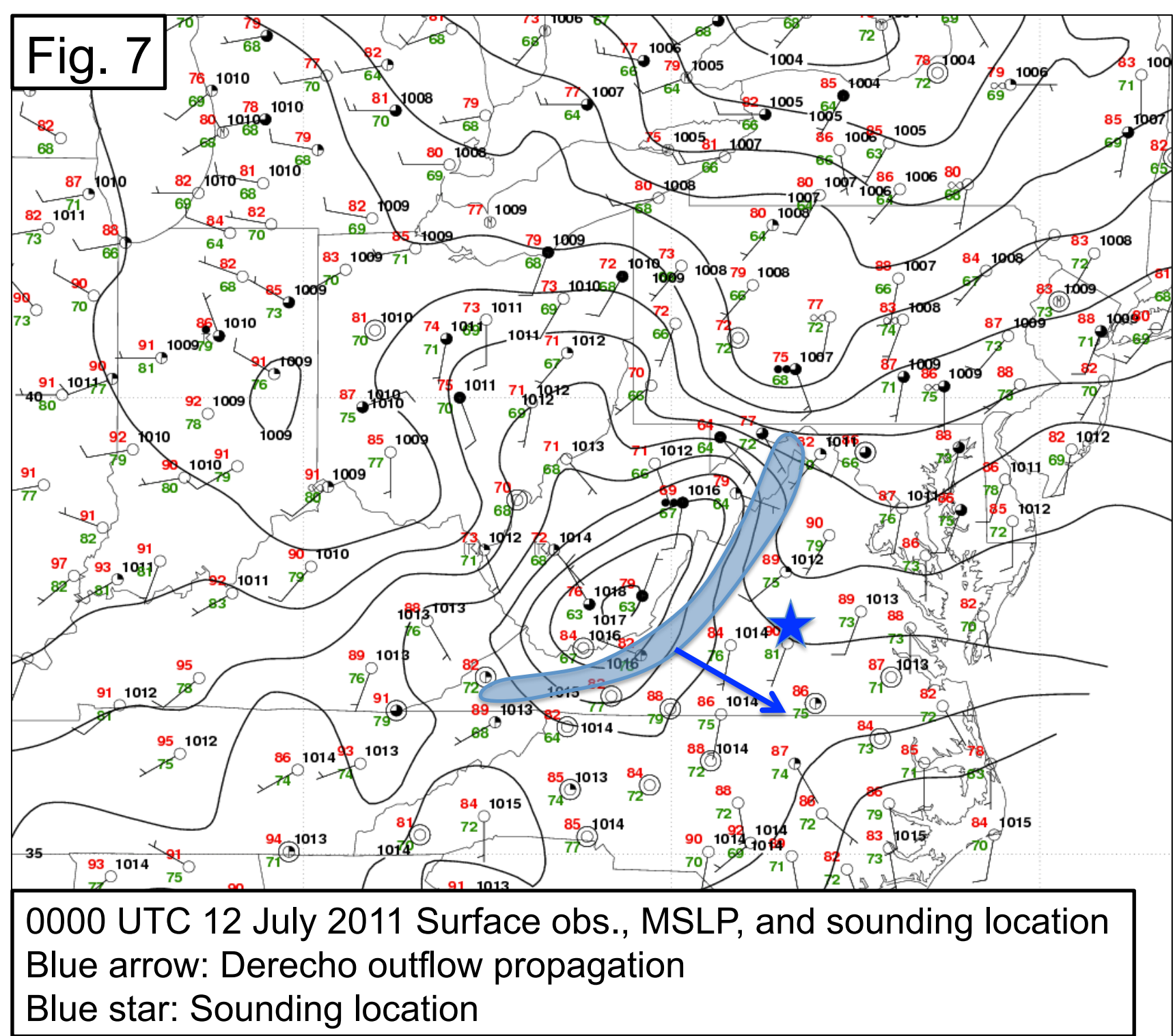
