2007 Climate Summary
A year in Review

ISSUED BY THE NATIONAL WEATHER SERVICE
GRAND RAPIDS MI

By William Marino

By far the most prominent aspect of 2007 in Southwest Lower Michigan was continued warm weather, which began during the summer of 2005 and continued unabated through 2007. Except for February, every month of 2007 was warmer than normal. Table 1 shows normal temperatures at each of three selected sites in Southwest Lower Michigan. Table 2 shows that 2007 was warmer and drier than normal at all three sites.

NORMALS	GRAND RAPIDS	MUSKEGON	LANSING
HIGH:	56.3°	55.8°	56.9°
LOW:	38.45°	38.3°	36.7°
MEAN:	47.6°	47.1°	46.8°
PRECIPITATION:	37.13″	32.88″	31.53″
SNOWFALL:	72.2″	105.5″	54.5″

Table 1. Yearly normals for Grand Rapids, Muskegon and Lansing

2007 Data	GRAND RAPIDS	MUSKEGON	LANSING
AVG HIGH:	59.3°	57.5°	57.9°
Departure from Normal	+2.4°	+1.7°	+1.0°
AVG LOW:	41.0°	40.8°	39.5°
Departure from Normal	+2.6°	+2.5°	+2.8°
AVG MEAN:	50.2°	49.2°	48.7°
Departure from Normal	+2.6°	+2.5°	+1.9°
PRECIPITATION:	32.78″	28.67″	31.35″
Departure from Normal	-4.35″	-4.21″	-0.18″
SNOWFALL:	97.2″	93.4″	44.9″
Departure from Normal	+25.0″	-12.1″	-9.6″

Table 2. 2007 departures from normals for Grand Rapids, Lansing and Muskegon.

For all of southwest Michigan, 2007 was the **12th warmest** year since 1895 (past 113 years). In fact **7** of the past **10** years are in **the top 20 warmest** on record.

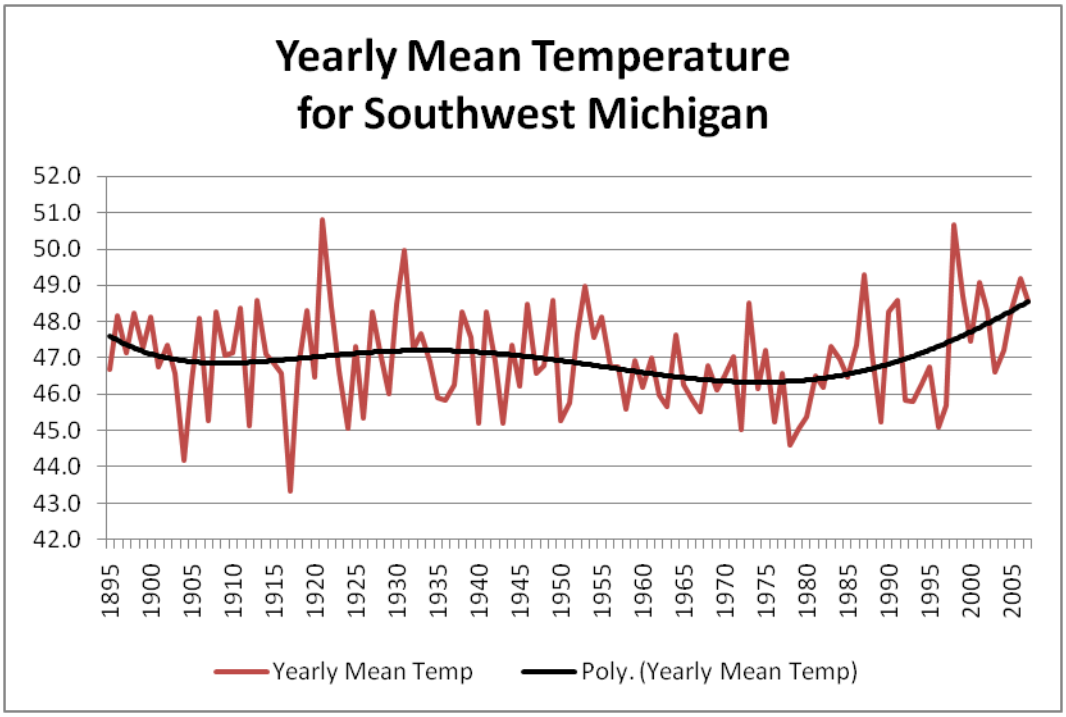

Fig. 1. Yearly Mean Temperature from 1895 through 2007. A trend line was added to show the warming after 1985. This chart uses all of the long term climates stations in Southwest Michigan.

Figure 1 shows that the last 6 years of the temperature record, using the trend line, are the warmest on record. This is not the average of a few climate stations, but for all of the long term climate stations, in all 23 counties of southwest Michigan back to 1895. This makes these results fairly robust.

Temperature trends continued to be above normal. This has continued since the summer of 2005 (excluding the fall of 2006, which was normal). Thus, eleven of the past twelve seasons were warmer than normal. This trend can be seen in Figs. 4, 7, 9, 11, and 13. (winter, spring, summer, fall, and annual, respectively).

Precipitation for 2007

Figure 2 shows the area averaged annual precipitation across all of Southwest Lower Michigan. There is a general upward trend since records began in 1895. This past year, 2007 had an area averaged 34.25 inches. That was well within the normal climatic range for total yearly precipitation, based on the 1971 to 2000 normal period. While the 34.25 inches was within the normal climate range, it was 7 inches less than the 2006 total of 41.34 inches. That year, 2006, was the second wettest year on record for Southwest Lower Michigan, using the area averaged precipitation.

Looking at the seasonal departure from the mean charts for precipitation, it can be seen that the winter, which had a prominence of lake effect snowfall during the winter of 2006/2007, was wetter than normal near the Lake Michigan shore (Fig. 5). This also can be seen in the snowfall anomalies chart (Fig. 6). The above normal snowfall on the west side of Lake Michigan is likely due to the track of synoptic storms that remained west and north of Southwest Lower Michigan.

In Fig. 7, it can be seen that spring precipitation was wetter than normal across Southwest Lower Michigan. This was the only season wetter than normal in 2007. Summer and Fall show drier than normal precipitation prevailed through the last half of 2007 (Figs. 10 and 11). Given that most of Southwest Lower Michigan was dry during the winter, summer and fall, it is no surprise that the yearly precipitation departure from normal showed conditions to be drier than normal (Fig. 11).

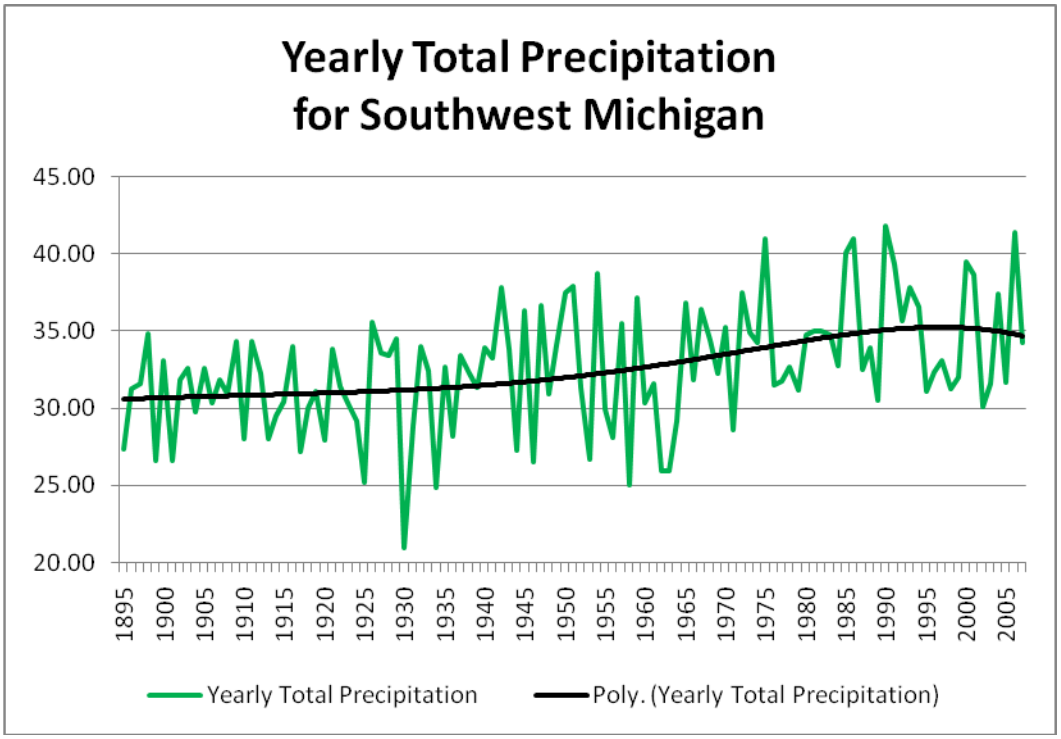

Fig 2. Yearly total precipitation based on the average of all long term climate stations total yearly precipitation. Note the trend line shows the last 20 years being the wettest period for the 113 years of data.

Figure 2 shows a general trend toward wetter years, with the most significant rise occurring between 1940 and 1990. Since 1990, the trend has leveled off. Even so, this does show that even with overall trend of falling Great Lakes water levels, precipitation has been mostly wetter during the past 15 to 20 years than prior to that. Figures 10 and 11 (summer and fall, respectively) show below normal precipitation across Southwest Lower Michigan. Finally the yearly departure from normal (Fig. 14), shows below normal precipitation prevailed north of Interstate 96 and above normal precipitation prevailed near and south of Interstate 94. Thus, the near normal area precipitation for

2007 came from averaging the wetter southern stations with the drier northern stations. It is worth noting here that all three stations in Table 2 are near Interstate 96, and similarly show below normal precipitation.

