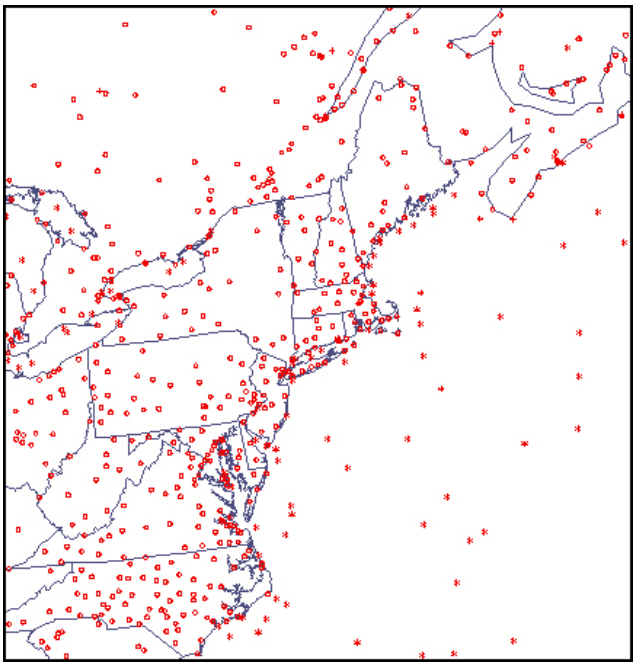
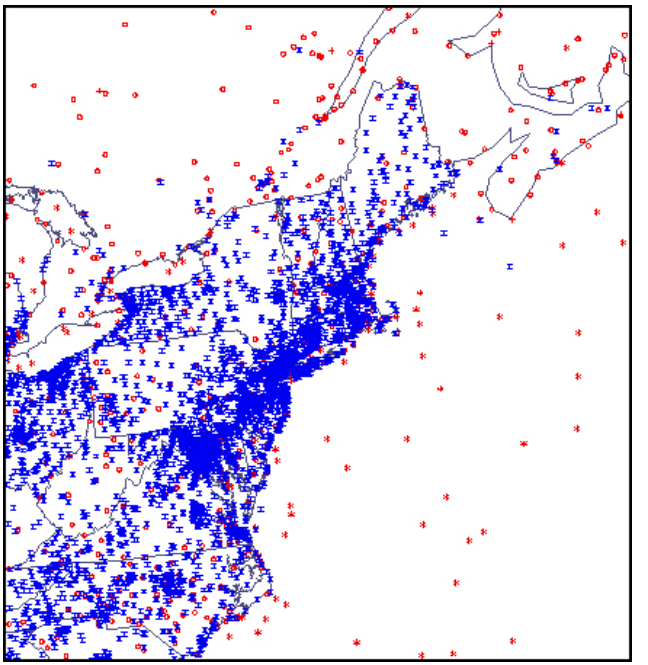
Meteorological Assimilation Data Ingest System (MADIS)





Surface Data Density Before MADIS Surface Data Density After MADIS

Patty Miller

Unidata Webcast

April 28, 2009

MADIS Background

History

- MADIS was established in 2001 to prototype new observation ingest, integration, quality control, and distribution techniques for real time and saved real-time data

Goal

- To integrate and quality control NOAA and other-agency observations and make them easily accessible and usable for operations, research, and commercial purposes

MADIS Background (continued)

Overall Benefits

- A more usable, complete, accurate, timely, and higher density observational infrastructure for use in local weather warnings and products, model predictions, and hazardous situations

NWS-Specific Benefits

- Improved observational functionality for…

1. enhancing forecaster situational awareness
2. reducing data access costs for Forecast Offices
3. supporting higher-resolution global and regional data assimilation systems
4. improving the National Digital Forecast Database

MADIS

Function

Observation access, integration, quality control, and distribution system with software support

Features

- Access to real-time and saved real-time data sets
- Observational quality control
- Application Program Interface (API)
- Multiple network-enabled data distribution mechanisms (ftp, http, ldm)
- Documentation and user support, including customization packages for NWS's Advanced Weather Interactive Processing System (AWIPS)

MADIS

System Capabilities

- Seamless access to real-time and saved datasets
- Continuous database updates triggered by arriving observations
- Uniform observation formats, units, and time stamps
- Automated quality control algorithms
- Station monitoring for network maintenance
- Secure authentication for proprietary data
- Web-enabled push/pull distribution capabilities, with server-side slice and dice capabilities
- On-the-fly data reformatting, variable transformation, and sounding generations

MADIS Current Status

Observational Datasets

MADIS supports the collection, integration, quality control, and distribution of thousands of NOAA and non-NOAA observations, including over 50K surface stations from local, state, and federal agencies, and private networks, as well as upper-air datasets including multi-agency profiler, radiosonde, radiometer, selected satellite observations, and commercial aircraft observations.

- Profiler data includes NOAA Profiler Network and Cooperating Agency Profilers
- Aircraft data includes MDCRS, AMDAR, TAMDAR, and WVSS-2
- Surface data includes METAR, maritime, snow, UrbaNet, and other mesonet