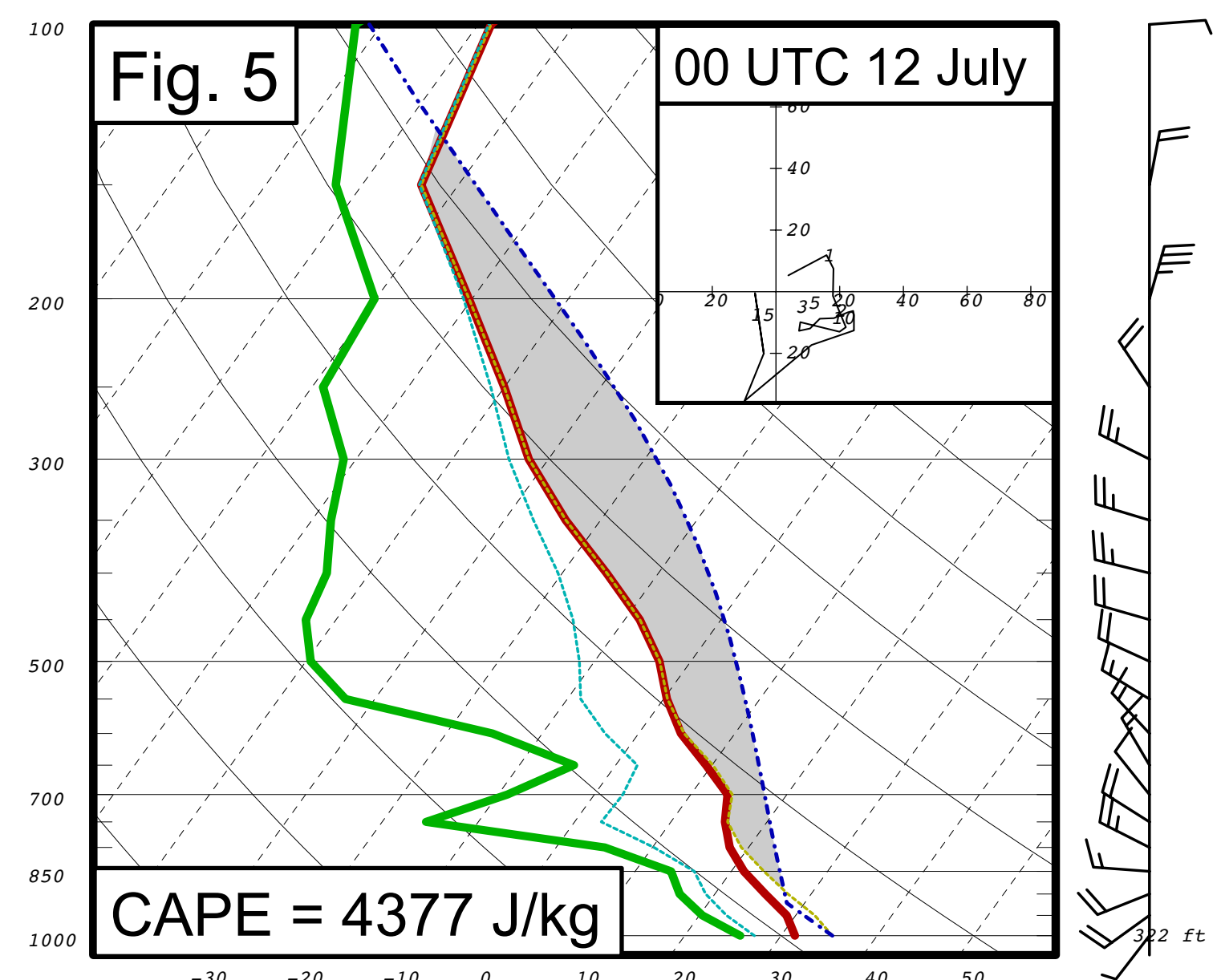
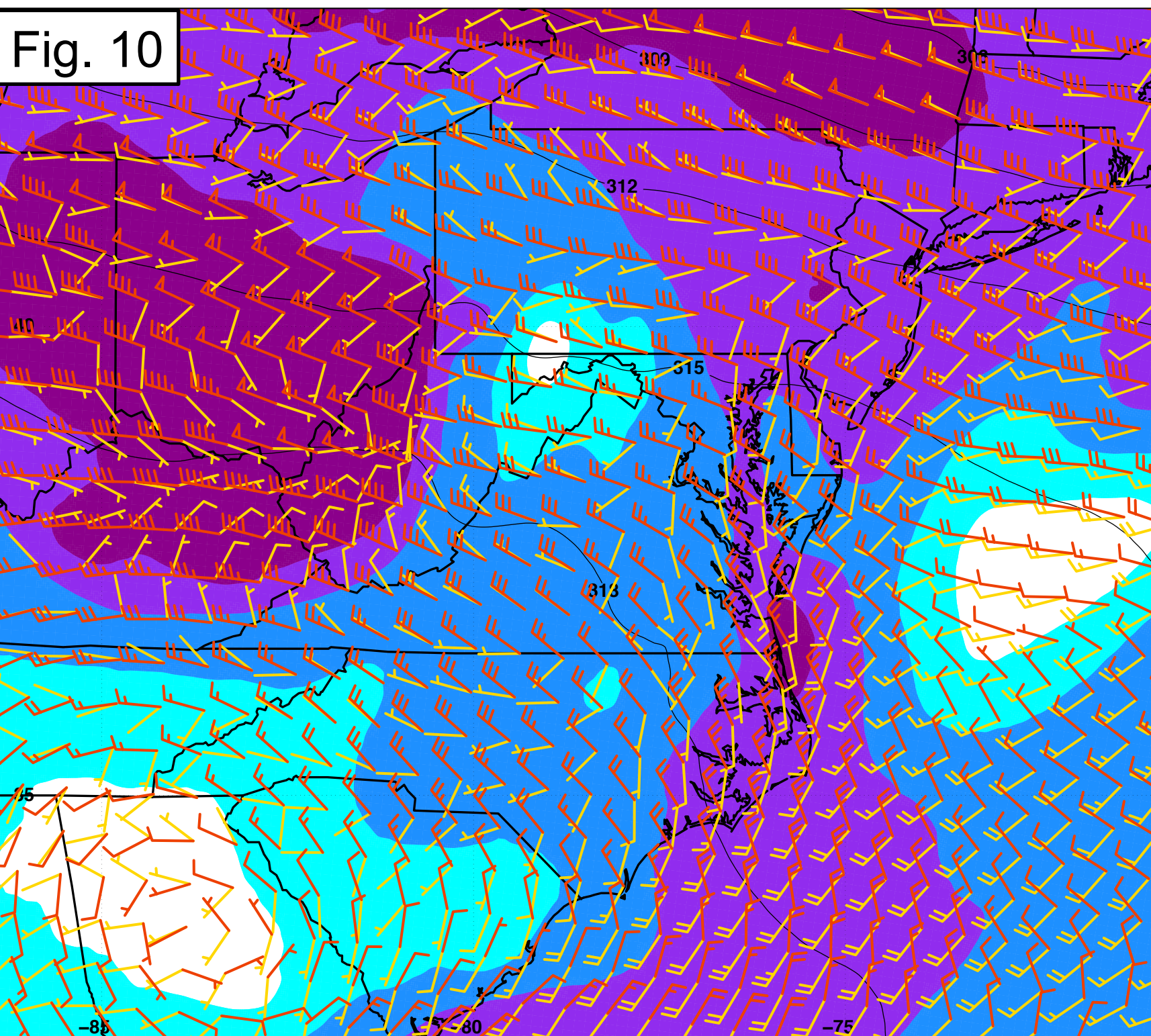
