Michigan’s Changing Climate:
Historical Observations and Trends

Jeffrey A. Andresen
Dept. of Geography
Michigan State University
Some Notable Pre-Instrumental Trends

- Tropical humid conditions during the Carboniferous and Devonian eras.
- Frigid, glacial/periglacial conditions as recently as 12,000 years ago during the end of the Pleistocene era.
- During early portions of the Holocene era, climate in the region warmed rapidly, resulting in a relatively mild and dry climate which lasted until about 5,000 YBP. Great Lakes levels fell until the lakes became terminal or confined about 7,900 YBP and vegetation in the region gradually transitioned from boreal to xeric species.
- Beginning about 5,000 YBP, climate cooled and precipitation totals increased, favoring the establishment of more mesic vegetation.
- During the late Holocene, the region experienced a period of relatively mild temperatures from approximately 800 A.D. to 1300 A.D. followed by a period of relatively cool temperatures from about 1400 A.D. until the late 19th Century.
Global air temperature
2008 anomaly +0.33°C
(10th warmest on record)

Source: Jones et al., 2009
Mean Temperatures vs. Year, Michigan
1895-2008
Great Lakes Region (1-yr, 1-week)

Year

Cold Wave Index (% deviation)

FREQUENT COLD WAVES
Grand Traverse Bay - Years Frozen by Decade
1851-2006

Years of Freezing
Yrs. Bay Froze
Great Lakes Ice Cover vs. Year (1973-2003)

Year

Ice Cover (%)
INTENSE HEAT WAVES
Frequency of Wet Days and Wet/Wet Days

Caro, MI

1930-2008

Proportion of Days

Year
Great Lakes Region (1-yr, 1-week)

Year
Heavy Precipitation Index (% deviation)


FREQUENT HEAVY RAINS
Total Seasonal Snowfall vs. Year
Bay City, MI
1897-2008
Total Seasonal Snowfall vs. Year
Chatham, MI
1901-2008
Annual Number of Days with Snowcover $\geq 1''$ vs. Year, Chatham, MI
1895-2008
Summary

- Climate has changed dramatically over geologic time across the Great Lakes region.

- Overall, mean average temperatures in Michigan rose approximately 1.0°F during the past century. Warming of about 2.0°F has occurred between 1980 and the present, much of it concentrated during the winter season and at night.

- Milder winter temperatures have led to less ice cover on the Great Lakes and the seasonal spring warm-up is occurring earlier than in the past.

- Annual precipitation rates increased from the 1930’s through the 1990’s but have leveled off recently.

- Seasonal snowfall totals and variability across the region are steady in some areas but increasing in others.

- The onset of spring warming is occurring earlier across much of the region.
Questions?