MesoWest
Accessing, Storing, and Delivering Environmental Observations

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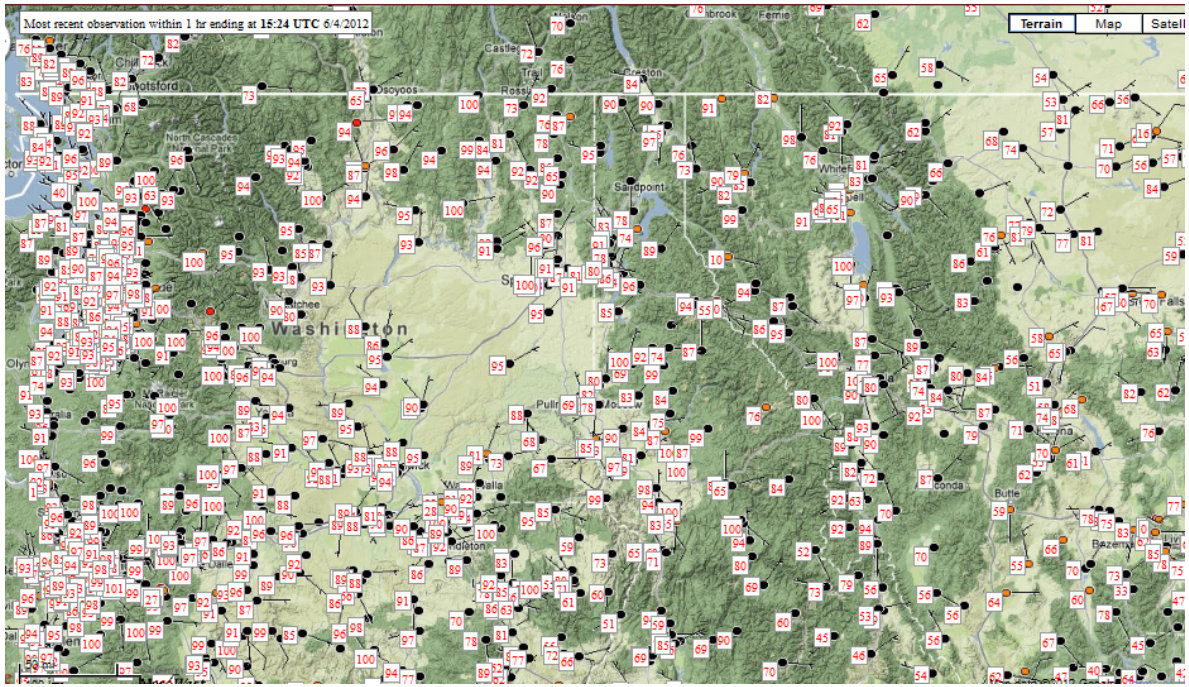