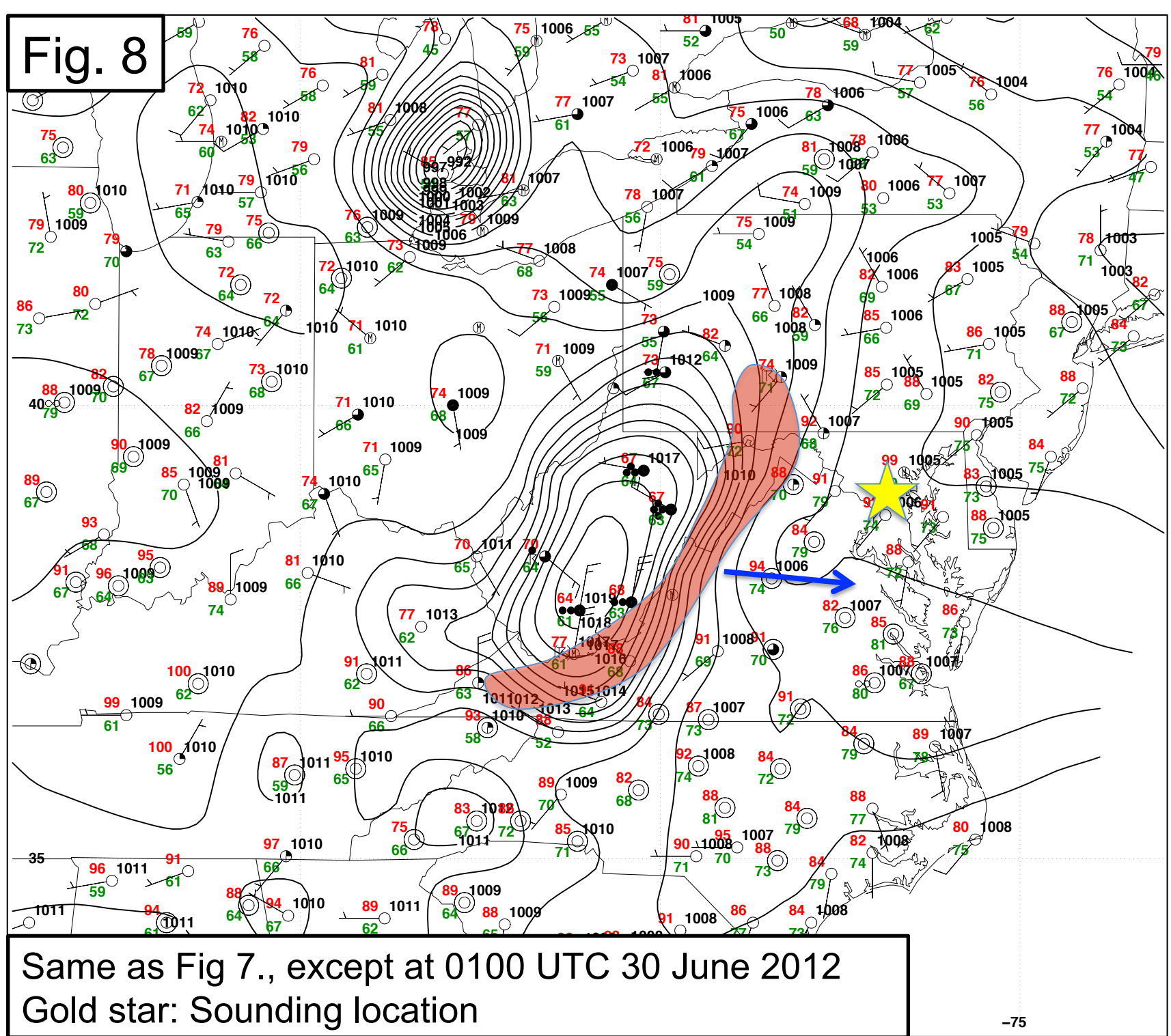
