Precipitation Networks

- CCPN
- NWS coop
- CoCoRaHS
- IVWA
Midwestern Regional Climate Center

Illinois
Cook County Precipitation Network

- US Army Corps of Engineers, Chicago District
- Since 1989
- Historical hourly precipitation data used as input into a hydrological model to compute the amount of water that is diverted from Lake Michigan, as per 1967 and 1980 Supreme Court Decrees.
- Real-time data used in water management decision making.
- Weighing bucket gages, year-round, hourly / 10-minute data
Weighing bucket gages

• Use year round, so must be able to handle snow
• Urban network, so do not want to use new very expensive gages
• Belfort “Universal” gage
8-day chart, 6-8 revolutions
Many Years of Chart Digitization

- 24-hour charts, 25 gages:
  - September 1989-February 2001

- 8-day charts, 25 gages
  - February 2001 – September 2010

- Now Campbell data loggers and Ravi Modems
Water is diverted from Lake Michigan in 3 ways:

1) Water is directly pumped from Lake Michigan for potable water supply

2) Storm runoff from the diverted watershed area that drains into the river and canal system; (precipitation data used in computing storm runoff)

3) Water directly diverted from Lake Michigan into the river and canal system (especially after a drawdown due to unrealized flood);
Data Quality

• Data from data loggers are noisy
• “am” events (heating of gage in early morning
• Snow melt issues
• Lawn watering
• Vandalism
• Trapped birds
• Urban siting not optimal;
• Only 1 gage shielded
Quality Control

Compare daily monthly total
   to each other
   to NWS Coop Gages
   to FAA/NWS automated sites (timing of precipitation)
   to CoCoRaHS gages
   to WSR-88D radar, and satellite image archives
Training Materials, Resources

- **National Weather Service Directives Systems**
  - NWSI 10-1301: Surface Observing (Land)
  - NWSI 10-1302: Instrument Requirements and Standards for the NWS Surface Observing Programs (Land)
  - NWSI 10-1307: Cooperative Station Management
  - NWSI 10-1310: Claims for On-the-Job Injuries to Contract/Cooperative Observers
  - NWSI 10-1314: Cooperative Observer Awards
  - NWSM 10-1315: Cooperative Station Observation
  - NWSI 10-940: Hydrologic Data Network Services
  - NWSI 10-10: Climate Services
  - NWSM 10-1401A: Rawinsonde Observations

- **NWS Observing Handbooks**
  - No. 8: Aviation Weather Observations for Supplementary Aviation Weather Reporting Stations (SAWRS)

- **Other Resources**
  - **New**: Snow Measurement Video
  - Snow Measurement Guidelines
  - Photo Tips for Awards and Related Digital Pictures
  - National Research Council Report: *Future of the NWS Cooperative Observer Network*
  - Cooperative Observer Program Brochure: PDF (Print then fold into 6-panel brochure.)
ASOS – airports – heated tipping buckets with wind shield
CoCoRaHS gages

- Community Cooperative Rain Hail and Snow
- All volunteer
- Started in Colorado about 10 years ago
- Now nation-wide
- 4” rain gauges
- New ET gauges
Welcome to CoCoRaHS! "Volunteers working together to measure precipitation across the nation."

CoCoRaHS WxTalk Webinar Series

6,354 daily precipitation reports received today as of 5/26/2013 4:11 PM EDT

Daily Precipitation (inches x.xx) USA 5/26/2013

- Trace
- 0.00 - 0.66
- 0.67 - 1.12
- 1.13 - 2.81
- 2.82 - 6.76
- 6.77 - 10.14
- 10.15 - 11.28
Placement of your gauge

“Location is the key to good data”
May - July 2012
Weekly Evapotranspiration and Rain

Inches

0 0.25 0.5 0.75 1 1.25 1.5 1.75 2 2.25

CMI_ETg
CMI_pan
CMI_ICN
CMI_PPT
Cook County Precipitation Network: Data Collection

Hourly Precipitation for Monday, March 25, 2013

Choose a station from the map or menu, at left. Map stations are hourly data.

Stations in the text list that are not linked (N/A) are temporarily not available.

If a station is shown on the map but is not linked, then data are temporarily unavailable.

Station locations

Rain totals for the previous day 0.10" and above are displayed on the map.

Real-time precipitation data are provisional, and may be subject to change after review. By using this web site you agree to our Data Disclaimer. Data are checked and revised during the 24 hours after selected time.
Since 1992

Daily precipitation data are used in conjunction with groundwater data from a well network to collect long-term data to determine the impact of groundwater withdrawal during the growing season (irrigation and evapotranspiration), and to determine the rate at which the aquifer recharges.
Quality Control

Compare gages
  to each other
  to NWS Coop Gages
  to WSR-88D radar, and satellite image archives
Primary Research Use

• Compare with WSR-88D precipitation measurements
• Determine accuracy of Radar adjusted by gage precipitation estimates (4 x 4 km gridded daily data) with
  o 1) NWS Cooperative Network daily gage data (8” non-recording gage)
  o 2) Specialized Network data
    • Boneyard – Local volunteer network (4” non-recording gage)
    • Cook County Precipitation Network Data
    • Imperial Valley Precipitation Network Data
Positive
QCgage > MPE
Negative
MPE > QCgage

a) Boneyard Network

Daily Precipitation, cm

Number of Observations

Percent Difference

- Percent Difference <= -12.5 %
- -12.5 % < Percent Difference < 12.5 %
- Percent Difference >= 12.5 %

b) Cook County Network

Daily Precipitation, cm

Number of Observations

c) Cook County Network

Daily Precipitation, cm

Number of Observations

d) Imperial Valley Network

Daily Precipitation, cm

Number of Observations
Results

• MPE generally, overestimate low precipitation amounts, underestimate high precipitation amounts; poor in winter months in northern regions when radar corrected by Automated Tipping bucket gages which do not handle snow well; amounts often with +/- 25% of gages; improved qc with realtime data improving estimates
Individual CCPN Gage
Daily Comparison
25 weighing buckets gages

KLOT = WSR-88D radar
CCPN Gages >= 2.54 cm (>= 1 inch)
Feb 2002 - Aug 2005

Percent Difference (CCPN-MPE)/CCPN

Median
25%-75%
Non-Outlier Range
Outliers