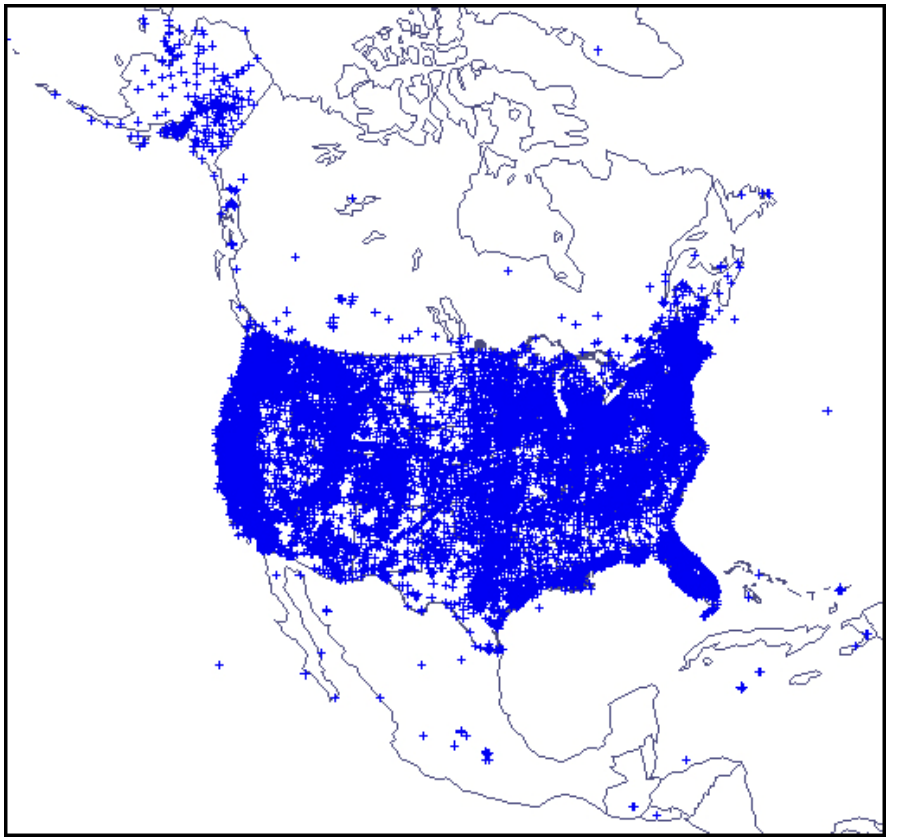
Scope

- 56,864 Surface Stations producing over 12,800,000 observations/day
- 154 Profiler Sites (> 200,000 obs/day)
- Over 450,000 aircraft observations/day
- Plus global radiosonde and satellite obs

Hundreds of MADIS Users, Including:

- NWS Forecast Offices, National Centers
- NSSL, AOML, ARL, NESDIS, NOS, +
- NCAR and NASA
- over 100 universities
- DOE laboratories
- Accuweather
- WSI Corporation
- DTN Meteorlogix
- AWS/WeatherBug
- Baron Services
- Weather Underground

Observing System Portfolio



➢ Current Surface Sites

METAR	=	6,397
Maritime	=	192
Meteorological Mesonet	=	27,920
Hydrological Mesonet	=	20,885
UrbaNet	=	1,470
Total	=	56,864

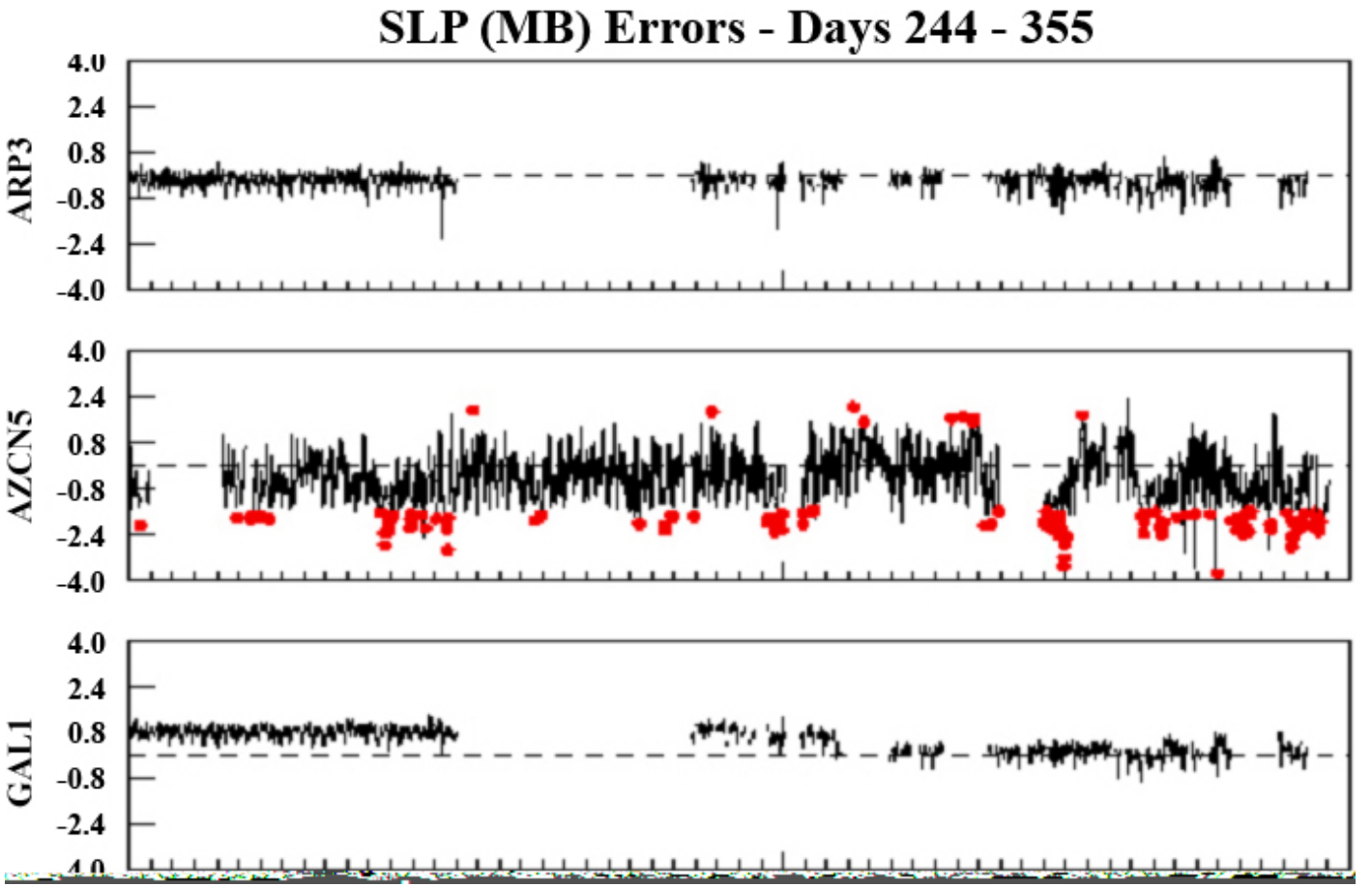
Networks Processed	>	170
Data Variables	=	144
Metadata Variables	=	55