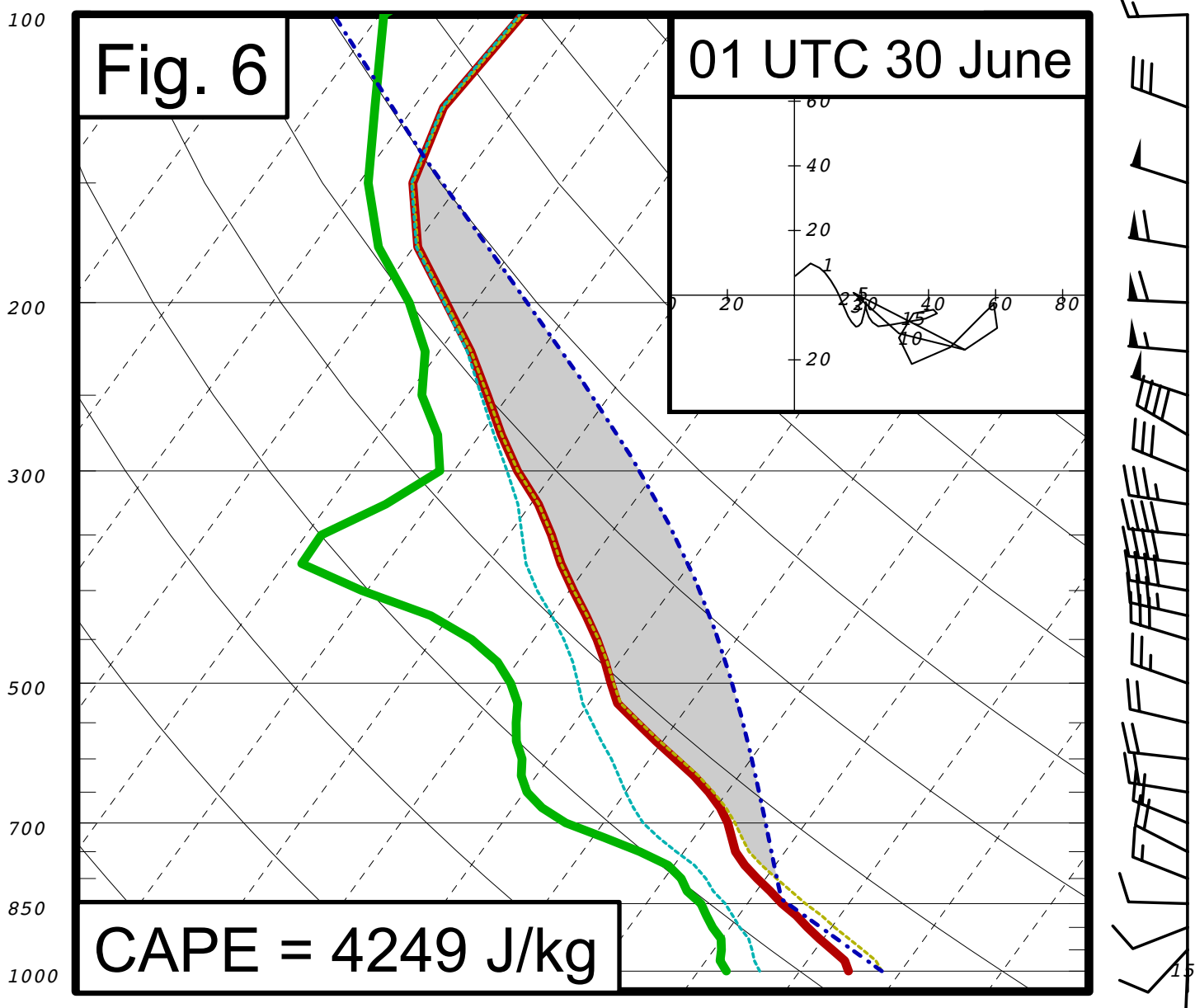