Snowfall for 2007

Snowfall for the first half of 2007 was driven mostly by clipper enhanced lake effect snowfalls, which resulted in above normal snowfall near and west of US-131 (Figs. 17 and 18). During that time the El Nino Southern Oscillation (**ENSO**), was for the most part in the neutral phase.

During the fall of 2007 a moderate La Nina developed, and was enhanced by an unusually strong Madden Julian Oscillation (MJO; Fig. 3). This pattern was responsible for a persistent storm track from California through Lower Michigan during the fall of 2007. This contributed to the heavy snowfall inland of Lake Michigan (Figs. 18 and 19).

Yearly snowfall and departures from the mean were slightly greater than normal across nearly all of Southwest Lower Michigan (Figs. 15 and 16). More specifically, snowfall was above normal near the lake shore during the first half of 2007, then above normal inland during the second half of 2007 (not shown), largely due to very different weather patterns.

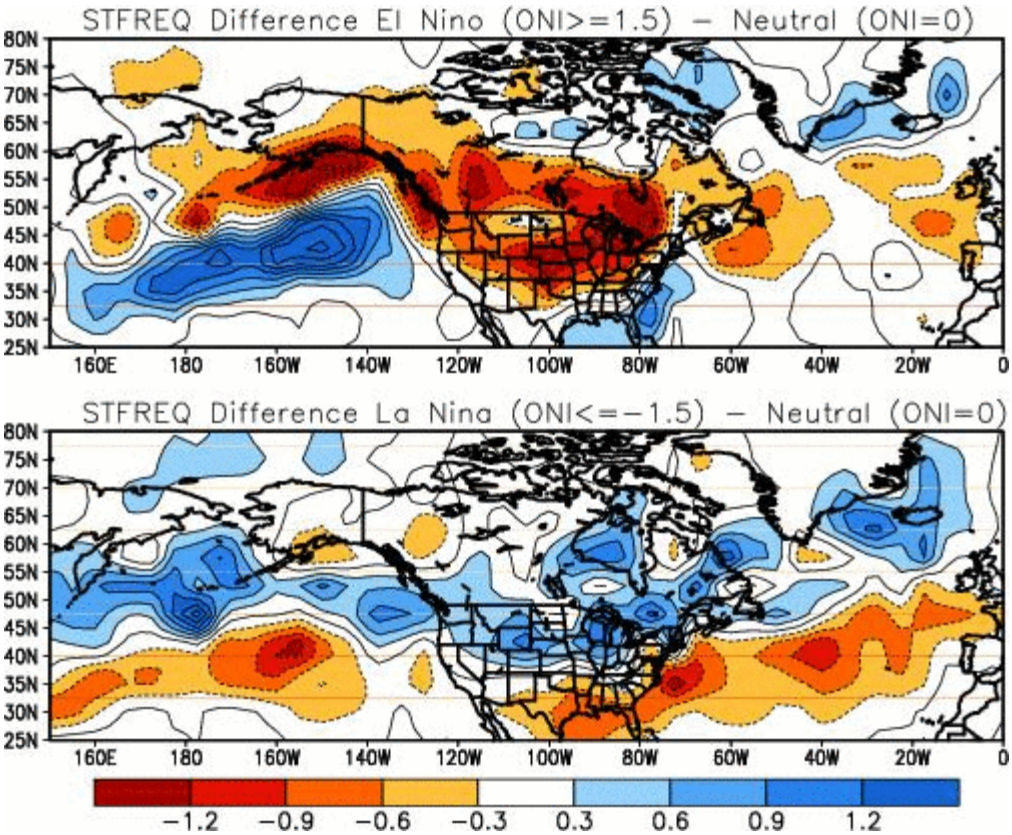

Figure 3 ENSO and Storm Track Change

This shows the changes in the preferred storm track compared to a Neutral ESNO. The top chart is for a moderate or stronger El Nino, the bottom chart is for a moderate to or greater La Nina. Note the cold colored areas are e enhanced storm track area while the warm colored areas show a decrease in the number of storms in that area. La Nina shifts the winter storm track toward the Great Lake while El Nino shifts it away from the Great Lakes.

Significant Storms of 2007

One aspect of 2007 was some memorable winter and summer storms. The year started with an unusually warm early January with below normal snowfall. However, that was not to last. Starting around the 25th of January, winter returned. A series of lake effect snow storms impacted Van Buren, Allegan, Ottawa and Kalamazoo Counties the last few days of January. After that 2 west flow lake effect events impacted areas near Grand Rapids. The second lake effect was a rare blizzard that lasted from the 2nd through the 4th. Wintry weather and very cold temperature, featuring highs of less than 10 above at times, made February 2007 unusually cold. For Grand Rapids, February 2007 was the second snowiest February on record (until February 2008 broke that record by 8 inches and is now the second snowiest February on record).

The snowy weather continued into April of 2007. An unusual late season snowstorm around the 11th of April deposited 4 to 6 inches of snow across most of southwest Michigan. Several late season daily snowfall records were set with that event.

The snowfall season of 2007/2008 began in November with a series of minor systems that for the most part deposited their snow near and north of Route 10. That pattern continued into the middle of December.

On the 15th of December the first big snow storm of the 2007/2008 season moved into Southwest Lower Michigan. That storm was the first storm of the season to deposit over 8 or more inches of snow on more than 6 counties (1/4 of the CWA). It was also the first snowstorm to bring a significant snowfall south of Route 10. The snow began falling around 7 PM on the 15th and ended by 5 PM on the 16th. The center of that storm passed south of Lower Michigan, but even with a rather far south track, all but the northwest sections of the Grand Rapid County Warning Area had over 6 inches of snow from that storm. Areas south of Interstate 94 had between 10 inches and a foot of snow. The next significant snow storm was a lake effect event that began on the afternoon of the 23rd, and then ended early in the morning on the 24th. Around 6 inches of snow fell over Kent County, with 3 to 5 inches of snow falling over a large part of the rest of southwest Lower Michigan.

The final significant snowstorm of 2007 began during the afternoon of the 31st and ended early in the morning of the 1st of January 2008. This was another synoptic system that put the heaviest snowfall over the southern counties of the GRR CWA. Near Jackson, 10 to 12 inches of snow fell. South of a line from Lansing to Kalamazoo, 6 to 10 inches of snow was reported.

While severe weather season got off to a very slow start, it finished with bang! The Eaton County EF3 tornado in August was the first F3 tornado in southwest Michigan since the Calhoun County tornado in March of 1991. Then, as if that were not enough for tornadoes, there was the first ever reported EF2 tornado in October, which occurred in Ingham County. One other interesting aspect about the October 18 Ingham County tornados was that it was the first multi-fatality tornado (killed more than one person) in Michigan since the Kalamazoo tornado of 1980.

Winter Anomalies Charts 2006/2007

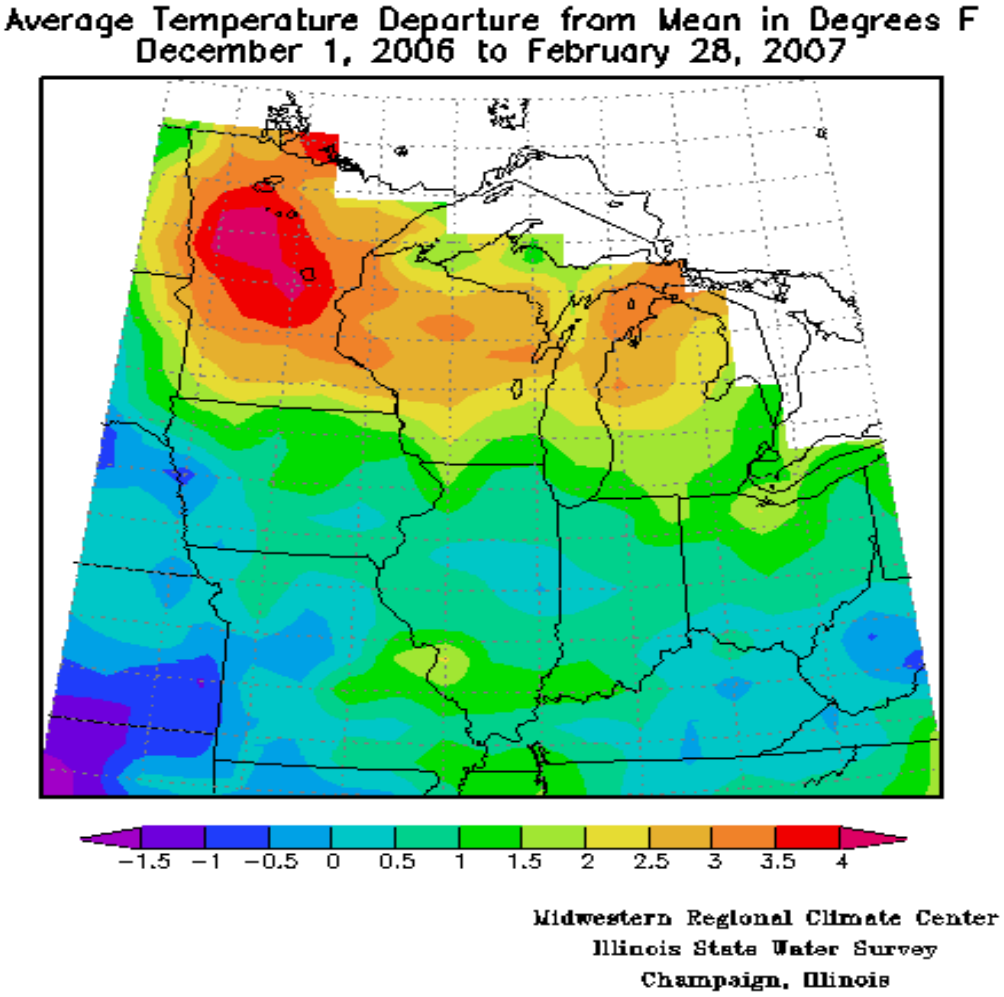

Fig. 4. The winter 2006-2007 temperature departure from the mean.