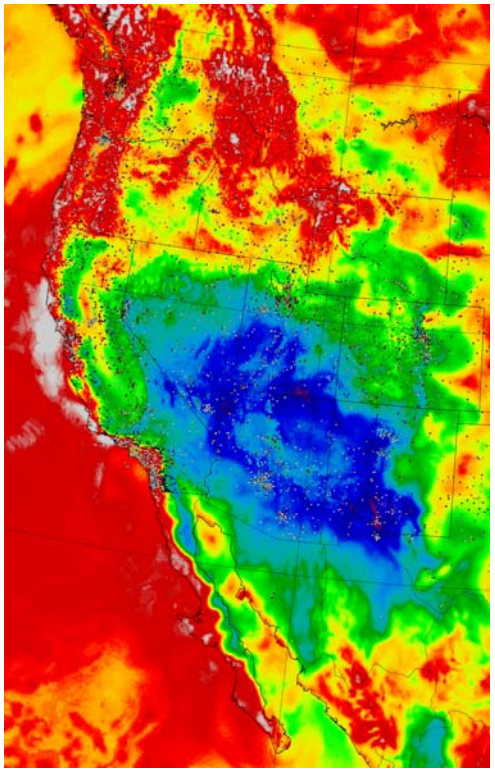

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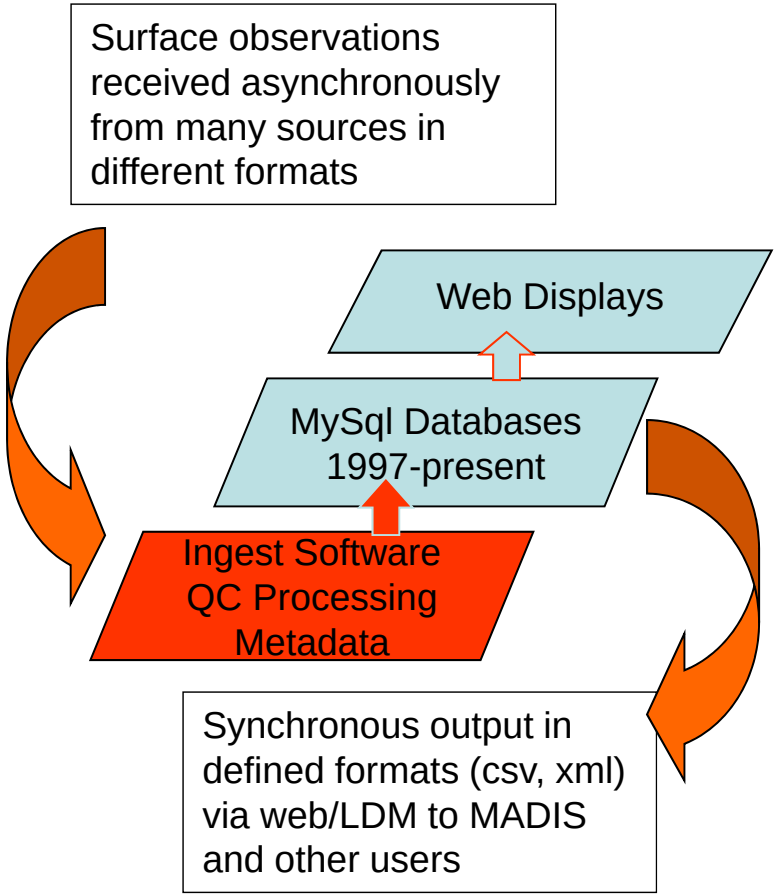
http://mesowest.utah.edu

- Goal: promote and support access, storage, and use of environmental observations across the nation
- Collect provisional data as they become available from hundreds of sources
- Archive the data in relational databases
- Provide access to the data via the web and through variety of data pushes and pulls
- Work closely with MADIS-NWS data hub