➢ Observations / Day
> 12,800,000

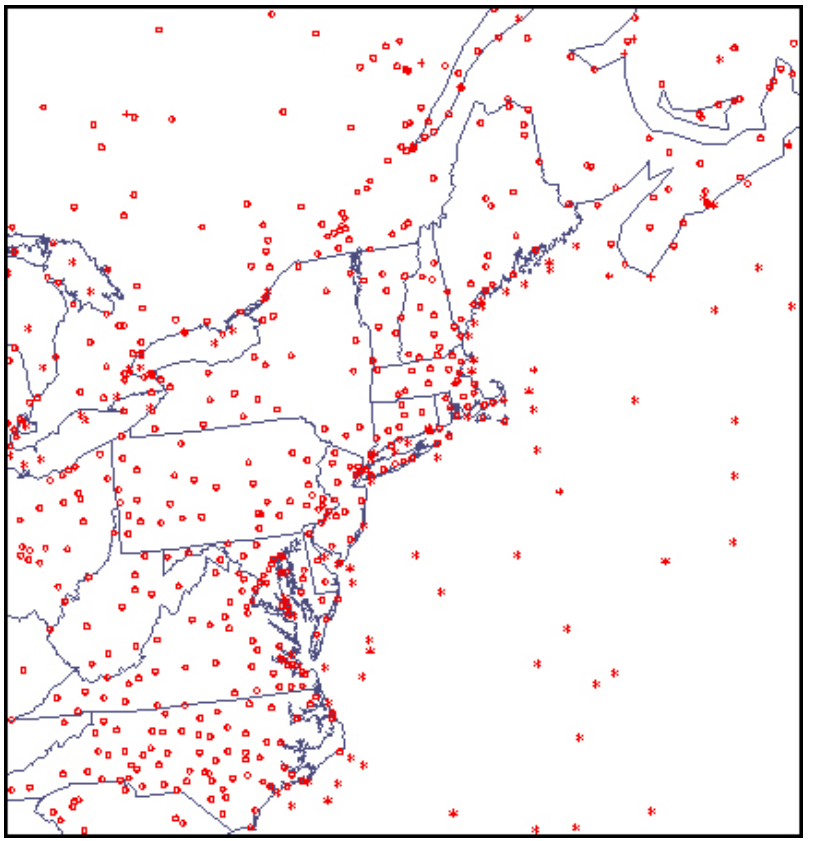
MADIS QC Capabilities by Observation Type

For more information see
http://madis.noaa.gov/madis_qc.html

MADIS SLP (MB) Errors



MADIS Northeast Standard Surface Network



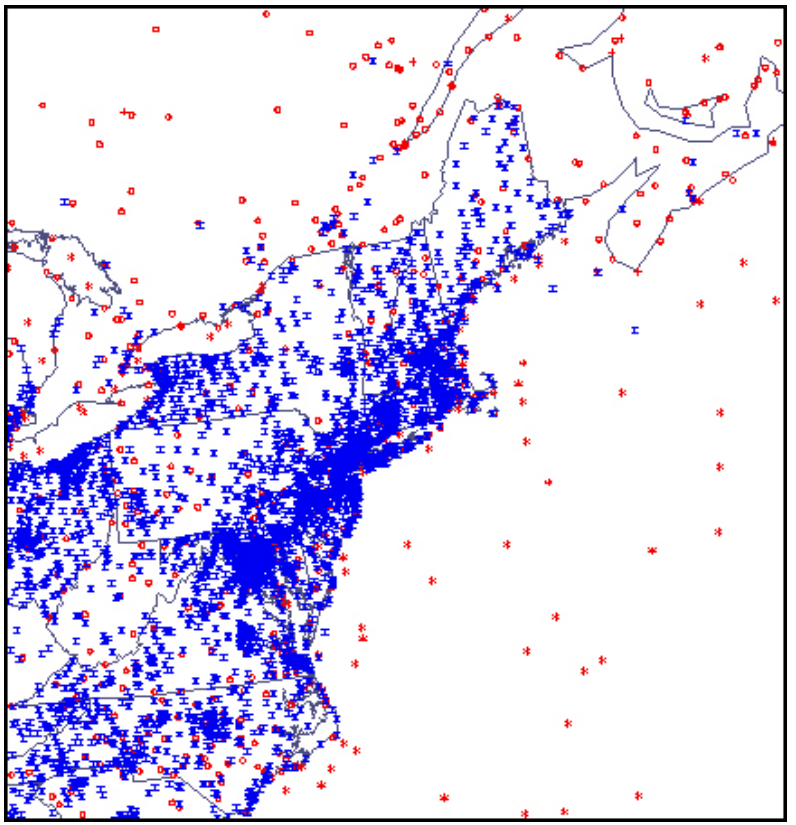
Standard Surface Observations

Meteorological Aviation Reports (METARs)

Maritime

Surface Aviation Observations (SAOs)