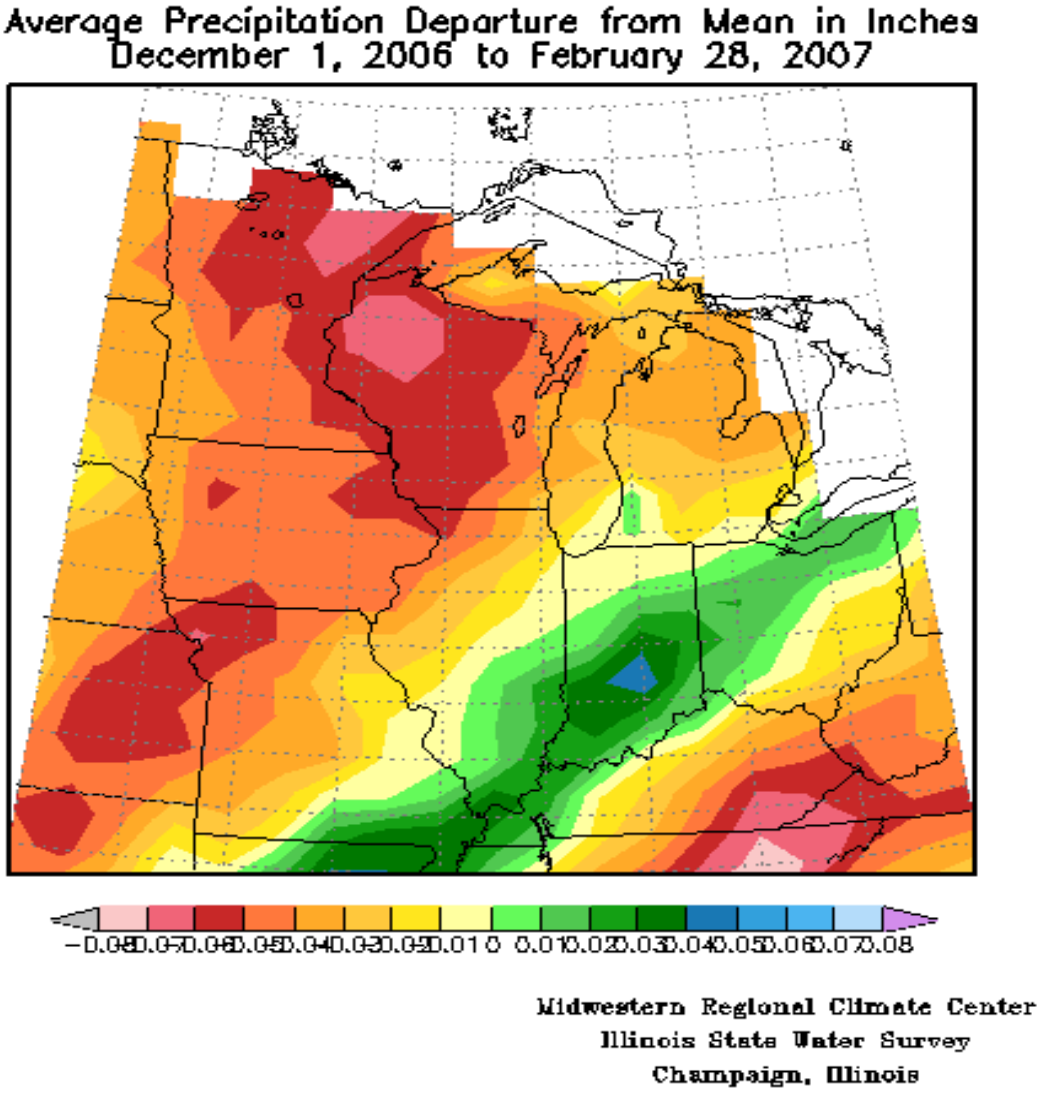

Fig. 5. The precipitation departure from the mean for 2007.