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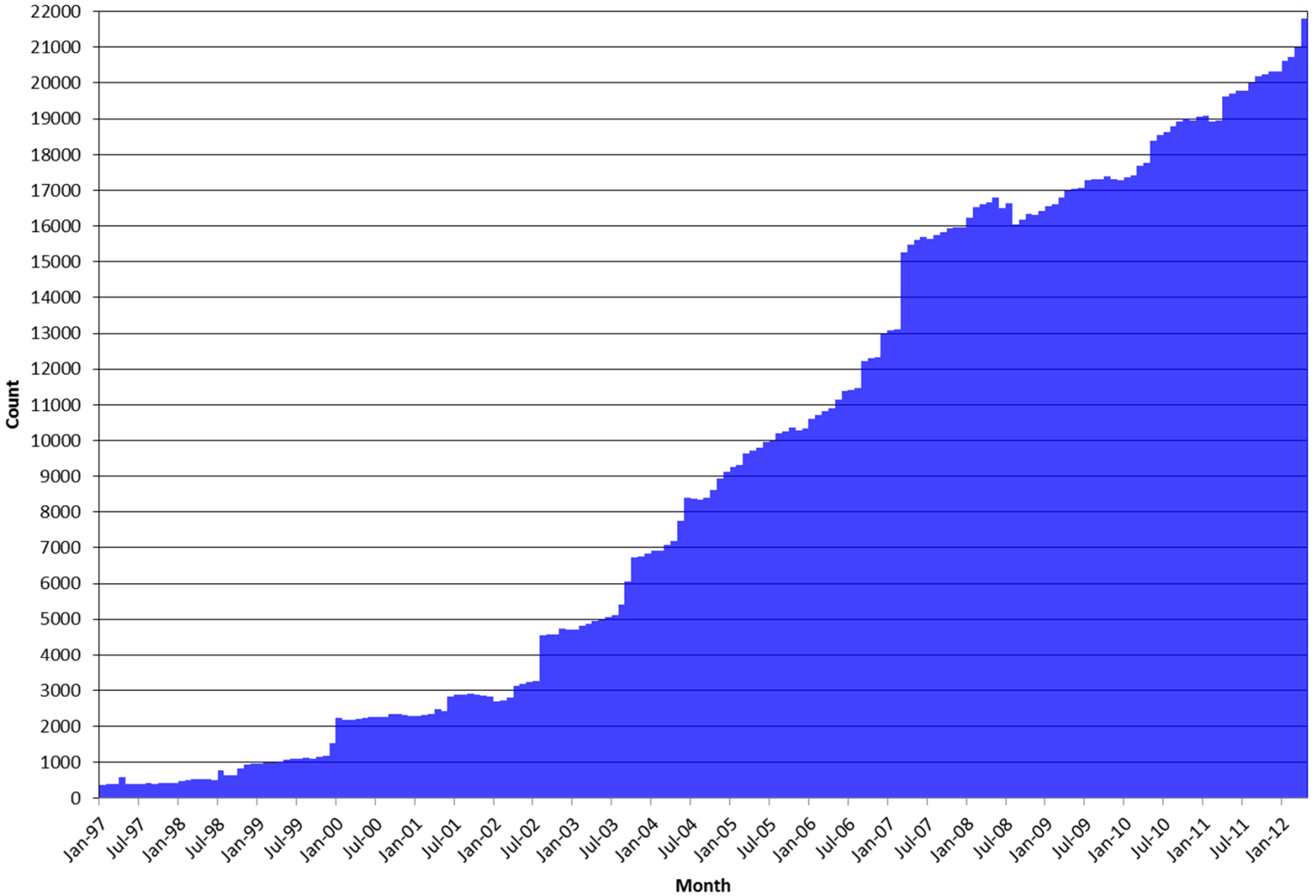
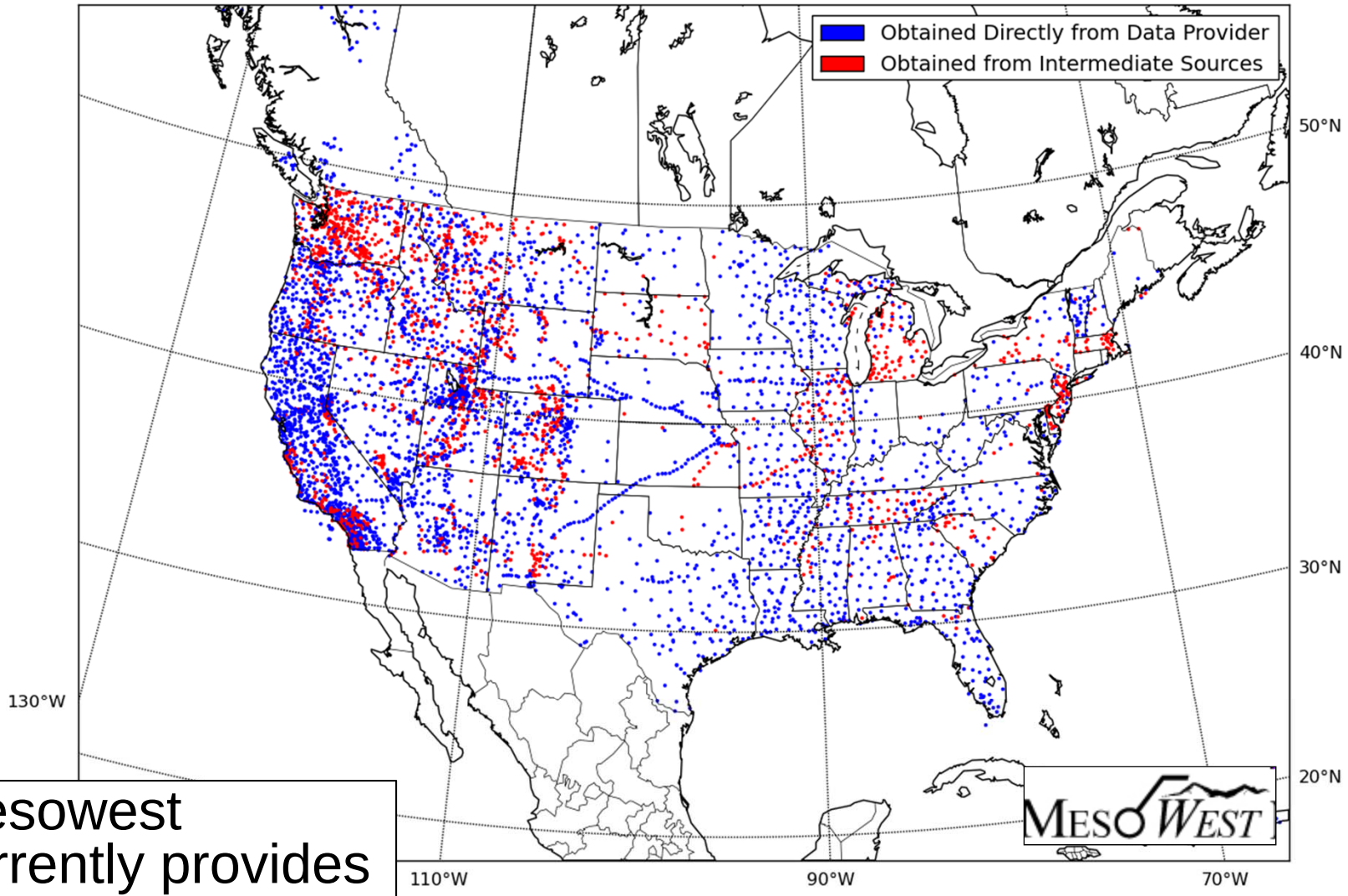
Monthly Total of Actively Reporting Stations ~ Jan. 1997 - Apr. 2012