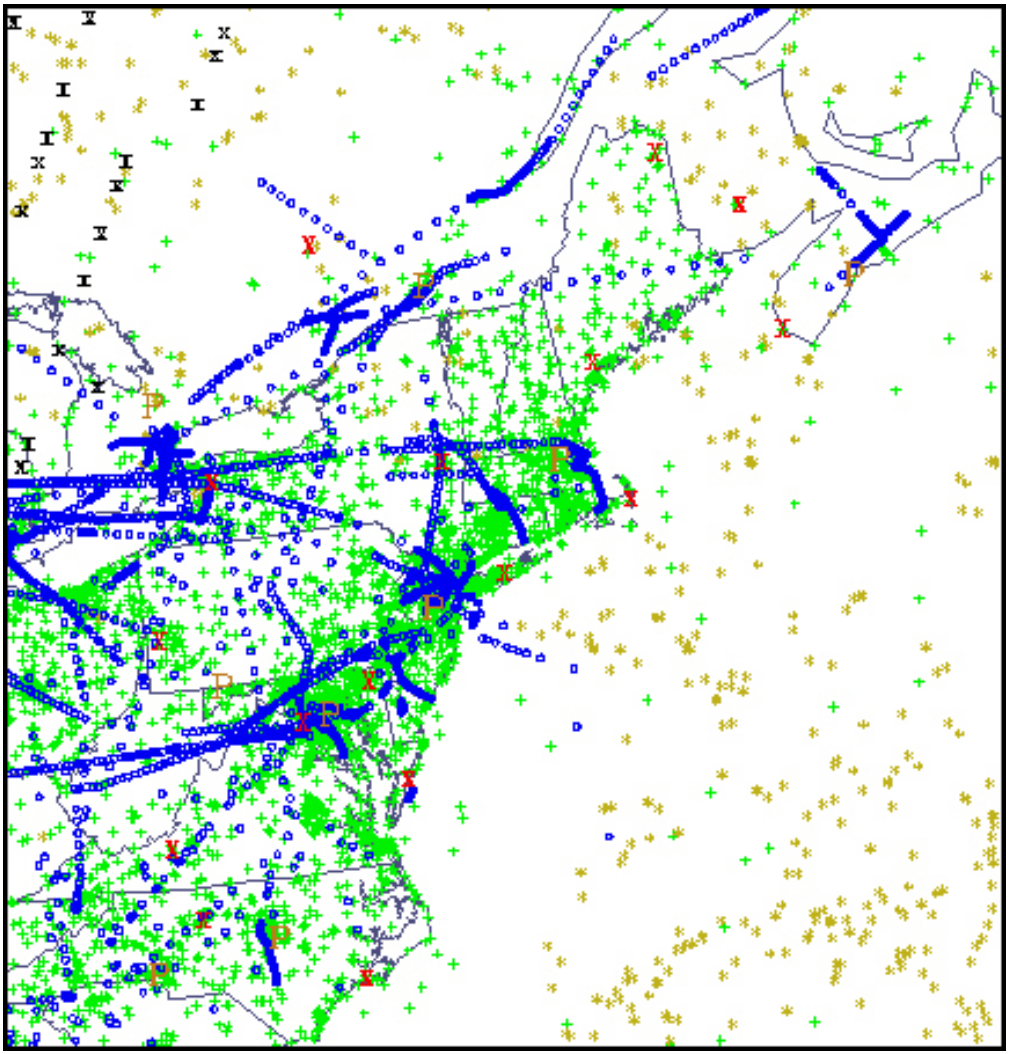
MADIS Northeast Surface Network



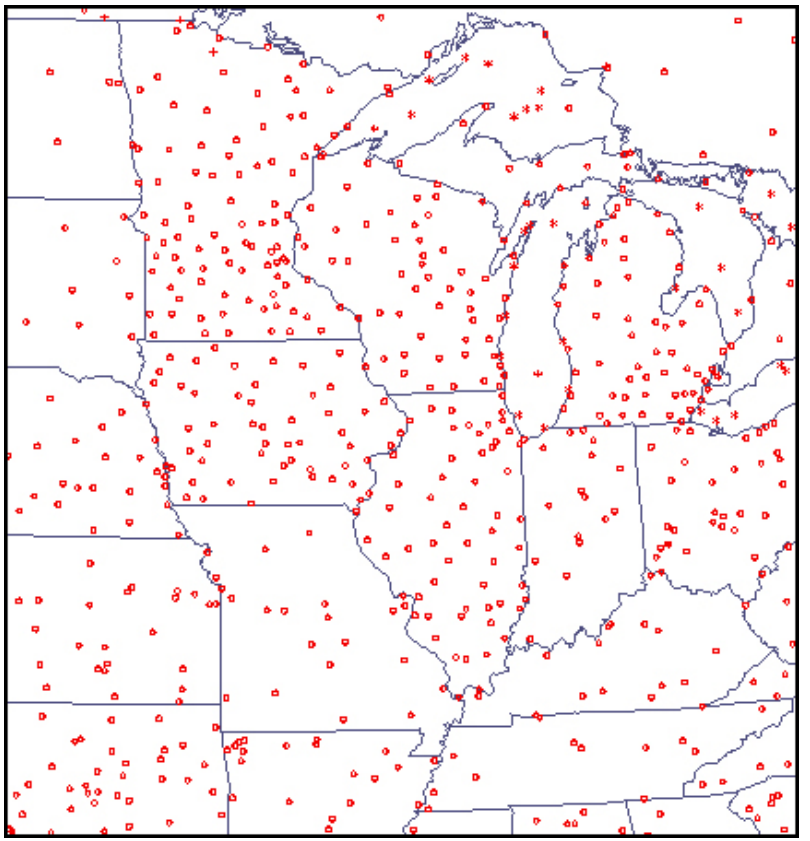
Additional Surface Observations

- New England Pilot Project (NEPP)
- AWS Convergence Technologies, Inc.
- Citizen Weather Observer Program
- Remote Automated Weather Stations
- ESRL Ground-Based GPS Meteorology
- Weather for You.com
- Anything Weather
- Soil Climate Analysis Network (SCAN)
- Gulf of Maine Ocean Observing System
- National Ocean Service Physical Oceanographic Real-Time System (PORTS) and National Water Level Observation Network (NWLON)
- Aberdeen Proving Grounds (APG)
- OAR – DCNet
- UrbaNet
- Hydrometeorological Automated Data System (HADS)
- North Carolina ECONet
- New Jersey Weather and Climate Network
- DoTs: GA, KY, ME, MD, NH, OH, VA, VT