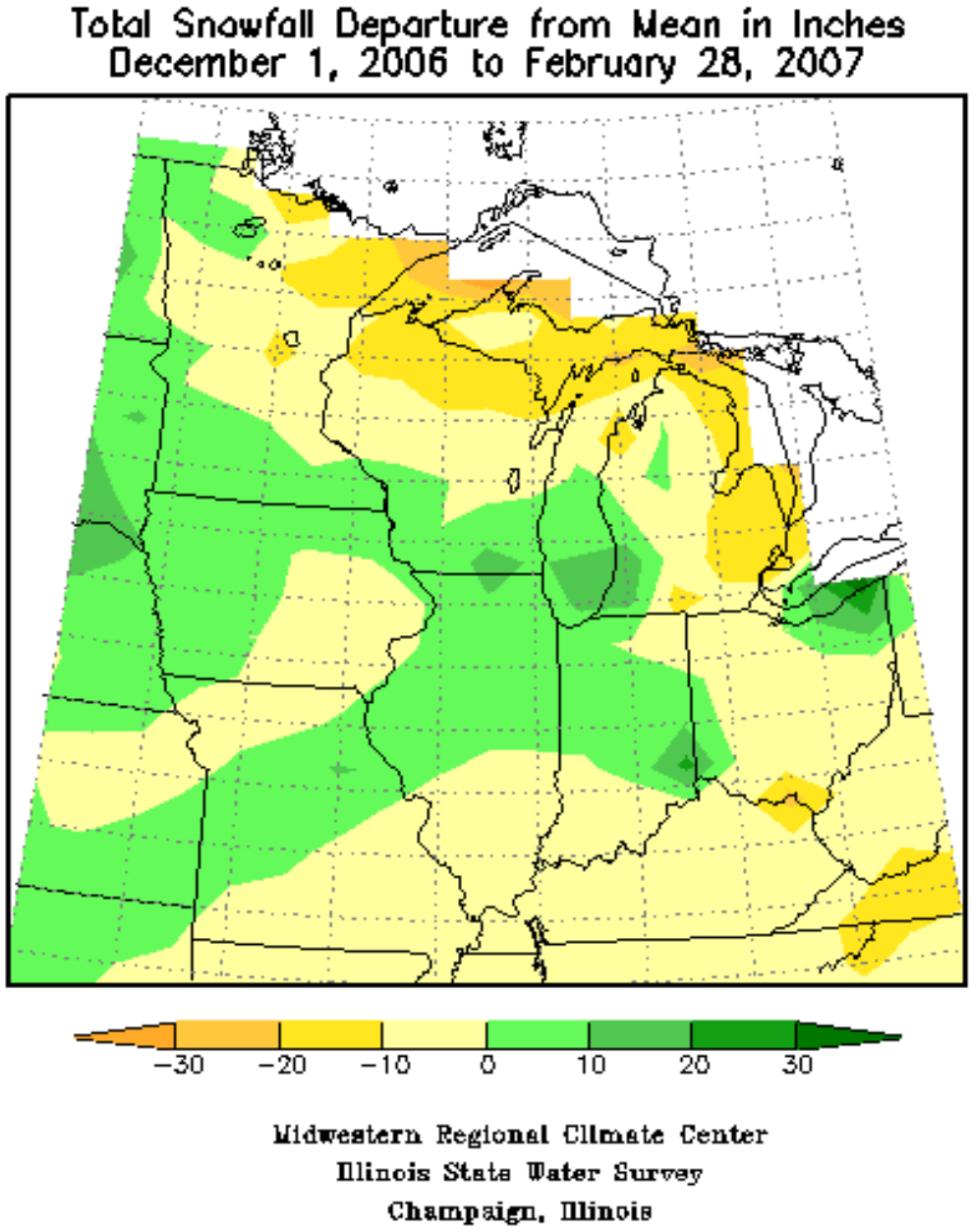

Fig. 6. The winter snowfall departure from mean for 2006/2007

Spring Anomalies Charts 2007

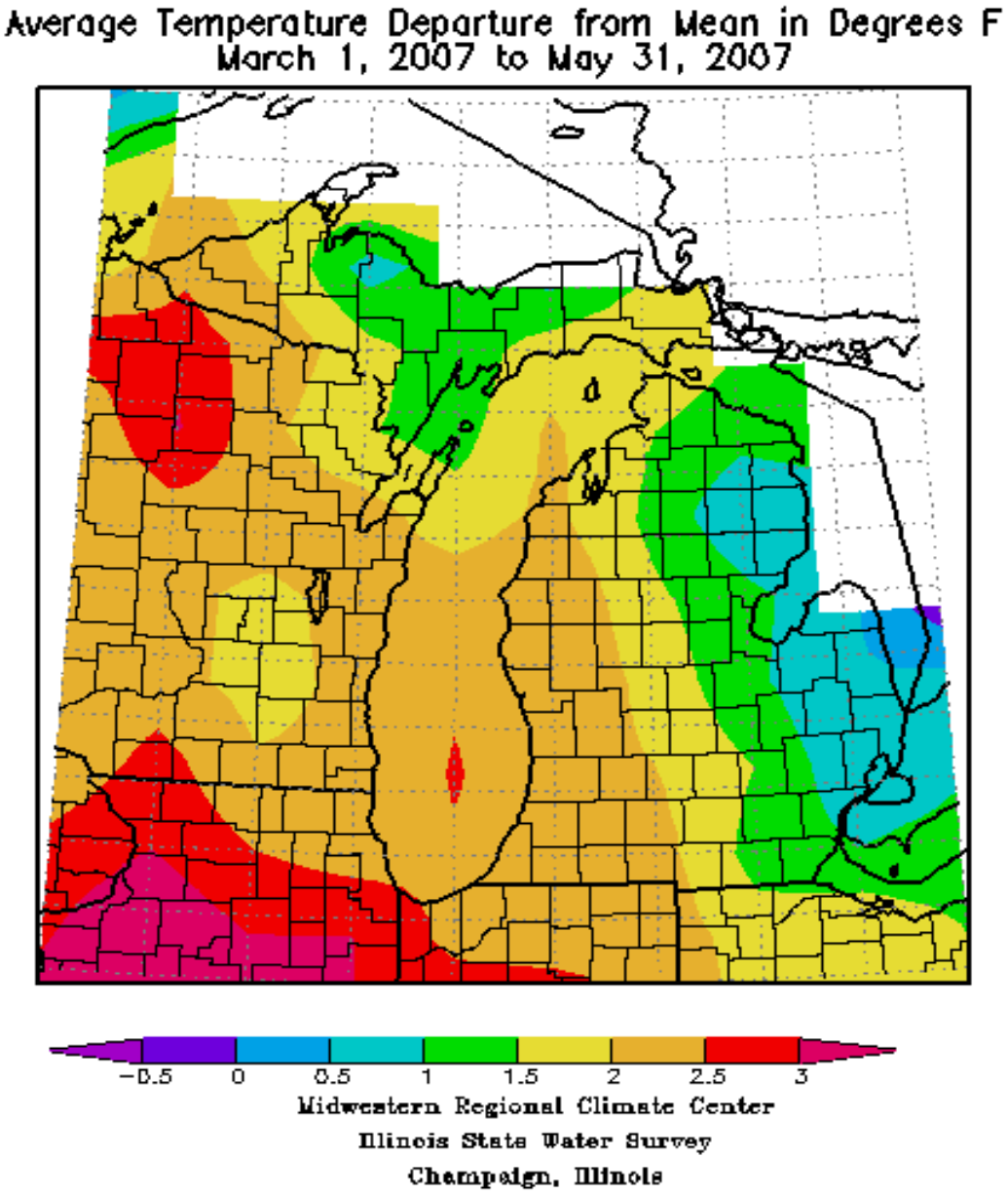

Fig. 7. The temperature anomaly for the spring of 2007.

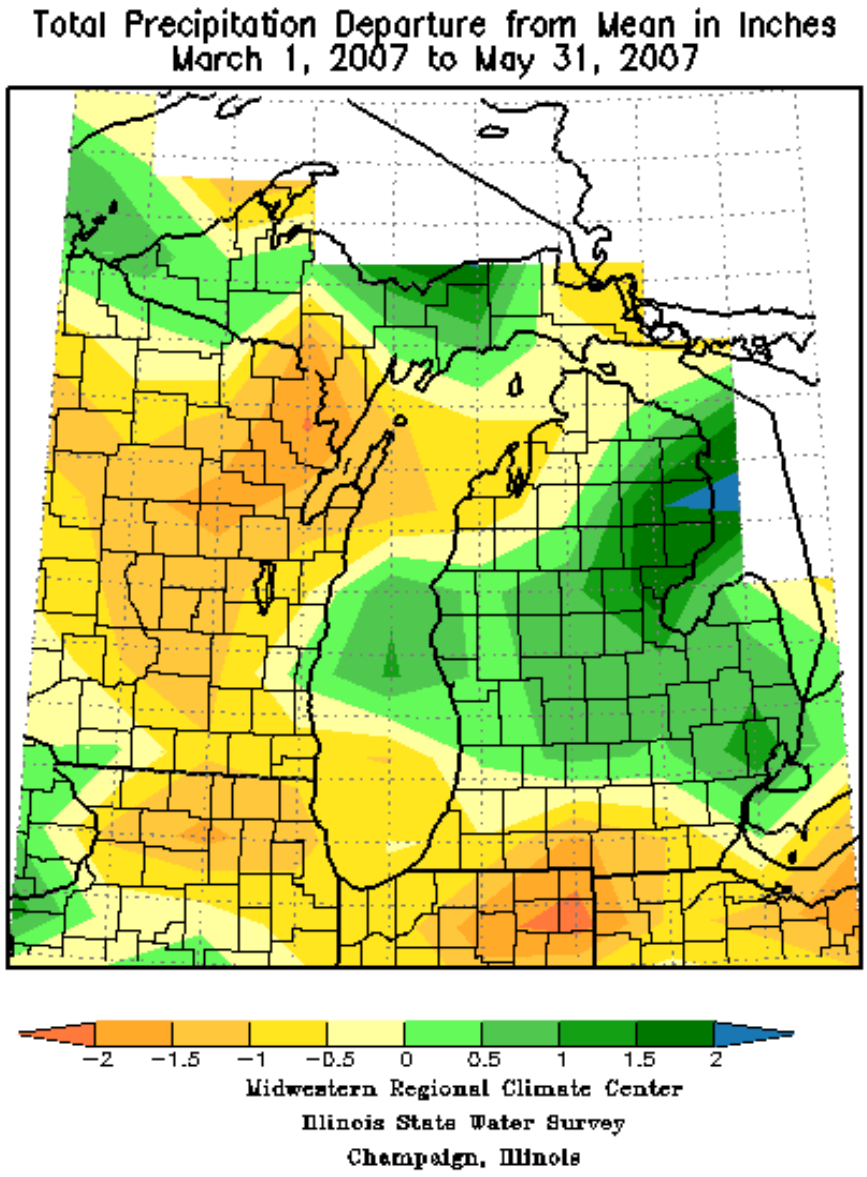

Fig. 8. The precipitation departure from the mean for the spring of 2007.

Summer Anomalies Charts 2007

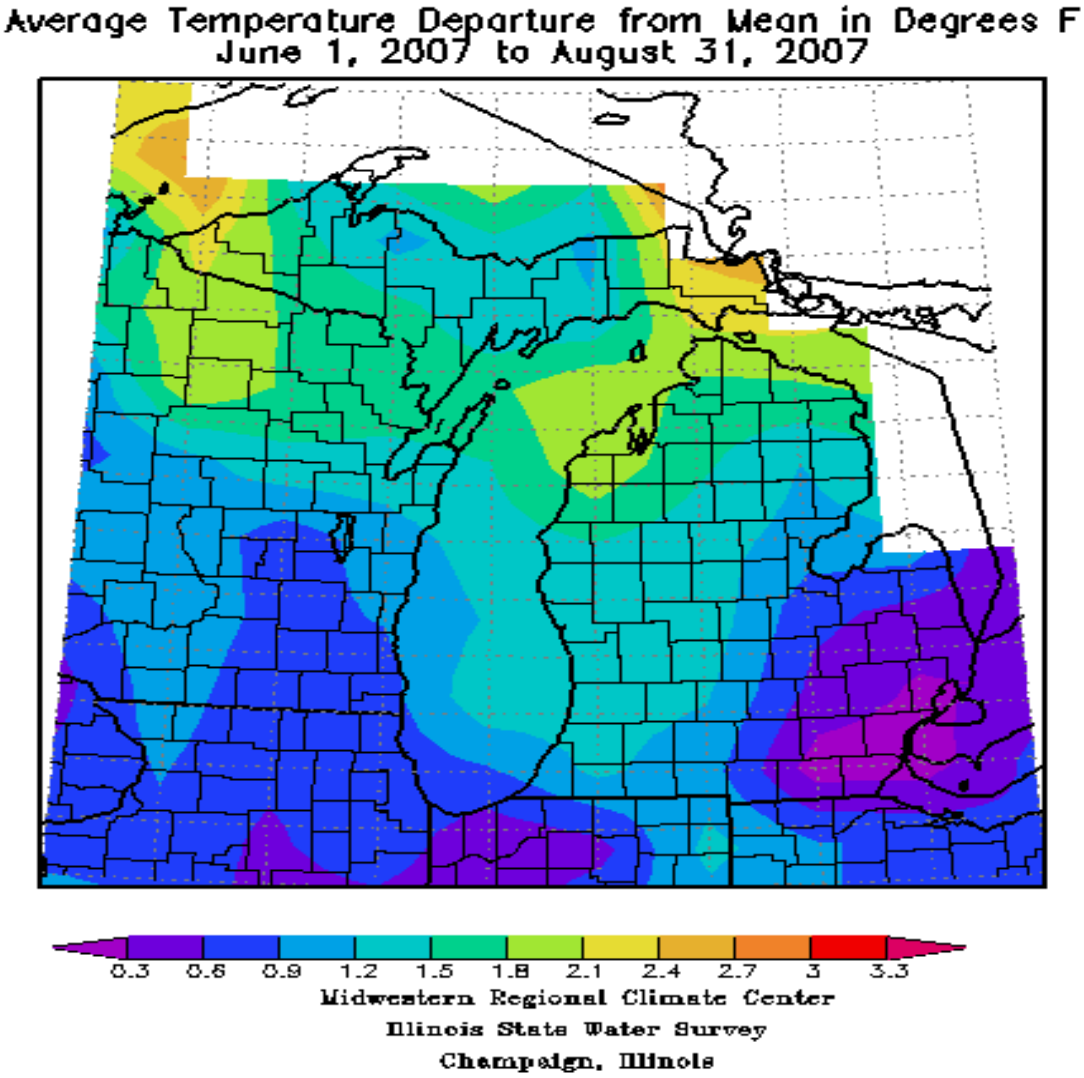

Fig. 9. Temperature departure from the mean for the summer of 2007.

