Eastern United States Warm Episode of 11-12 January 2017

By
Richard H. Grumm
National Weather Service State College, PA

1. Overview

A large ridge of the southern United States (Fig.1) with +1 to +2σ 500 hPa height anomalies brought period of warm weather to much of the eastern United States from 11 to 13 January 2017. During this period of time about 809 maximum temperature records were set or tied and 540 maximum low temperature records were set or tied (Table 1). The warmest day over much of the Mid-Atlantic region was 12 January 2017 when temperatures peaked in the 60s over much of Pennsylvania and Maryland (not shown).

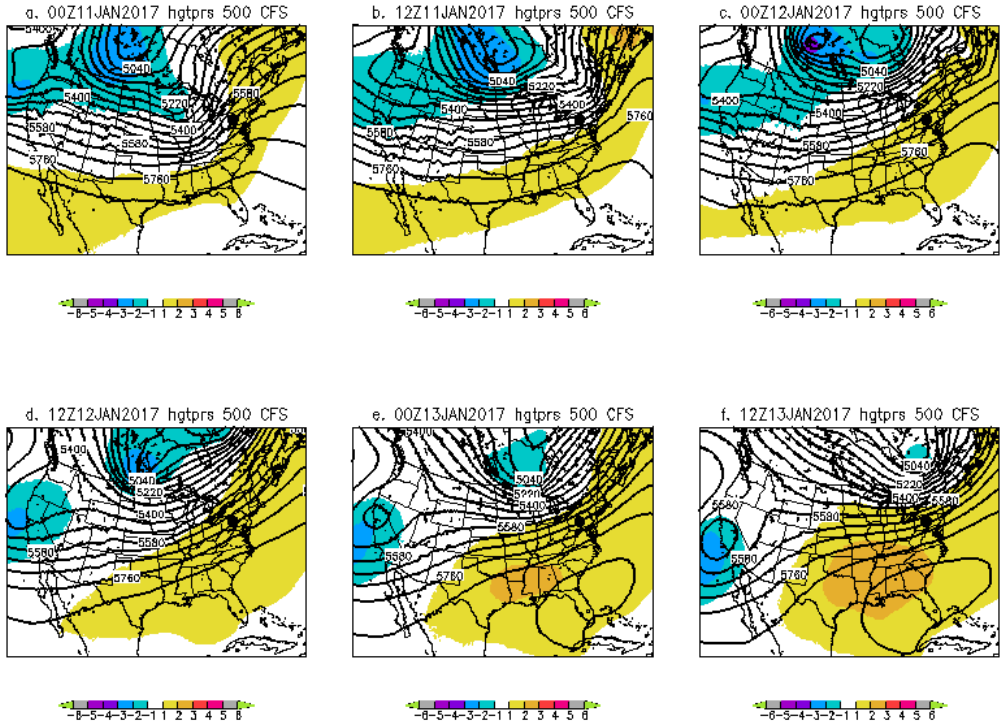

Figure 1. The CFSV2 500 hPa height pattern (m) over the United States and the 500 hPa height anomalies (shaded) from a) 0000 UTC 11 through f) 1200 UTC 13 January 2017. Heights are every 60 m.

The warm moist air produced a localized severe weather event on 12 January as a cold front moved through the region. There were 17 reports of wind damage in eastern Ohio and western Pennsylvania with the frontal system (Fig. 2).

Date	Max	Temp	Only	Max-min	temps	
	Tied	Broken	Total	Broken	Tied	Total
11-Jan-17	46	106	152	48	92	140
12-Jan-17	90	263	353	46	162	208
13-Jan-17	72	182	254	39	107	146
14-Jan-17	19	31	50	14	32	46
Totals	227	582	809	147	393	540

Table 1. Record Maximum and record high minimum temperatures set from 11 to 14 January 2017. Date from the NCEI website.

The warmest day over the Mid-Atlantic region was the 12th of January ahead of the cold front. There was a surge of high precipitable air ahead of the front (Fig. 3c) and the 850 hPa temperatures were well above 0C and were +1 to +2σ above normal over much of the eastern United States with the highest standardized anomalies over the northeastern United States.