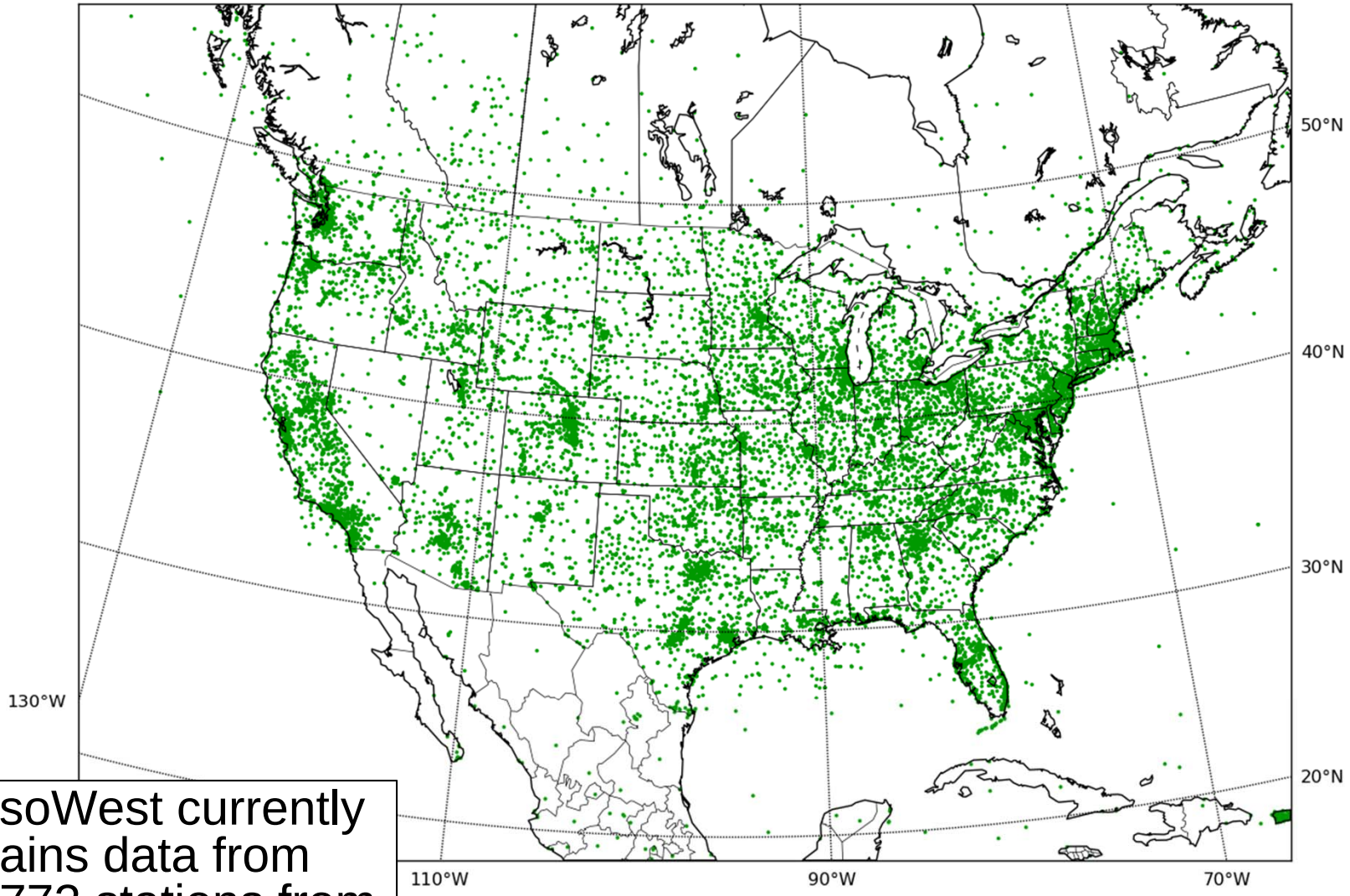
Stations in MesoWest Distributed to MADIS