MADIS Northeast Regional Domain Observations



MADIS Midwest Standard Surface Network



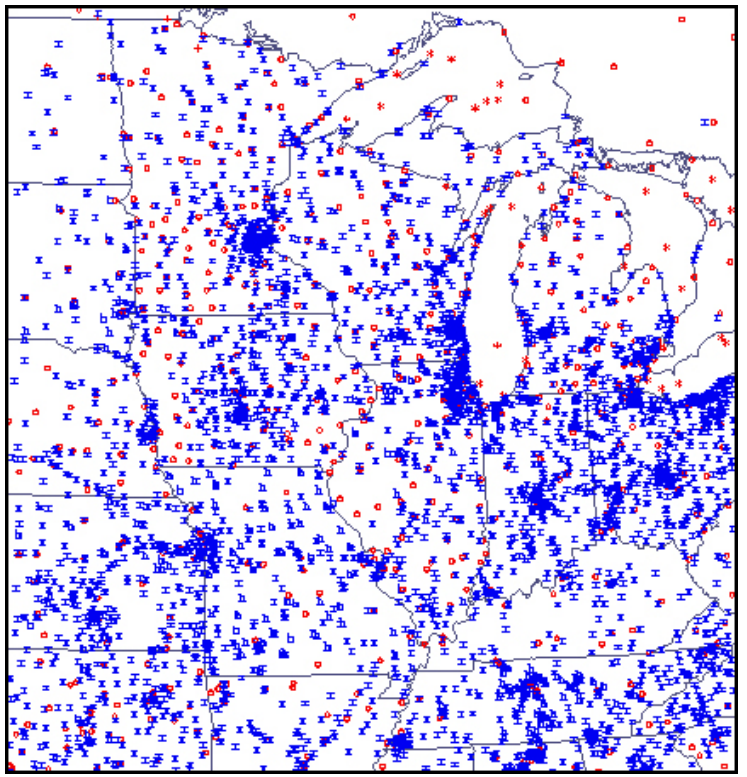
Standard Surface Observations

Meteorological Aviation Reports (METARs)

Maritime

Surface Aviation Observations (SAOs)

MADIS Midwest Surface Network



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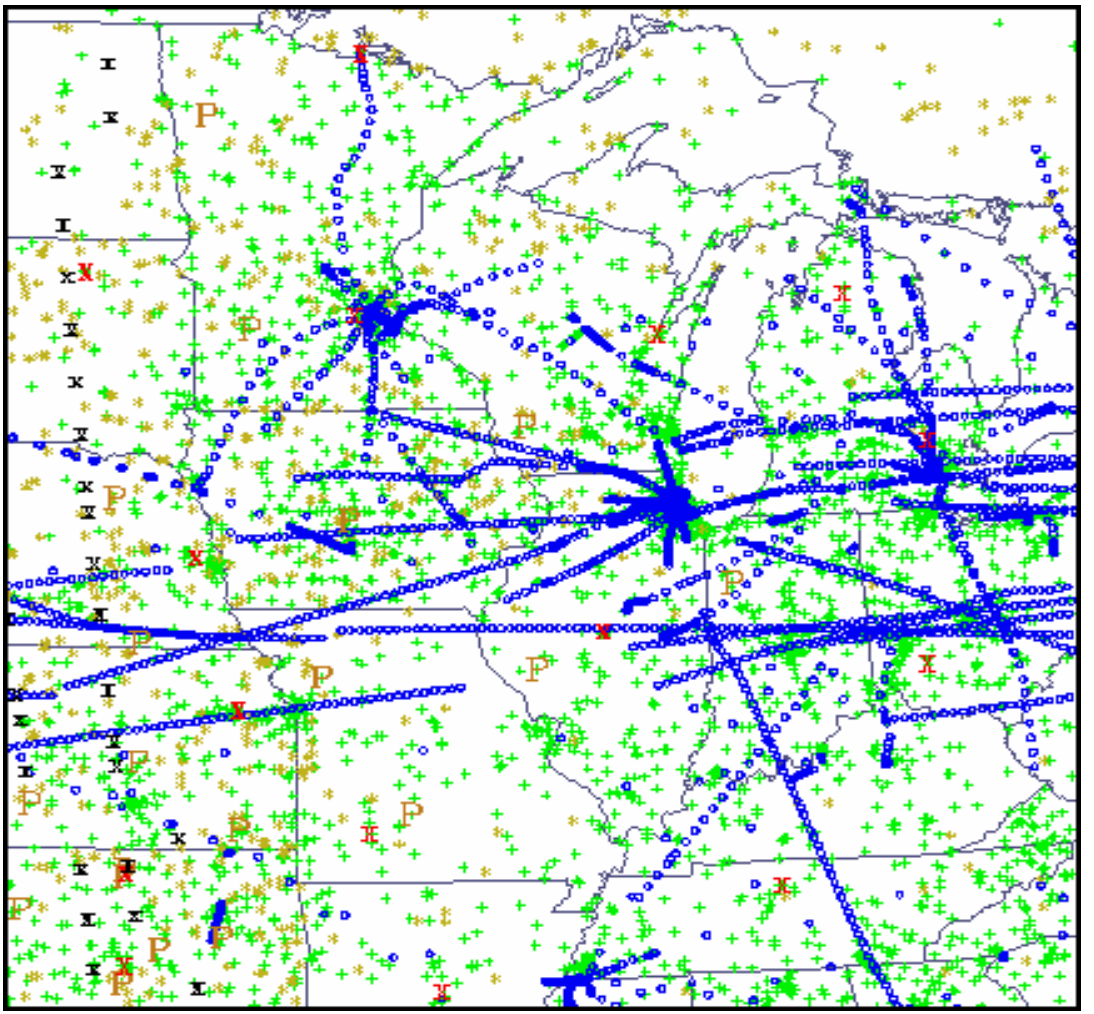
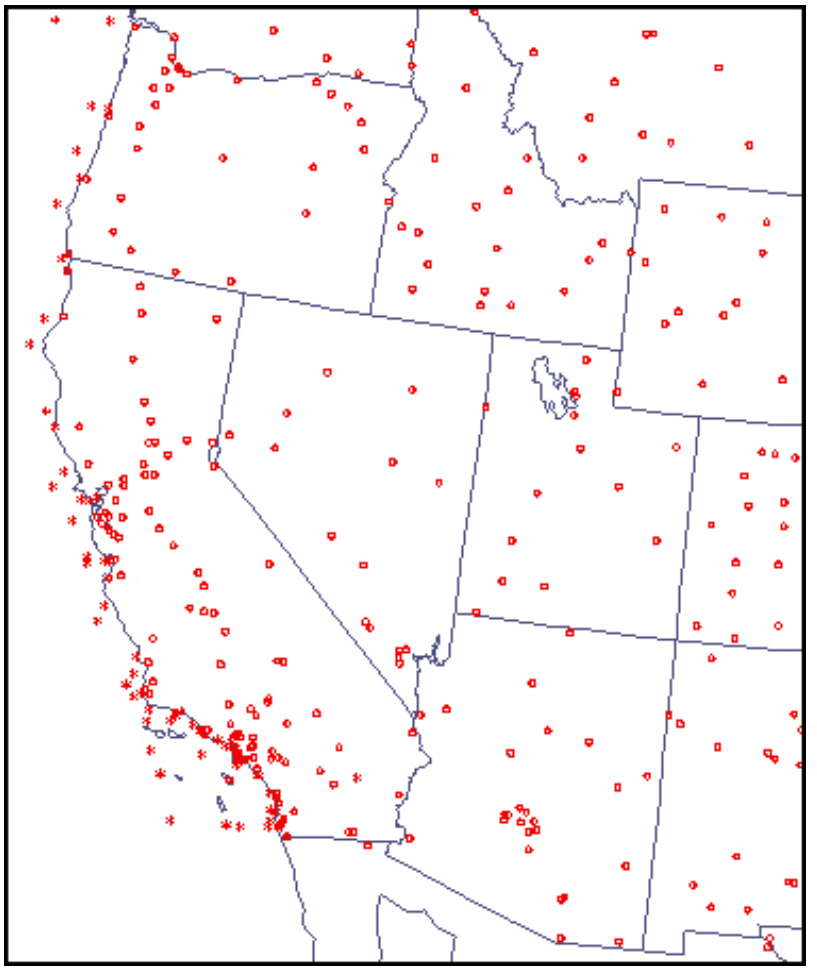
- Soil Climate Analysis Network (SCAN)
- National Ocean Service Physical Oceanographic Real-Time System (PORTS) and National Water Level Observation Network (NWLON)
- UrbaNet
- Oklahoma Mesonet
- DOTs: IA, IN, KS, KY, MN, ND, OH, WI
- Marquette Mesonet
- Union Pacific Railroad
- Non-Federal AWOS
- NERRS (National Estuarine Research Reserve System)
- CoCoRaHS
- Hydrometeorological Automated Data System (HADS)
- North Carolina ECONet