The CFSR 2m temperatures Fig. 4) showed the warm air over the Mid-Atlantic region at 1800 UTC 12 January. The 18C contour covered most of eastern Virginia, Maryland, and the DC metropolitan area. The 12C contour extended across central Pennsylvania. Temperatures above 20C were present in southeastern Virginia and northeastern North Carolina. These two regions had received 4 to 14 inches of snow just 5 days earlier.

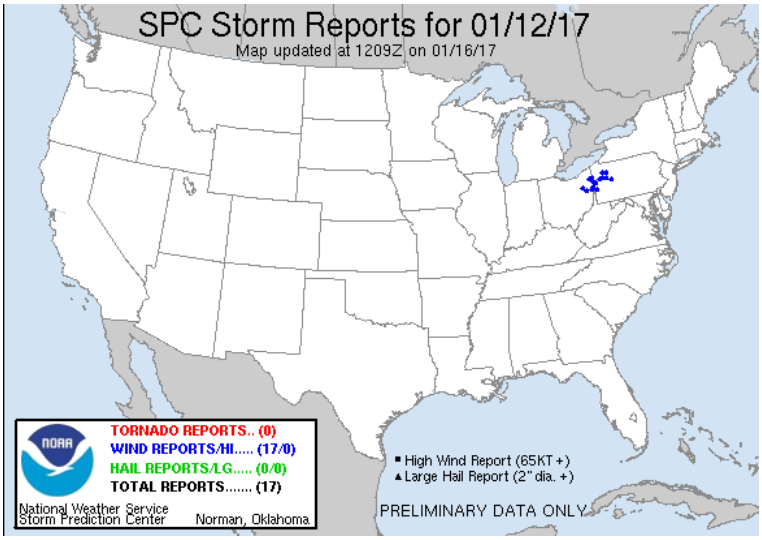

Figure 2. Storm reports for 12 January by type from the Storm Prediction Center website.

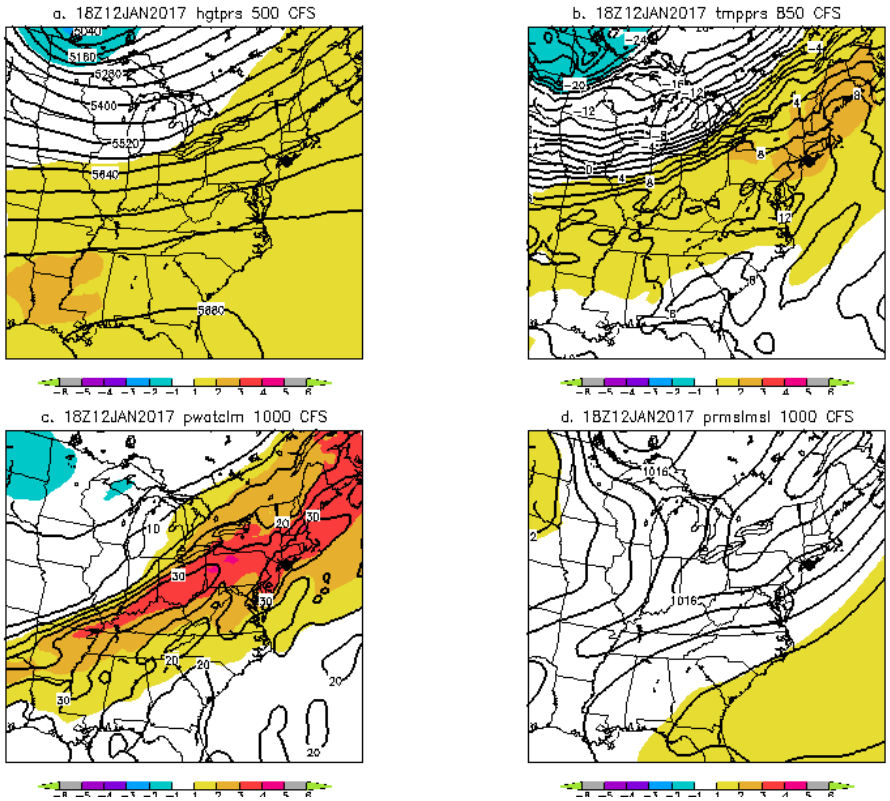

Figure 3. CFSRV2 analysis with standardized anomalies showing conditions at 1800 UTC 12 January 2017 parameters include the a) 500 hPa heights, b) 850 hPa temperatures, c) precipitable water, and the mean sea-level pressure.

