Elevation-Induced Cold Pocket around Spencer, Indiana

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The choice for this particular exercise is to document the elevation-induced cool pocket located SW of Indianapolis. The chosen location of focus is the town of Spencer, Indiana in the east-central portion of Owen County.

The average annual and monthly temperature minimums at Spencer, for the years 1971 to 2000, were compared with five other observation sites located 25 to 80 miles, NNW to NE of Spencer. Those sites include Greencastle 1W, Whitestown, Frankfort, the Lafayette airport, and the Indianapolis International Airport. Even though these sites are north, some well north, of Spencer…the average temperature minimums at the Spencer site read lower than those sites further north. Now, a bit of background on the Spencer area may help illustrate why this occurs. Spencer is located on the NE border of an area of lower elevations across the southwest portion of our CWA. At 550 feet in elevation, the town is also located within the White River valley.

Table 1. Location Information and Average Annual Minimum Temperatures for Sites Compared

Location	Lat/Lon (Deg.)	Elevation (ft)	Miles @ Dir. from Spencer	Avg. Annual Minimum Temp
Spencer	39.284, -86.770	550	N/A	39.8
Greencastle 1W	39.644, -86.877	735	25.5 @ 347 deg	42.5
Indianapolis AP	39.720, -86.289	779	39.6 @ 040 deg	43.0
Whitestown	39.996, -86.354	948	53.9 @ 024 deg	40.8
Frankfort	40.299, -86.507	824	71.3 @ 011 deg	40.8
Lafayette AP	40.412, -86.948	596	78.4 @ 353 deg	41.5

While comparing the different sites, Spencer proved to have lower average monthly minimums across the board, except in January when compared to observations at Whitestown and the Lafayette airport. Further investigation showed that this local phenomenon has a seasonal component as well. While it still occurs in the winter months, it is not as prevalent as in the other seasons. The main synoptic pattern that allows this feature to develop occurs when the area is under the influence of a broad high-pressure regime with light winds and clear skies

allowing for stronger surface cooling at lower elevations. Unfortunately, model guidance does not seem to have enough resolution to fully depict this feature and under certain conditions, this cool pocket affects our temperature grids and would need to be accounted for. It would also be beneficial to have a handle on during frost and freeze situations as well as fog events, provided there was moisture available and other ingredients came in line. Be sure to keep this climatologically-cool location in mind when forecasting lows in the area.

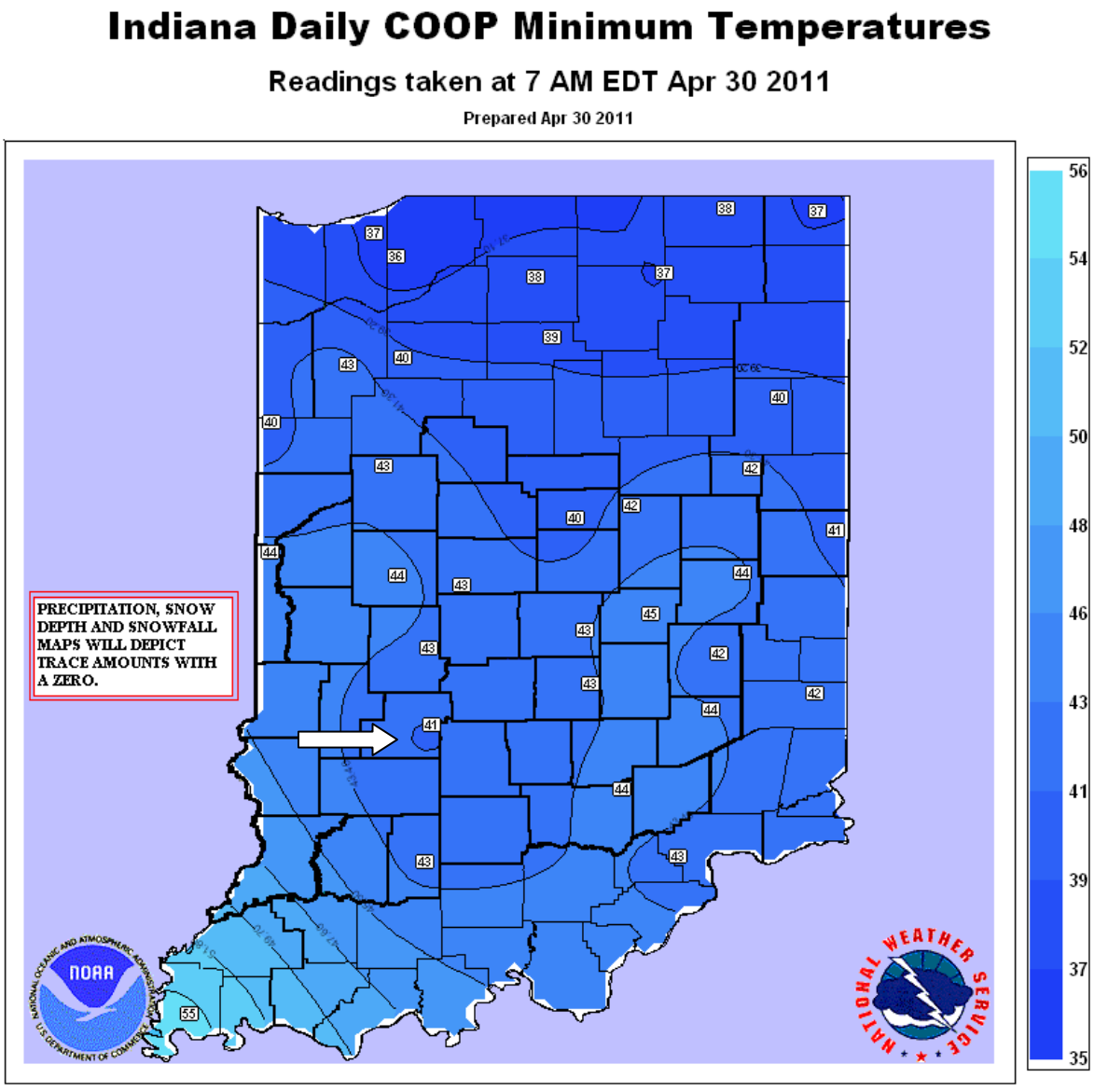

Figure 1. COOP map showing the Spencer cold pocket of a 41 degree minimum marked by the white arrow.