MADIS Midwest Regional Domain Observations



MADIS West Coast Standard Surface Network

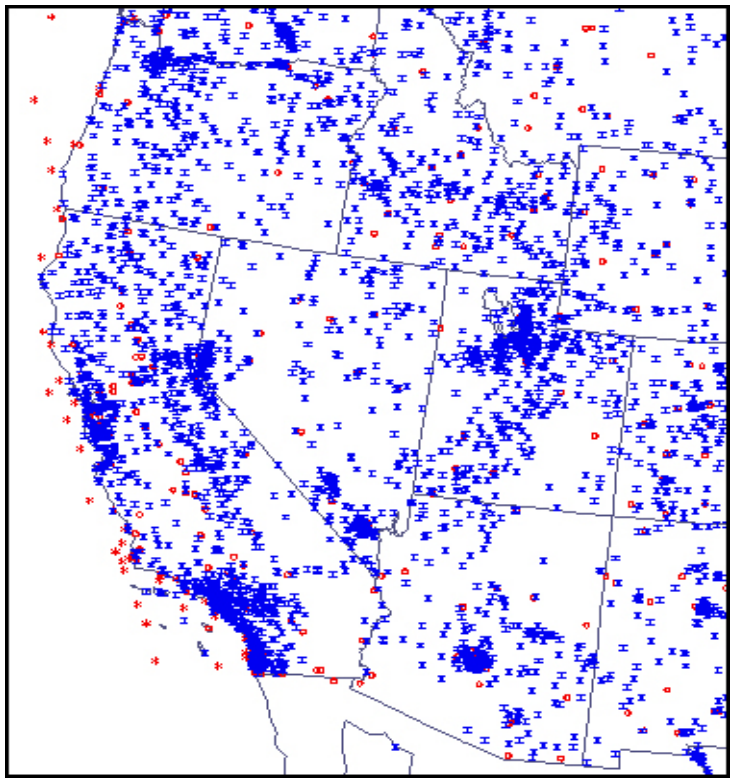


Standard Surface Observations

Meteorological Aviation Reports (METARs)

