CLIMATE CHANGE

EXCHANGE CLUB
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DEFINITION of CLIMATE

- The statistical aggregate of weather conditions over a period of time: temperature; precipitation; wind; cloudiness; storms; etc.
- Climate “normals” are set over 30 year periods: means; extremes; frequencies of occurrence etc.
- Current “normal” period is 1971-2000.
- This will change to 1981-2010 in 2011.
DEFINITION of CLIMATE CHANGE

- You can’t have climate change over less than a 30-year period.
- Climate change can be a change in the mean, a change in extremes, or change in frequencies.
EXAMPLES OF CLIMATE CHANGE

• Change in the annual mean

• Constant mean with change in extremes

• Constant mean with change in frequency of extremes
Confluence of the Illinois, Mississippi and Missouri Rivers

July 4, 1988

July 18, 1993
THE WATER CYCLE: PRECIPITATION and TEMPERATURE AFFECT SURFACE WATER and GROUNDWATER
Global Warming
Source: Hadley Centre, UK

![Graph showing global temperature trends from 1850 to 2010. The graph indicates a steady increase in global average temperature over time, with a marked upward trend from the late 20th century onwards.](image-url)
MEAN ANNUAL TEMPERATURE
1971-2000, ILLINOIS
Temperature Annual Smoothed
Source: Jim Angel, Illinois State Water Survey
ANNUAL TEMPERATURE TRENDS
THE “WARMING HOLE”

Figure 1. ANNUAL temperature trends in the U.S. expressed as the total change over the period 1895-2006 in degrees F and derived from climate division data. Copyright 2007. Illinois State Water Survey.
TEMPERATURE CHANGES IN ILLINOIS AND CENTRAL USA ARE NOT THE SAME AS GLOBAL AVERAGE TEMPERATURE TRENDS
10-Year Running Averages

- Watershed precipitation
- Illinois River streamflow at Meredosia/Valley City (minus Lake Michigan diversion)
- Groundwater elevation at Snicarte

10-year running averages of Illinois River watershed precipitation, streamflow (minus Lake Michigan diversion), and groundwater elevation.
Mississippi River at Keokuk, IA

- Average watershed precipitation (3 gages)
- Streamflow at Keokuk

Annual Precipitation 10-year moving average (inches)

Annual Streamflow, 10-year moving average (inches)

\[ r = 0.878 \]

Vern Knapp in Winstanley et al. (2006), ISWS IEM 2006-02
USA HEATWAVE INDEX
(K. Kunkel)

Extreme Heat Wave Index, 4-day/1-year

Year
1850 1870 1890 1910 1930 1950 1970 1990

Index
0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

- Annual Forts Index
- 11-yr Average Forts
- 11-yr Average Coop
CONCLUSIONS

- The climate in the Midwest is cooler than it was 70 years ago.
- Precipitation increased over the past century but equally high precipitation occurred in the 19th century.
- High natural variability makes it difficult to detect global warming in the Midwest.
- High uncertainty in projecting future climate
  - probably warmer
  - wetter? drier?
HAVE A NICE DAY!

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