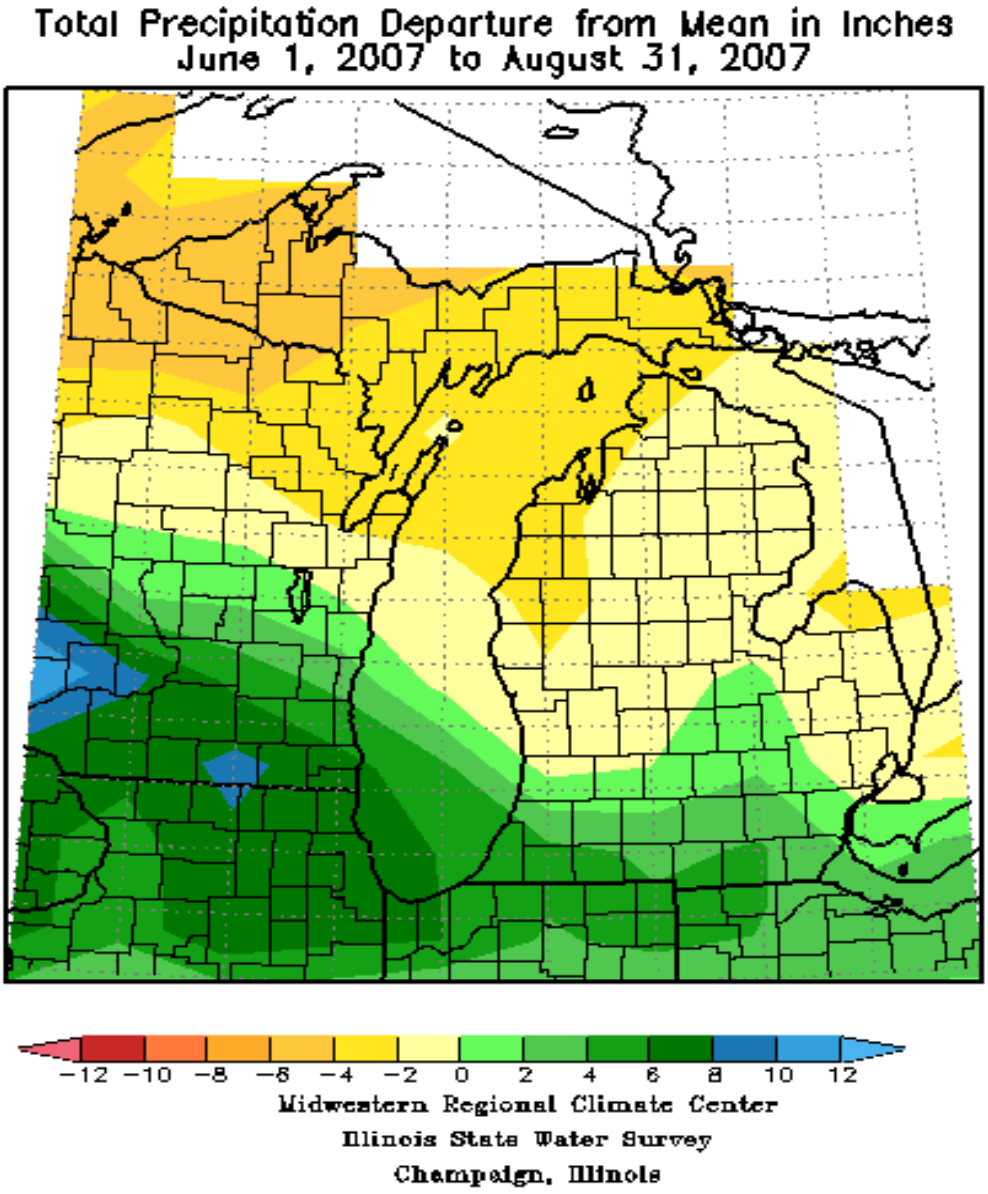

Fig. 10. The precipitation departure from the mean for the summer of 2007.

Fall Anomalies Charts 2007

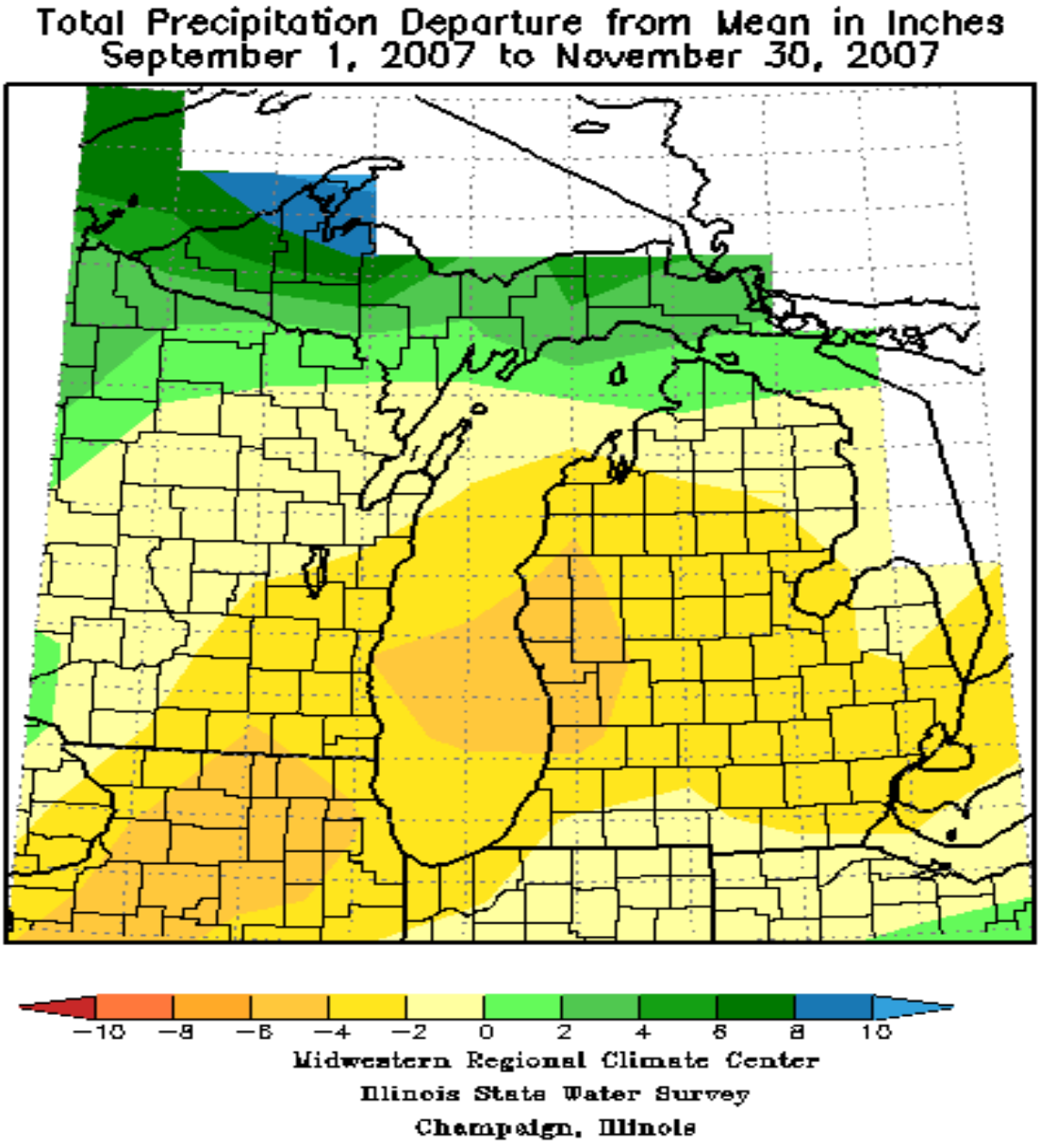

Fig. 11. The precipitation departure from the mean for the Fall of 2007.