The cold front and drier air moved into Pennsylvania during the late afternoon and evening hours of 12 January. In the warm moist air over western Pennsylvania the front trigged showers and thunderstorms. As shown in Figure 2 these thunderstorms produced damaging winds in portions of eastern Ohio and western Pennsylvania. The relatively cooler air in the mountains likely limited the eastern extent of the severe weather.

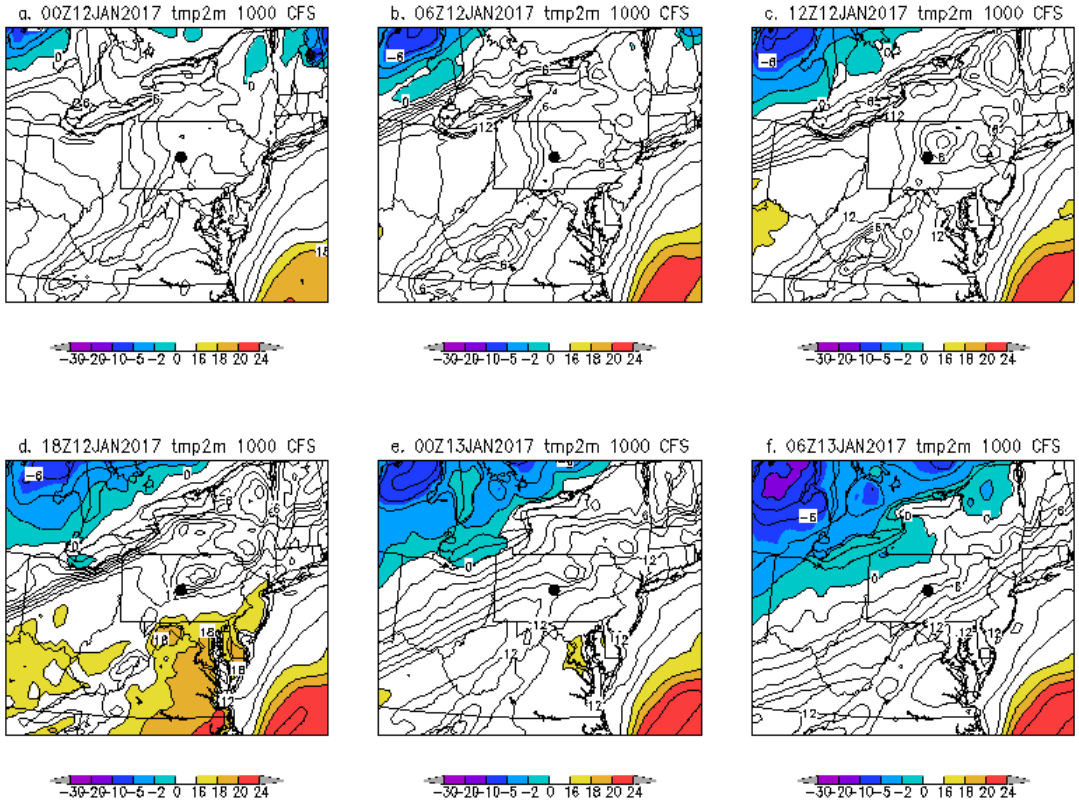

Figure 4. As in Figure 3 except for the CFSR 850 hPa temperatures in 6-hour increments from a) 0000 UTC 12 January through f) 0600 UTC 13 January 2017. Black dot is the approximate location of State College.

The HRRR with 3km resolution showed the warm air over the Mid-Atlantic region from 1500 UTC to 2000 UTC 12 January (Fig. 5). These data show the large areas where the 2m temperatures exceeded 20C (red) and 16C (yellow). Despite a general lack of record highs temperatures in many locations were 20 to 30C above normal.

These data show that combination of a sharp 500 hPa ridge in the southeastern United States, a surge of high PW air and above normal 850 hPa temperatures produced a very warm day in the eastern United States on 12 January. The overall pattern produced 4 successive days where the high and overnight low temperatures were much above normal (Table 1). This was a relatively short-lived warm up which was well predicted by the NCEP GEFS and GFS (not shown). The warm moist air west of the mountains produced a relatively rare mid-January severe weather

event in Ohio and Pennsylvania (Fig. 2). As this event was unfolding the GEFS was forecasting a potentially more interesting and enduring warm episode for the eastern United States.