Mesowest currently provides data from 6,415 stations to MADIS

Many in PNW obtained from University of Washington

Stations in MesoWest Obtained from MADIS



MesoWest currently obtains data from 15,772 stations from MADIS

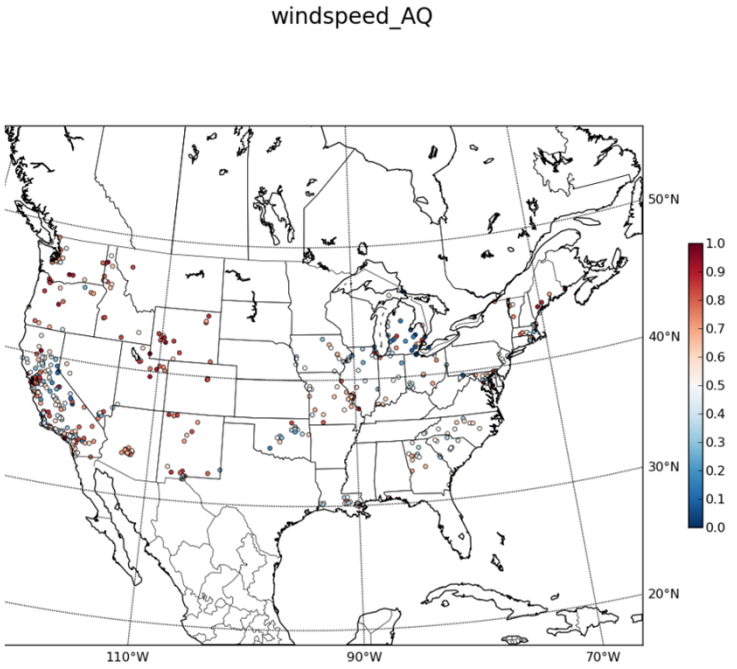
Categorizing Mesonets

TABLE 1. Mesonet categories based on purpose and type of network, total number of stations and the median IDI value for that category, and the number of observations and assumed observation to background error variance ratio for each variable.