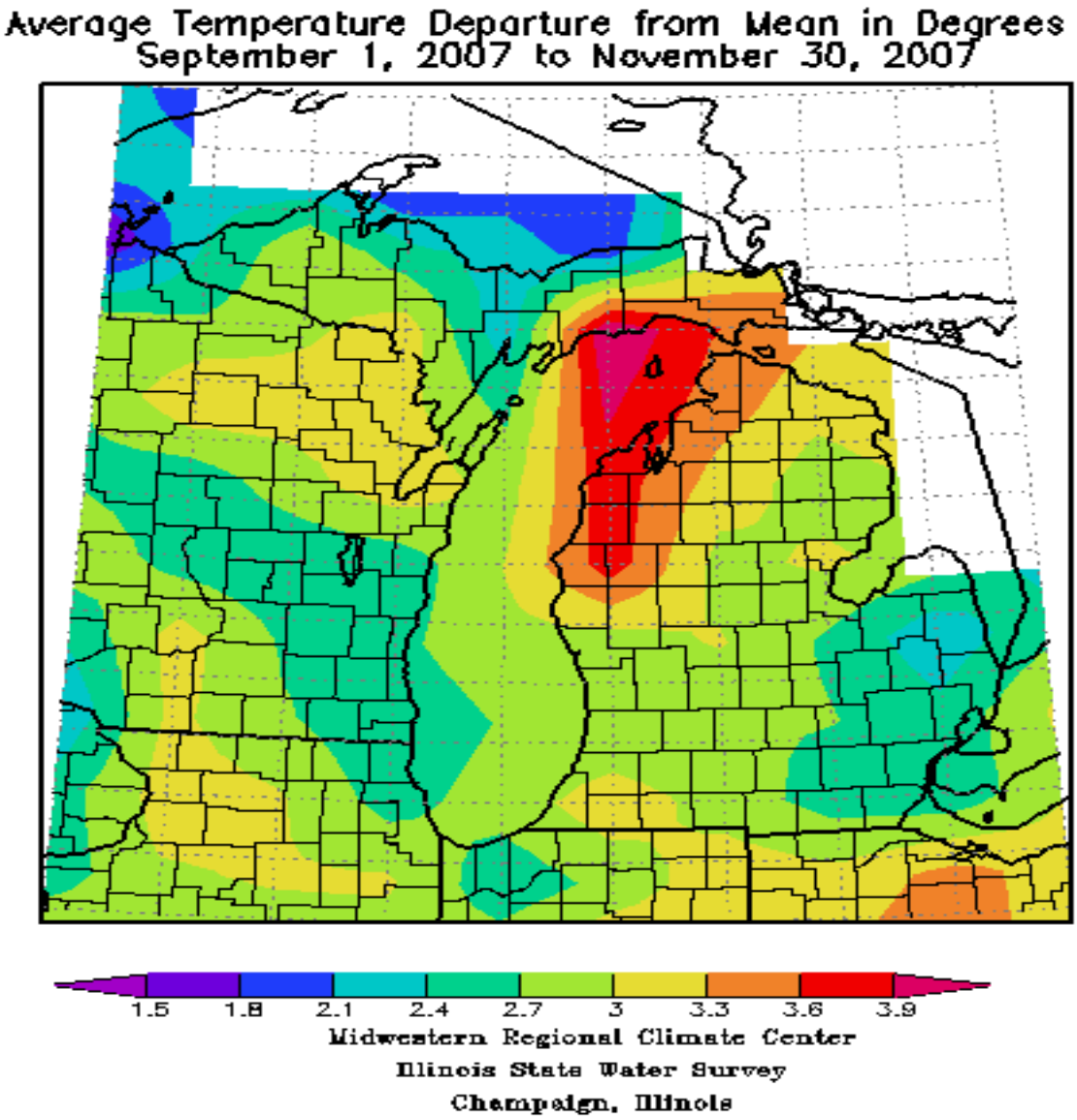

Fig. 12. The temperature departure from mean during the fall of 2007.

2007 Anomalies Charts

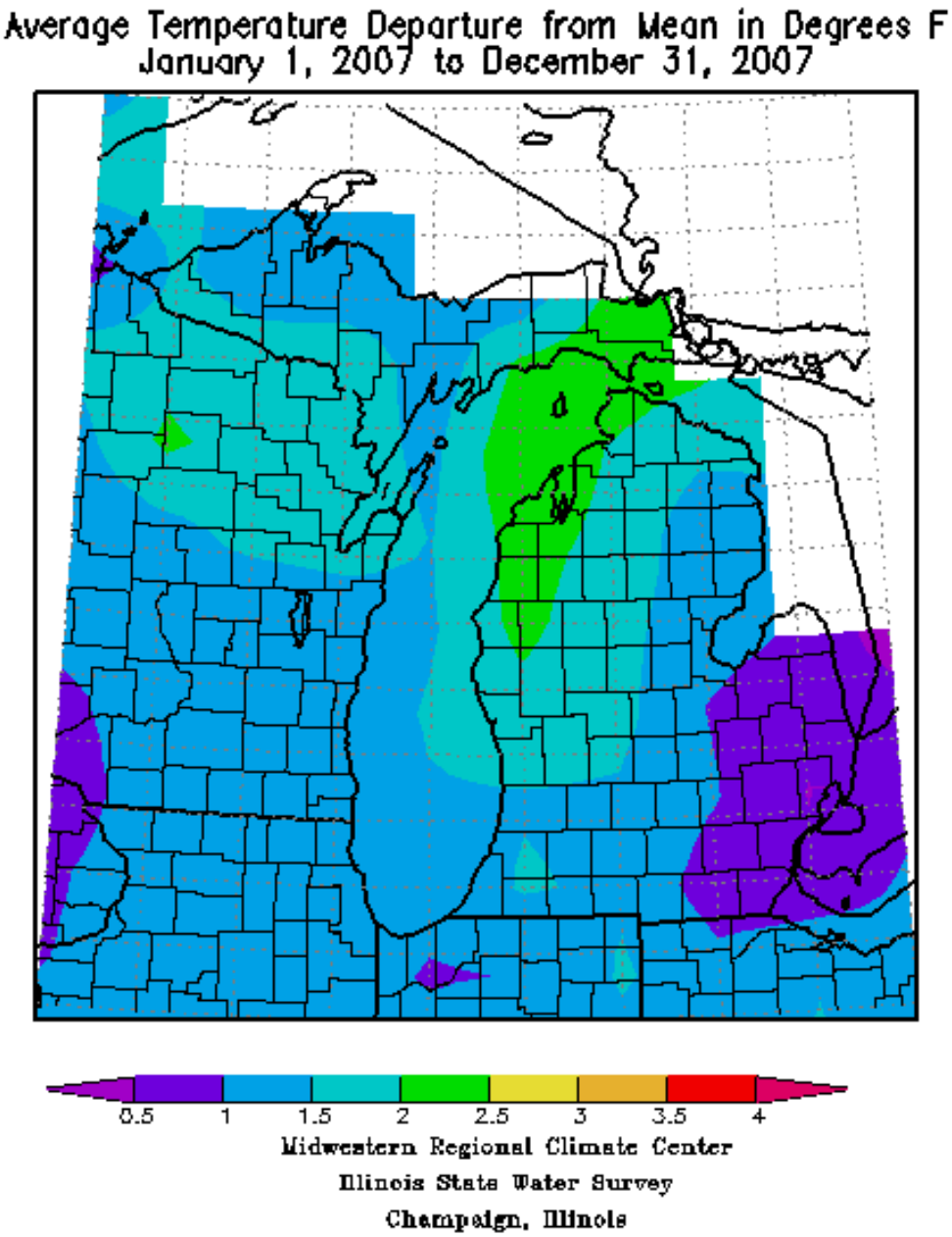

Fig. 13. The yearly temperature departure from the mean for 2007.

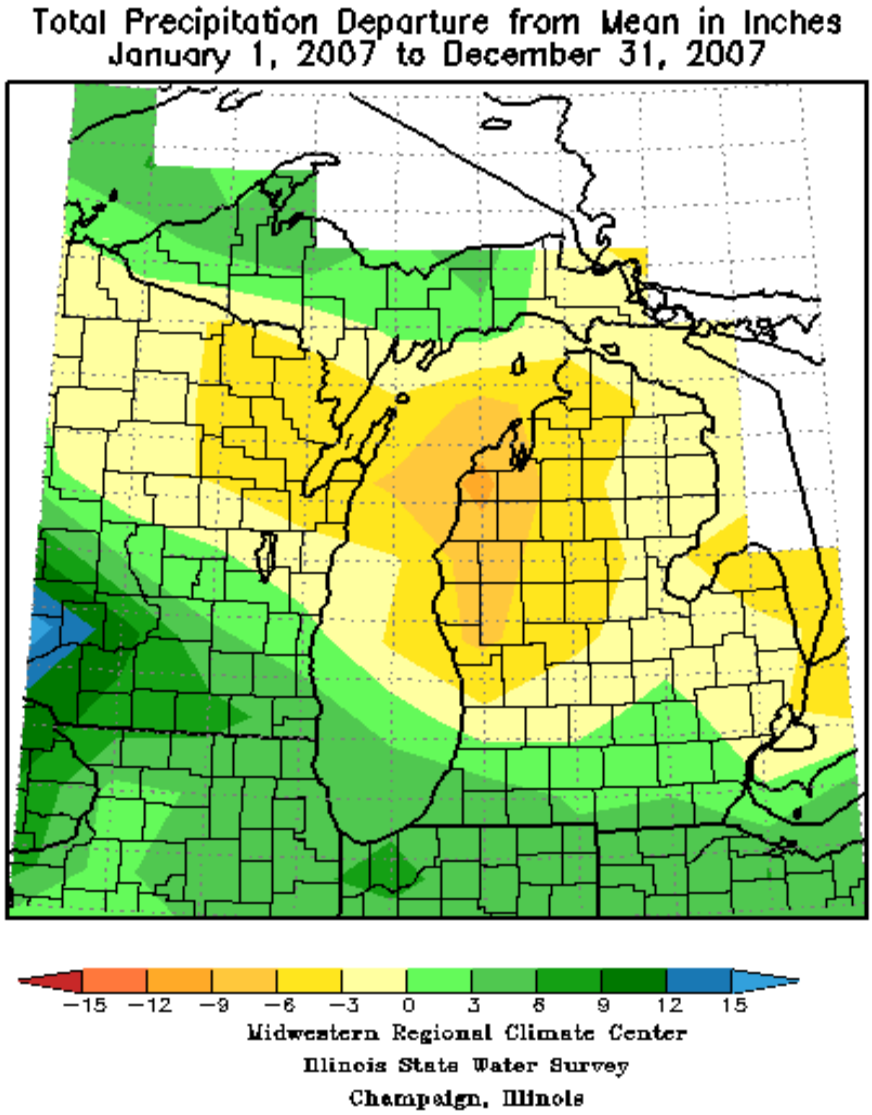

Fig. 14. The yearly precipitation departure from the mean for 2007.