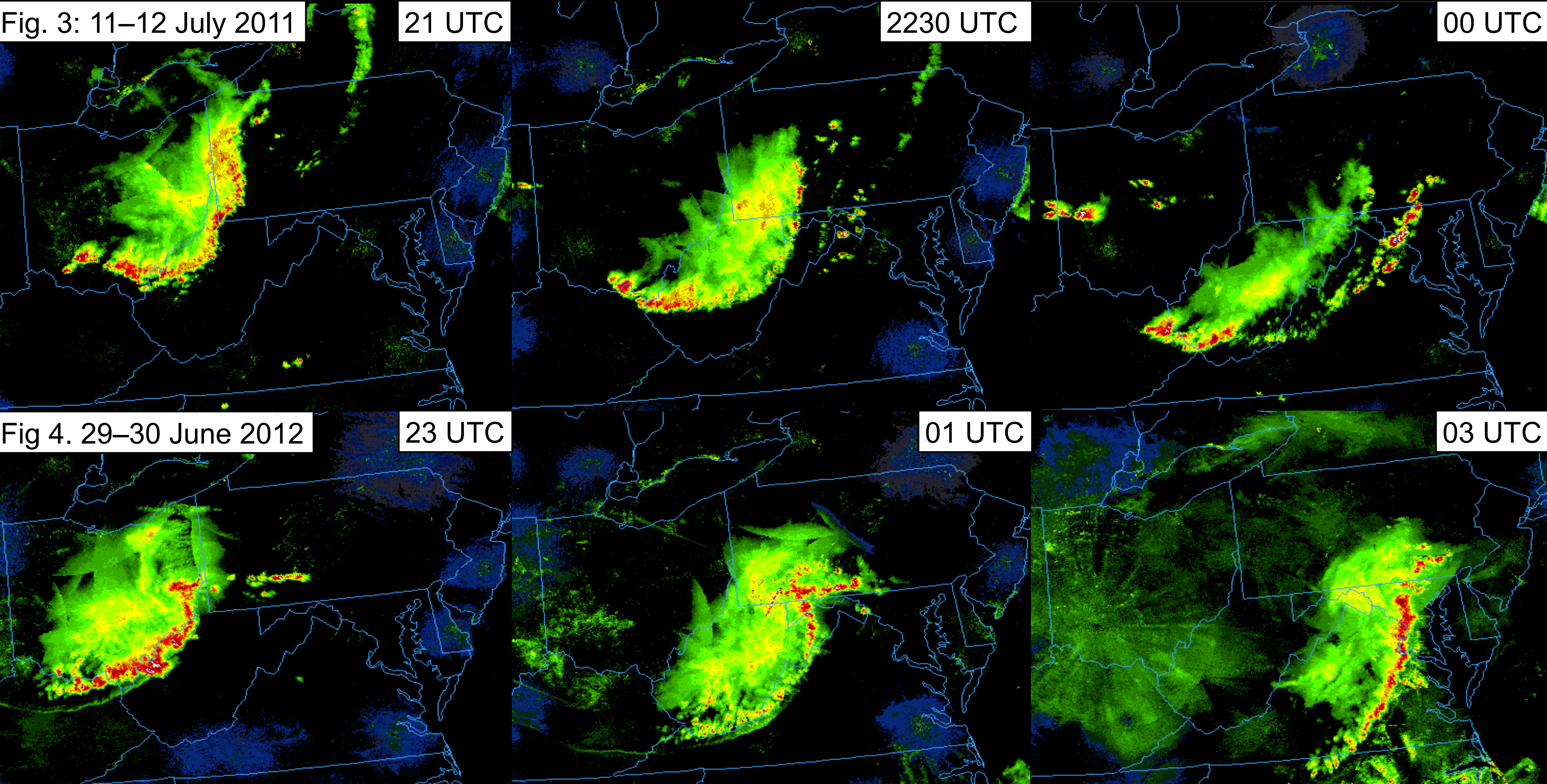
Fig. 9: 1000-hPa to 500-hPa shear magnitude (knots, color fill), 700-hPa height (black contours), 1000-hPa wind (yellow barbs), and 500 hPa wind (orange barbs) for 0000 UTC 12 July 2011.