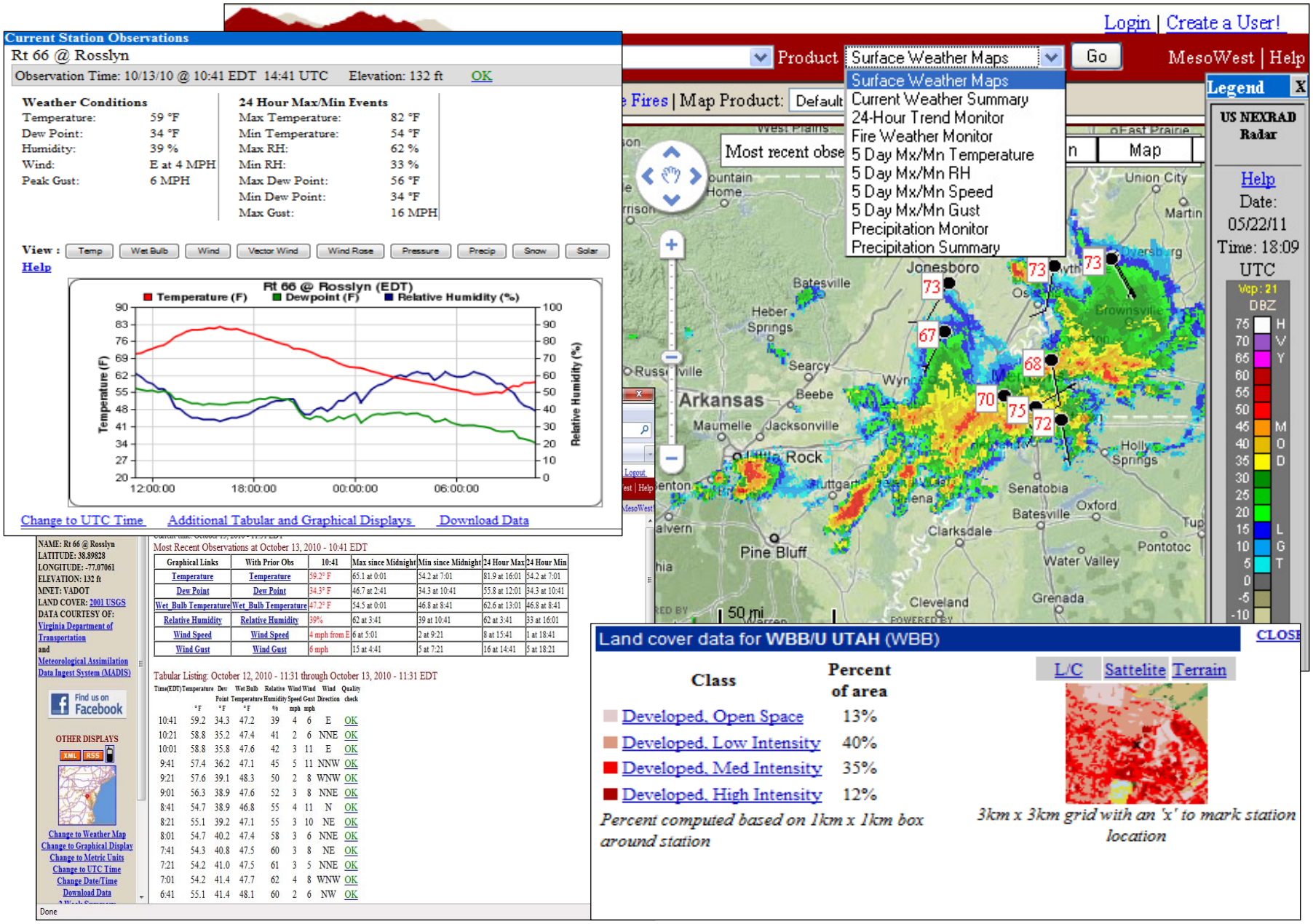
					Temperature		Dewpoint		Wind	
Category	Group Purpose/Type	No. of Networks	Total No. of Stations	Median IDI	No.	σ_o^2/σ_b^2	No.	σ_o^2/σ_b^2	No.	σ_o^2/σ_b^2
NWS	NWS/FAA	1	1814	0.94	1751	1.0	1747	1.0	1733	1.0
FED+	Federal and state networks	21	849	0.95	696	1.0	513	1.0	470	1.0
RAWS	Fire weather	1	1986	0.86	1736	2.0	1729	2.0	1674	2.0
PUBLIC	Primarily Citizen Weather Observing Program (CWOP)	3	6808	0.96	5263	1.5	5168	1.5	4842	2.0
AG	Agricultural	9	472	0.94	440	1.5	434	1.5	413	2.0
AQ	Air quality	8	796	0.96	522	1.5	227	1.5	650	1.5
EXT	Offshore, Canadian, Mexican	6	940	0.71	755	1.5	392	1.5	628	1.5
HYDRO	Hydrological	11	3580	0.85	1411	2.0	151	2.0	207	2.0
LOCAL	Commercial, state, and local	41	799	0.94	610	1.5	542	1.5	492	1.5
TRANS	Road and rail weather	24	1653	0.93	1538	1.5	1116	1.5	1076	1.5
	TOTAL	125	19697	-	14722	-	12019	-	12185	-