Snowfall 2007 Charts

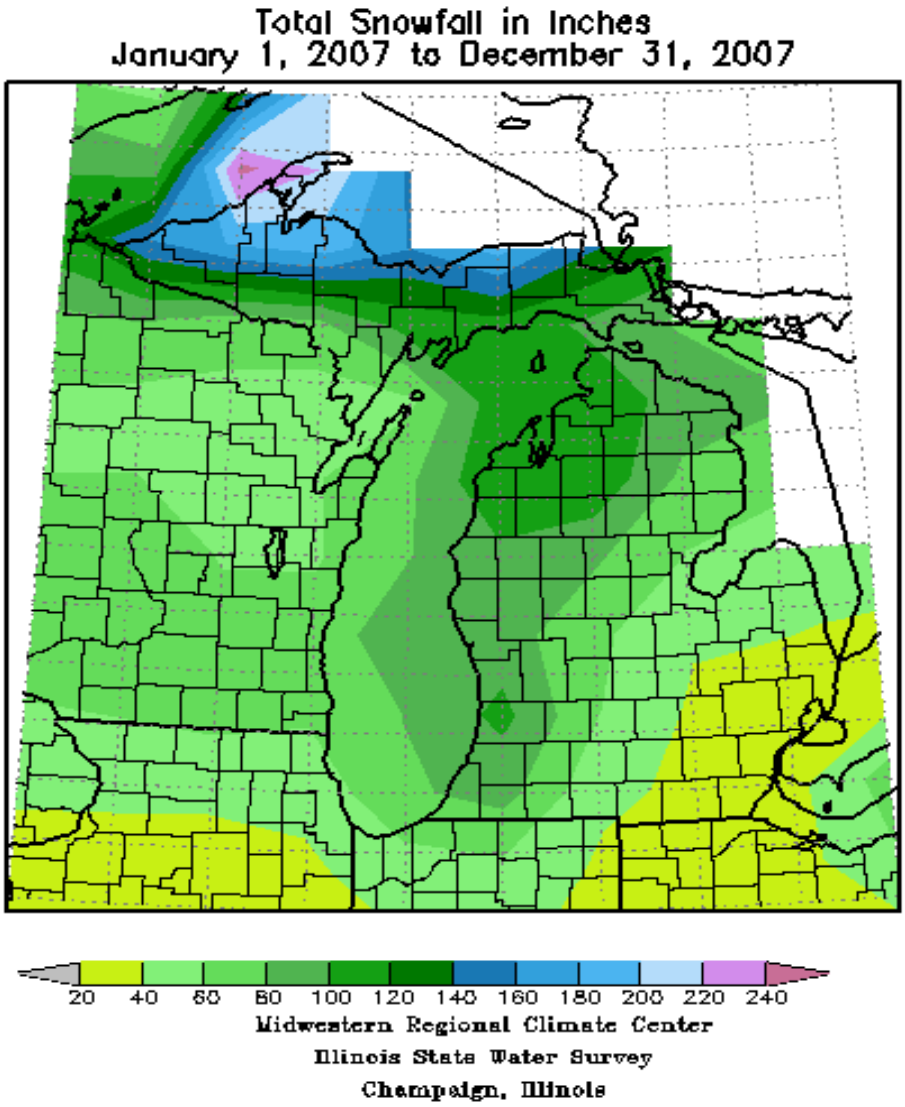

Fig. 15. The yearly total snowfall 2007.

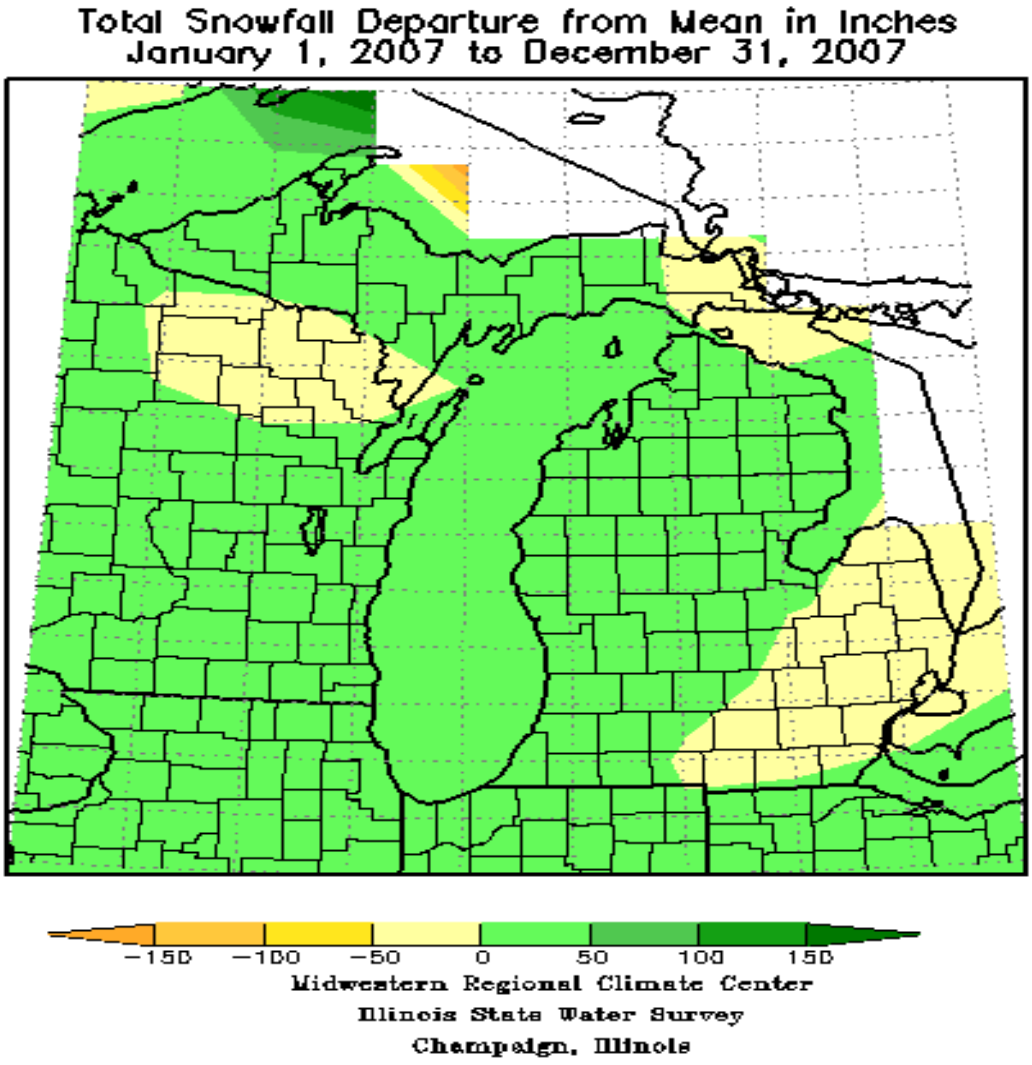

Fig. 16. The snowfall departure from mean for 2007.

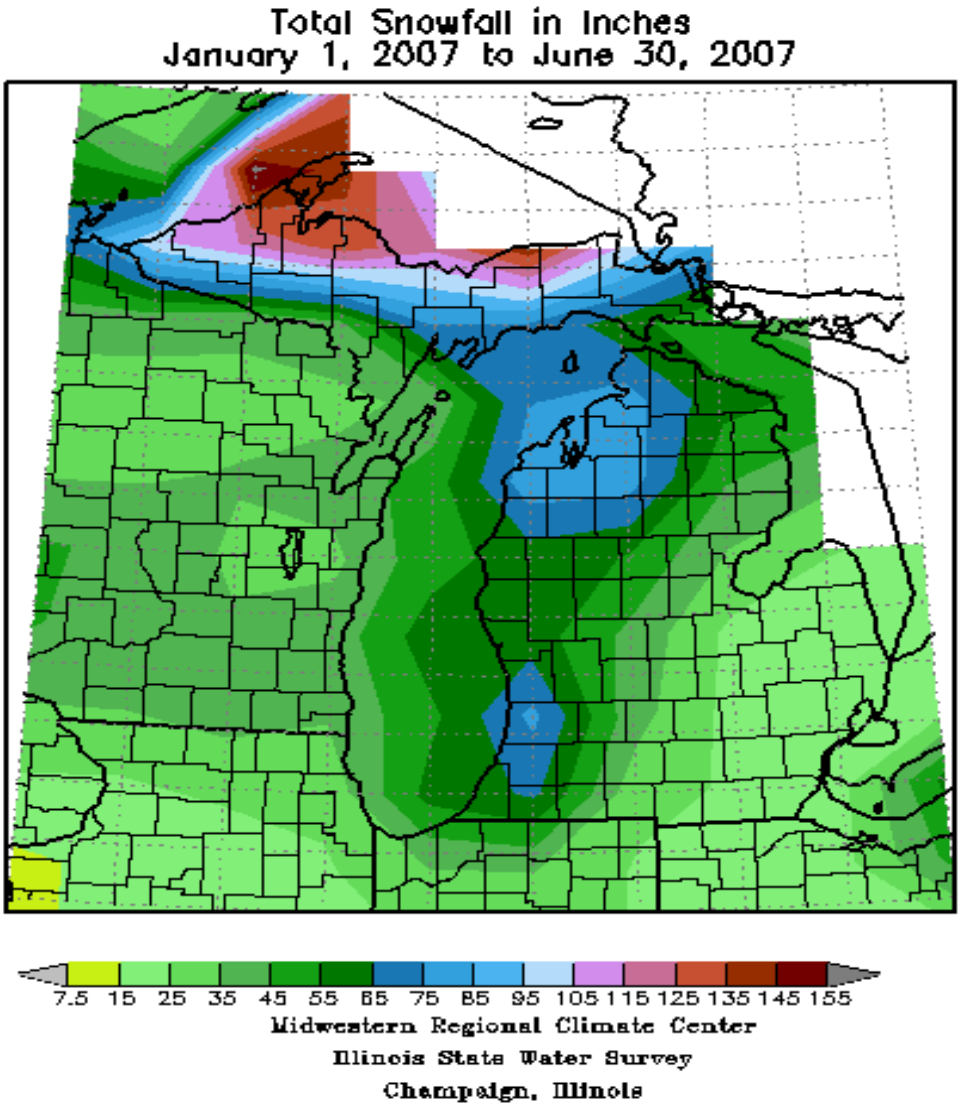

Fig. 17. The total Snowfall from January through June 2007.