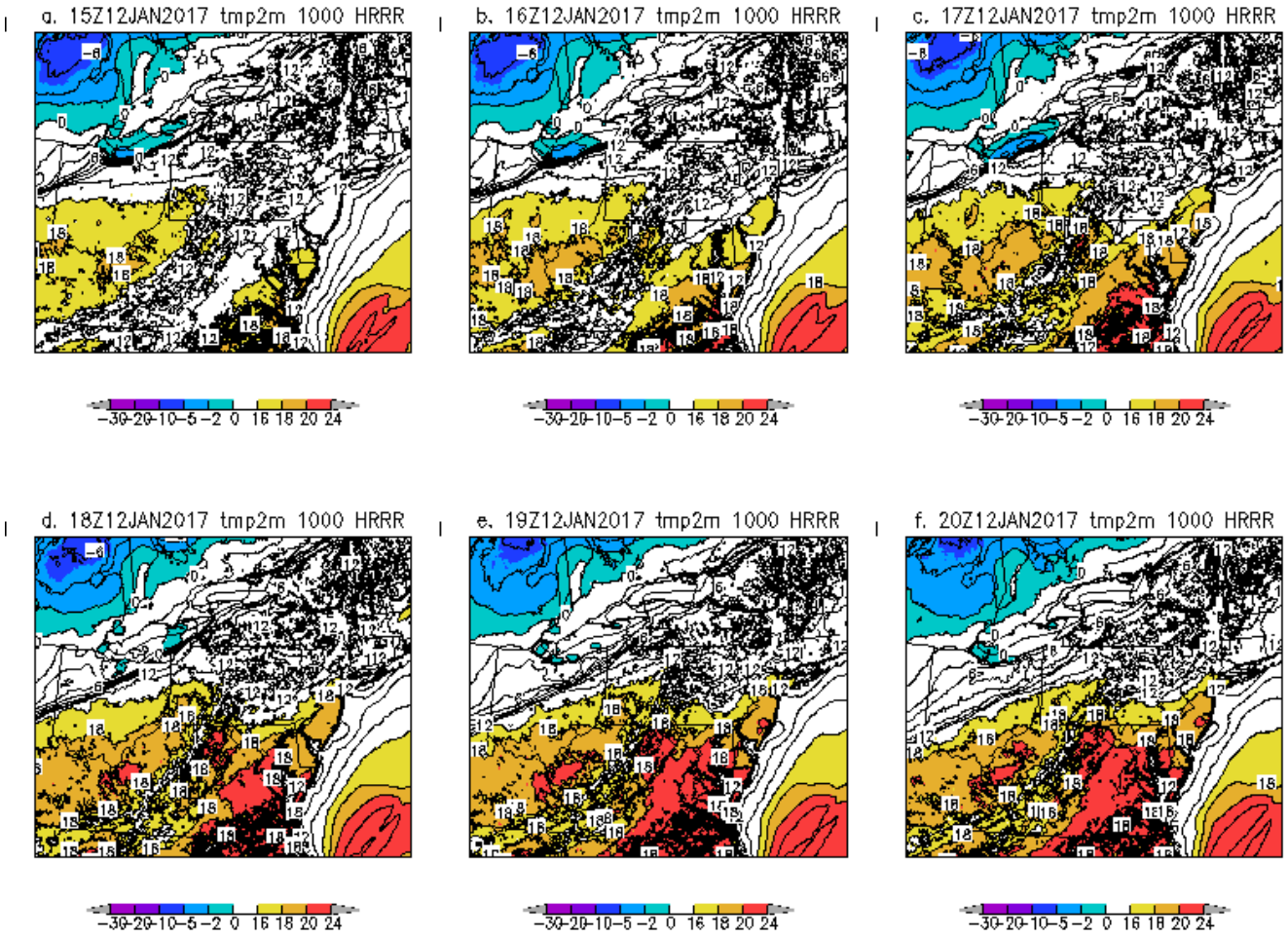

Figure 5. As in Figure 4 except for the 3km HRRR 2m temperatures over the mid-Atlantic region in 1 hour increments from a) 1500 UTC 12 January through f) 2000 UTC 12 January 2017.