Fig. 10: Same as Fig. 9, except for 0100 UTC 30 June 2012.

## June 2012



## Radar Comparisons:



- The derecho on 11 July 2011 approached the Appalachians by 2100 UTC, interacted with elevated terrain by 2230 UTC, and considerably weakened by 0000 UTC 12 July (Fig. 3).
- The 29 June 2012 derecho approached the Appalachians by 2300 UTC. It interacted with the mountains and weakened slightly by 0100 UTC 30 June. By 0300 UTC, the derecho re-intensified in the lee of the mountains and progressed to the coast (Fig. 4).

## Summary:

### Similarities:

- Strong anticyclone to the southwest of the region
- Mid-tropospheric flow perpendicular to the Appalachians provided for development of a lee trough
- Extremely unstable airmasses lee of Appalachians
- Derecho traversed similar paths
- Presence of the Appalachian lee trough enhanced convergence along trough axis and southerly flow to the east of the trough axis

### Differences:

- Mid-level shear axis was slightly stronger in 29 June 2012 case
- Closer proximity of the jet stream provided for stronger and more unidirectional wind shear on 29 June 2012
- Lee trough developed much earlier in the day on 29 June 2012
- Cold pool of 29 June 2012 derecho was significantly stronger (higher SLP perturbation in cold pool)

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