Maritime

MADIS West Coast Surface Network



Additional Surface Observations

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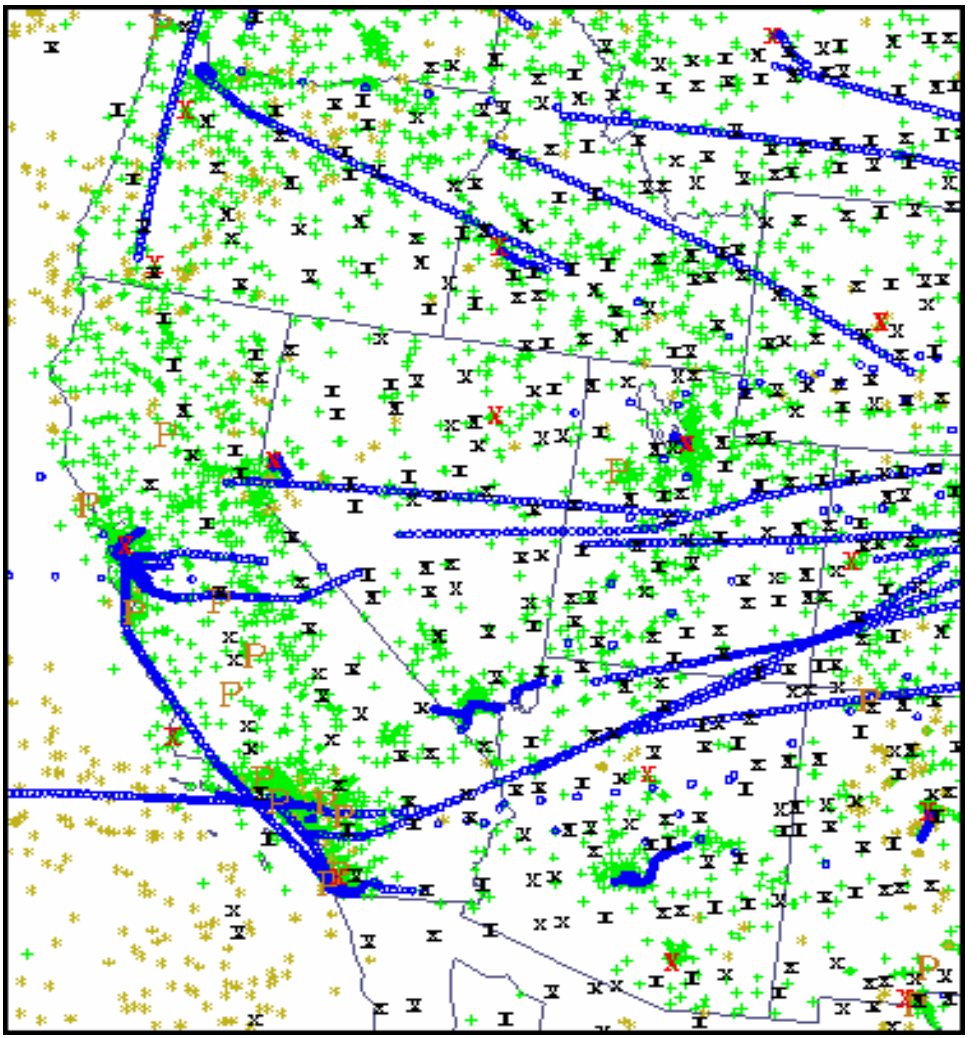
- Remote Automated Weather Stations
- Weather for You.com
- Anything Weather
- Soil Climate Analysis Network (SCAN)
- National Ocean Service Physical Oceanographic Real-Time System (PORTS) and National Water Level Observation Network (NWLON)
- Union Pacific Railroad
- Snow Information and Technology (SNOTEL)
- CA River/Nevada River Forecast Center
- CoCoRaHS
- U.S. Bureau of Reclamation Agrimet
- Pacific Northwest National Laboratory
- CO River Basin Forecast Center
- Dugway Proving Grounds
- Non-Federal AWOS
- UrbaNet
- DOTs: CA, CO, ID, MT, NV, UT, WY

and many more mesonets…

MADIS West Coast Regional Domain Observations



MADIS Research to Operations

The NOAA MADIS Independent Review Team

Purpose

To assist NOAA management in making decisions on how best to transition MADIS into NOAA operations

IRT Members

NESDIS

Al Powell (IRT Chair/Director, Center for Satellite Applications and Research)

NWS

David Caldwell (Director, Office of Climate, Water, and Weather Services)

Allan Darling (Chief, Software Branch/Telecommunications Operations Center)

Brent Gordon (Chief, NCEP Central Operations/Systems Integration Branch)

OAR

James Kimpel (Director, National Severe Storms Laboratory)

Eddie Bernard (Director, Pacific Marine Environmental Laboratory)

Jeremy Warren (Deputy Chief Information Officer)

MADIS Research to Operations (continued)

The NOAA MADIS Independent Review Team unanimously selected a joint OAR/NWS distributed processing solution

Transition Goals

- Expedite the transition of current GSD capabilities to operations
- Maintain the continuity of MADIS data streams and services before, during, and after the transition
- Pre-plan for product improvements and technology infusion

Summary Statement

"The partnership between OAR and NWS led to a solid technical solution and provided a smoother transition from research to operations."

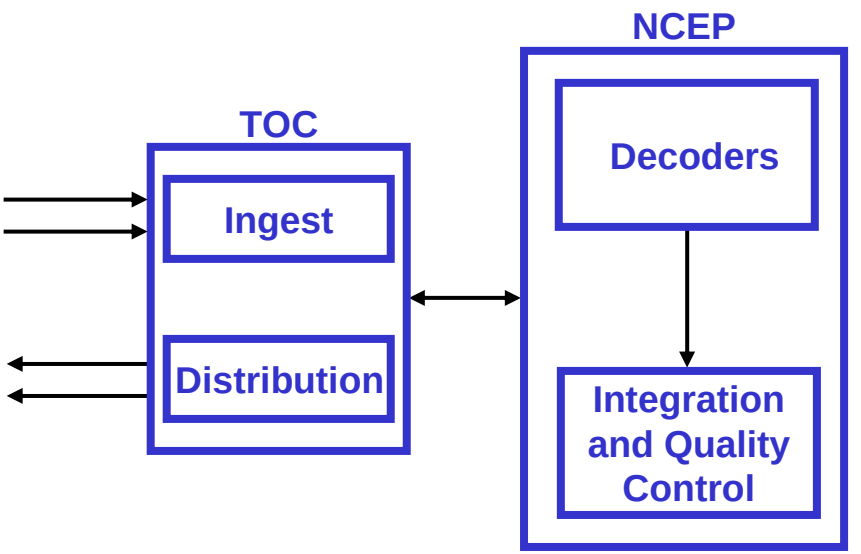
MADIS Research to Operations (continued)