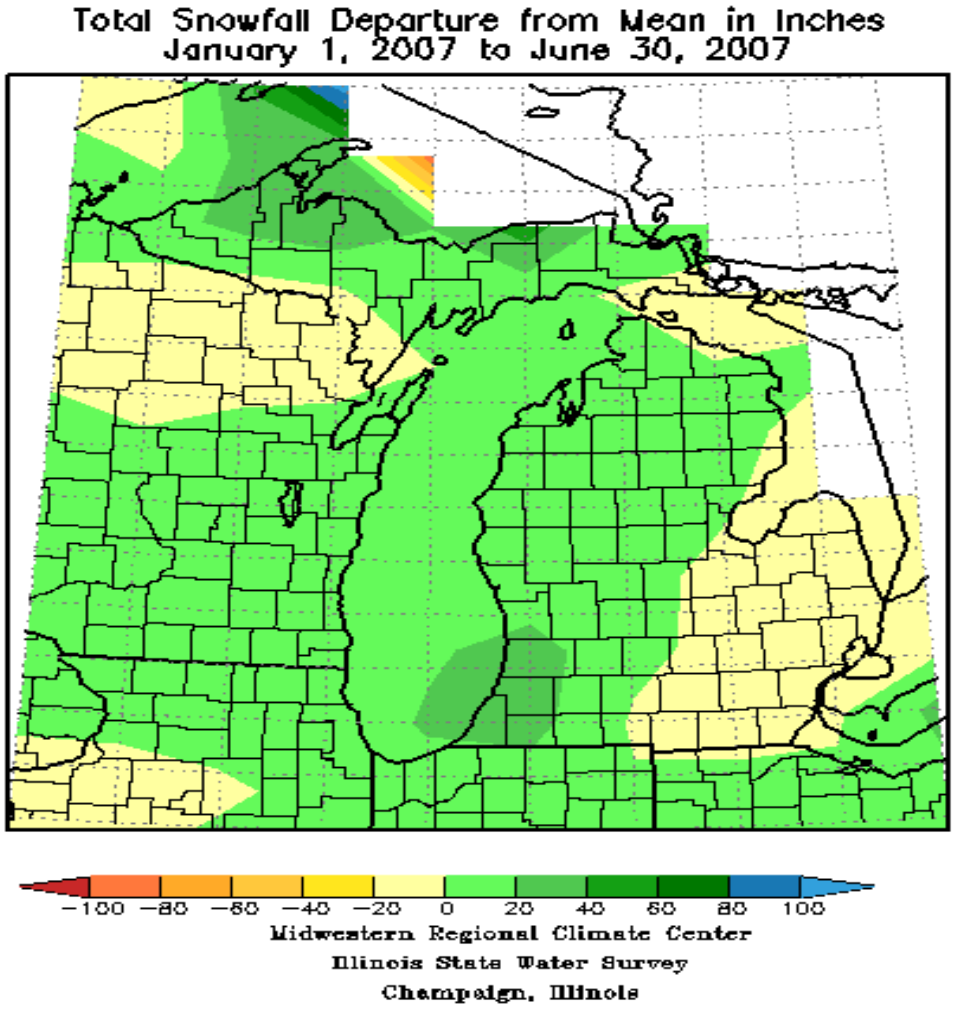

Fig. 18. Snowfall from January through June 2007 departure from the mean.

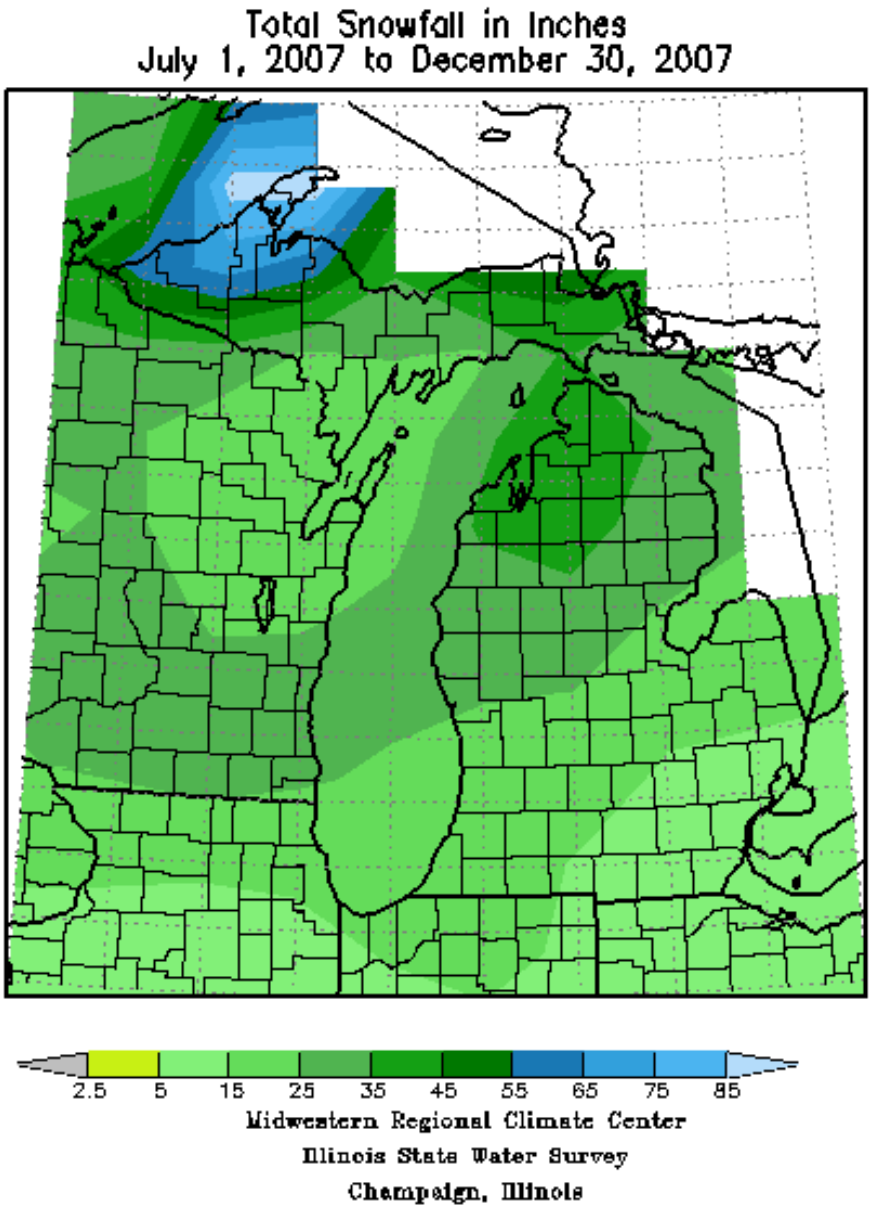

Fig. 19. The total snowfall from July through December of 2007.

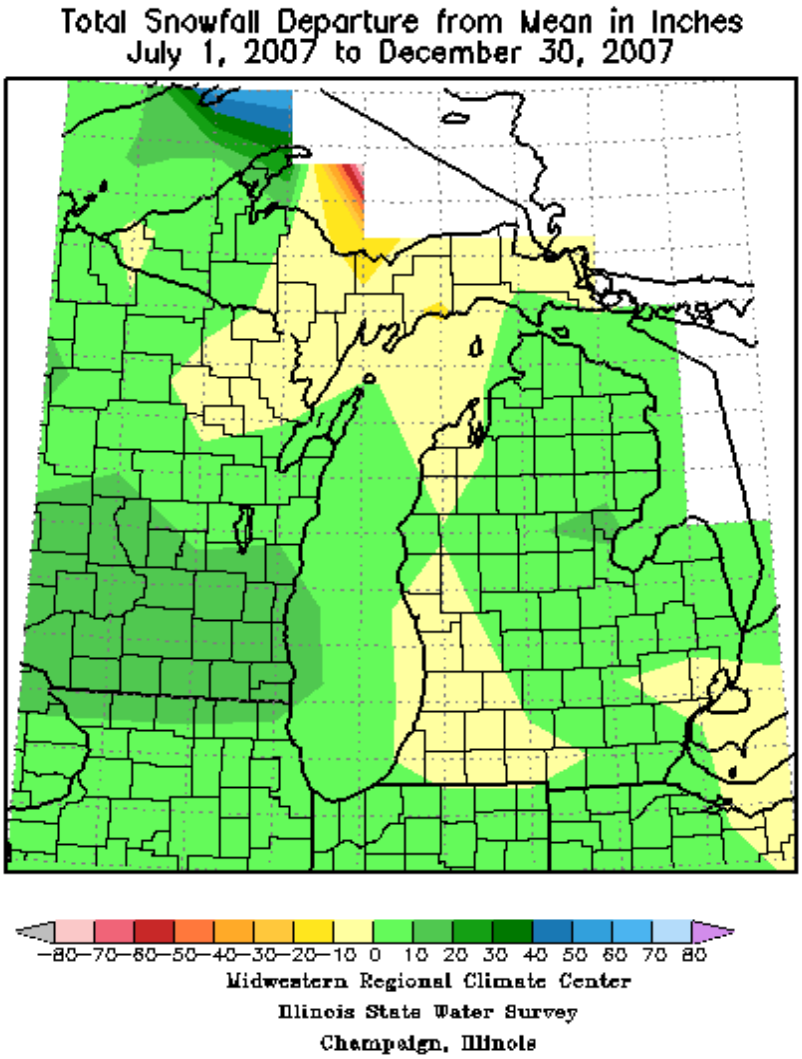

Fig. 20. The snowfall departure from the mean from July through December 2007.

Climate References:

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North Atlantic Oscillation / Pacific - North American pattern (NAO/PNA):
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Drought Monitor:
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National Weather Service:
http://www.weather.gov/

Climate Diagnostics Center:
http://www.cdc.noaa.gov/

National Climate Data Center Year 2007 Summary:
http://lwf.ncdc.noaa.gov/oa/climate/research/2007/ann/ann07.htm

Ed Berry Climate Blog (typically updated weekly)
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Archived data and information on climate patterns
http://www.cpc.ncep.noaa.gov/products/predictions/90day/tools/briefing/index.pri.html