The NOAA MADIS Independent Review Team

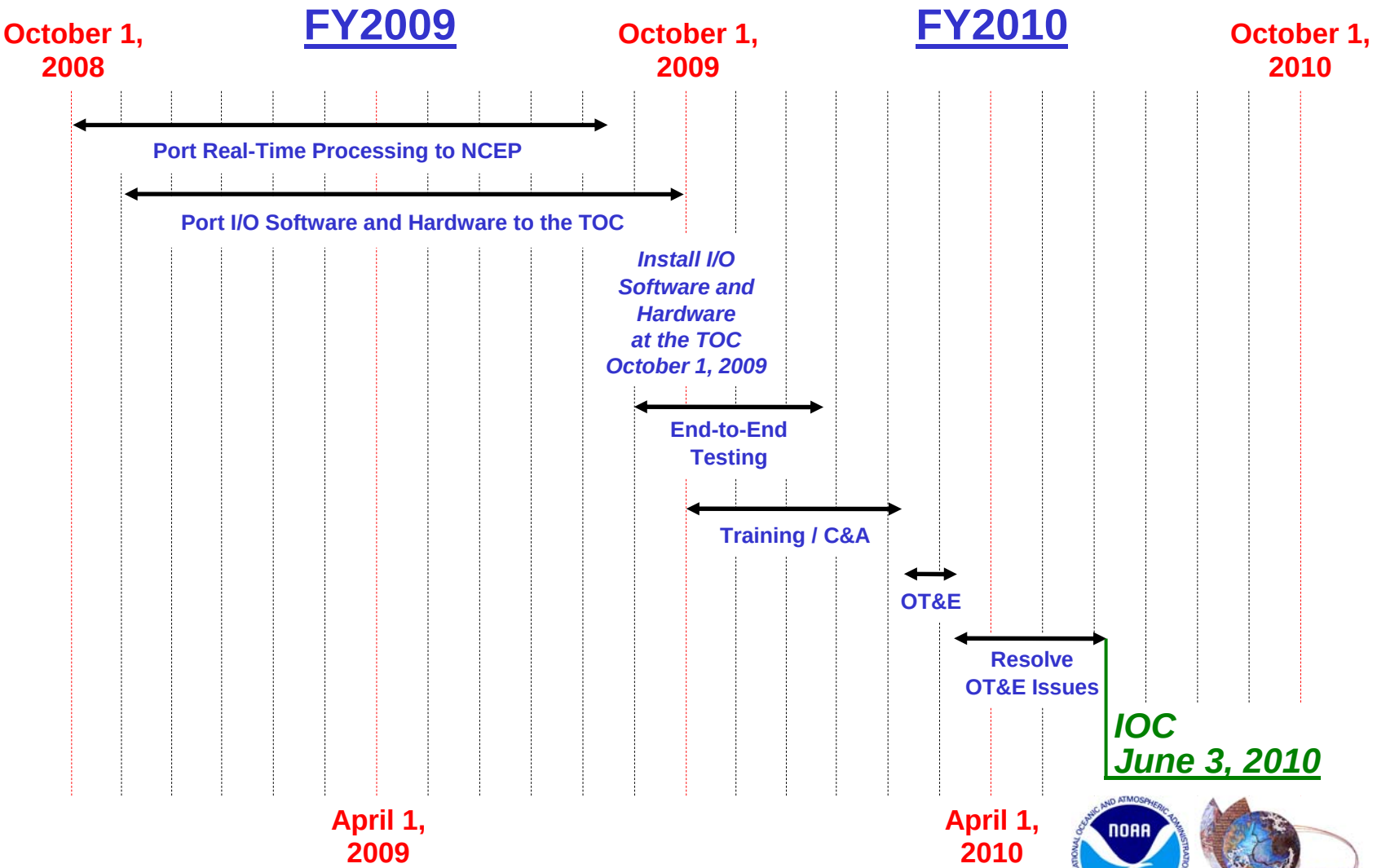
Technical Recommendation

Port the existing GSD MADIS software to an integrated NWS TOC and NCO distributed environment, with a supporting research-to-operation test environment at GSD

MADIS Compute Environment



MADIS Transition Plans Time Table to IOC



MADIS Transition Plans
Time Table to FOC

FY2010 | **FY2011** | **FY2012**

June 1, 2010 — April 1, 2011 — April 1, 2012

- Port Data Recovery Process to NCEP
- Port Web Displays to TOC MADIS Servers
- CAP Port to TOC
  Install CAP Hardware and Software January 14, 2011
- Prepare Archive for Transfer to NCDC
- End-to-End Testing
- OT&E (4/14/11 – 4/29/11)
- Resolve OT&E
- ***FOC June 14, 2011***

October 1, 2010 — October 1, 2011

Post-FOC Product Improvement

Product improvements such as: 1) advanced data query and web services; 2) expanded metadata fields; 3) additional datasets; and 4) improved and expanded observation QC will serve:

NOAA Operations

- NextGen – includes high frequency ASOS
- National Surface Weather Observing System (NSWOS)/FHWA support
- Historic Climate Network – Modernized (HCN-M)
- UrbaNet, National Mesonet
- Next Generation NOAA Profiler Network (NGNPN)

NOAA Research

- Testbeds (HMT, DTC, Severe Weather Testbed)
- Fire weather mobile observations
- DHS research support
- UAS data management

Observations: MADIS NextGen Services

Sounding Systems
- NOAA Profilers
- Cooperative Profilers
- Radiometers
- Ceilometers
- Sodars

Satellites
- Vector Winds
- Soundings
- Radiance

Radars
- NexRad
- TDWR/ARSR
- Private

Aircraft
- AMDAR
- TAMDAR
- UAS

Surface
- ASOS/AWOS/SAO
- Marine
- DoT/RWIS
- Integrated Mesonet
- Climate
- Mobile Platforms
- Snow Fall/Depth

Radiosonde

- Data Integration
- Quality Controlled Observations
- Metadata
- Accuracy and Availability Statistics
- Net-Enabled Observation Subsetting and Web Responses

Web Services

Network Enabled Operations

Questions?

Patricia.A.Miller@noaa.gov

MADIS Home Page URL
http://madis.noaa.gov

MADIS

Supplemental Slides Follow

MADIS URLs

- Home Page
  madis.noaa.gov/
- Real-Time Surface Observation Display
  www-frd.fsl.noaa.gov/mesonet/
- Real-Time Profiler Display
  www.profiler.noaa.gov/npn/profiler.jsp
  www.madis-fsl.org/cap
- Real-Time Aircraft Display
  acweb.fsl.noaa.gov
- Real-Time Upper Air Soundings
  www-frd.fsl.noaa.gov/soundings/java

Surface Observation Web Page