Pac NW Atmospheric Data from state AQ networks in MesoWest

- ID- via Airnow
- WA- via Airnow & UW
- MT- only Polson from Airnow
- OR- via Airnow & UW



MesoWest Product Examples



Quality Control of Observations

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- Typical baseline checks of observations as received
- Developing tools to use pdf's of observations over available record (can be as long as 1997-present)
- Use national scale hourly analyses of temperature, moisture, and wind at 2.5 km run at University of Utah to evaluate observations further
  - intended to provide overview of networks' "health"

Relative Humidity: 6/3 23 UTC

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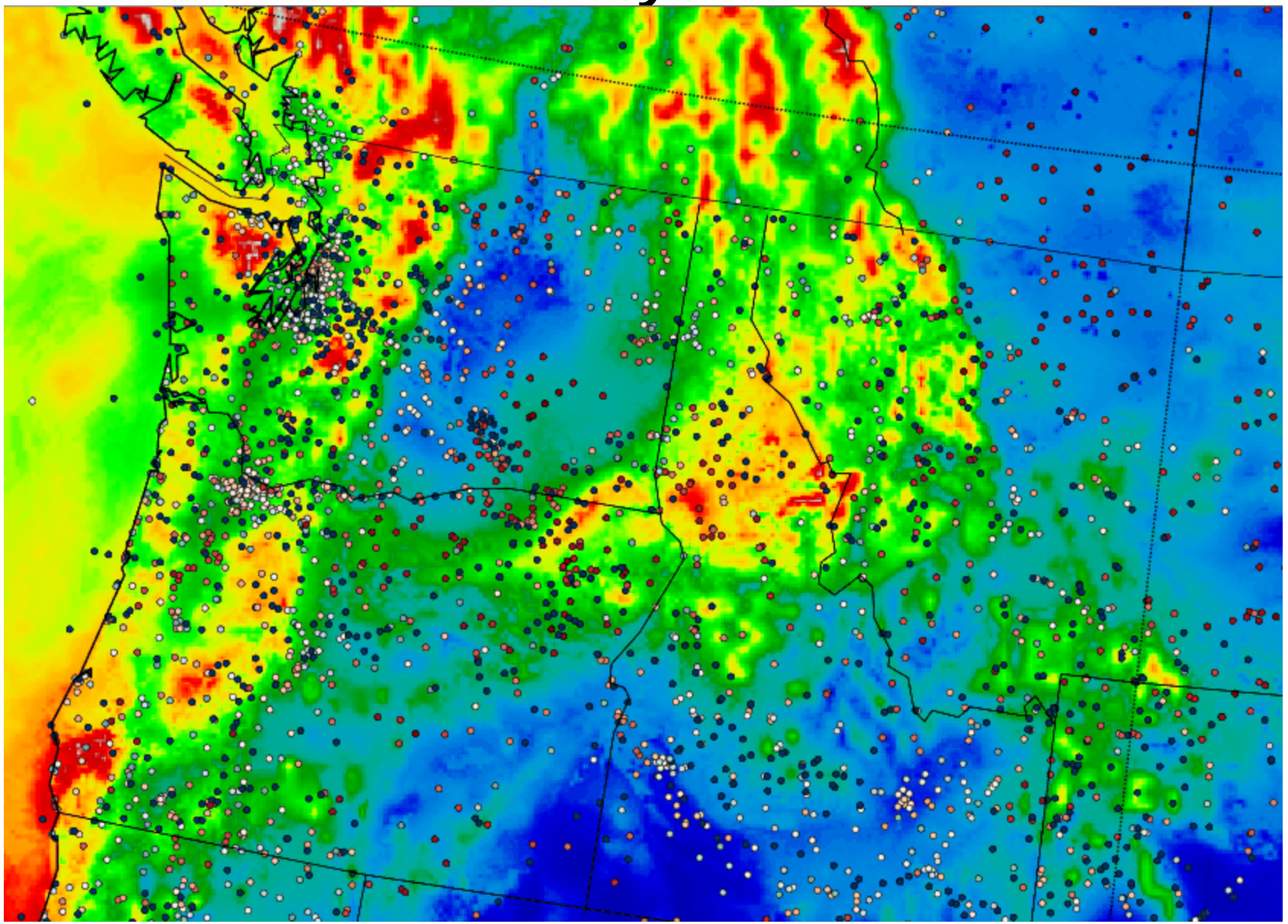
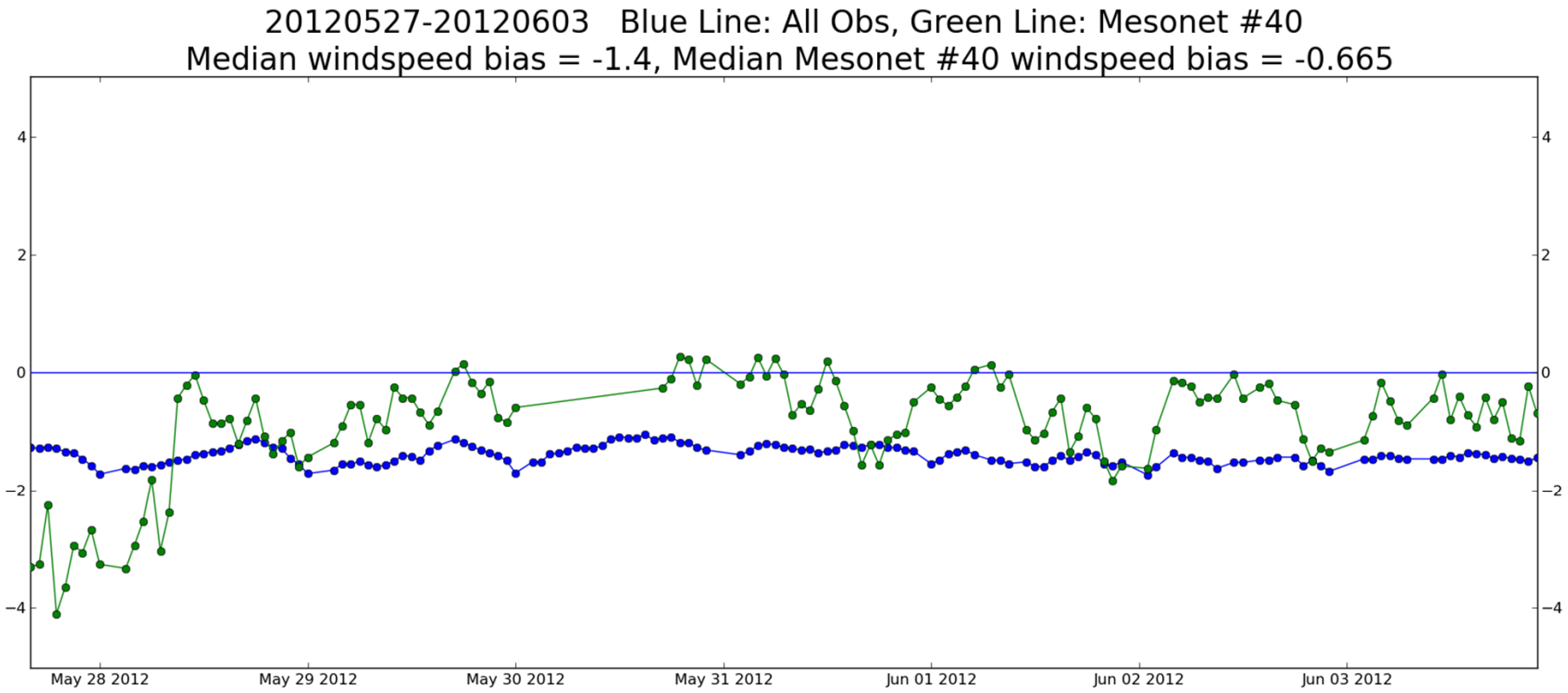
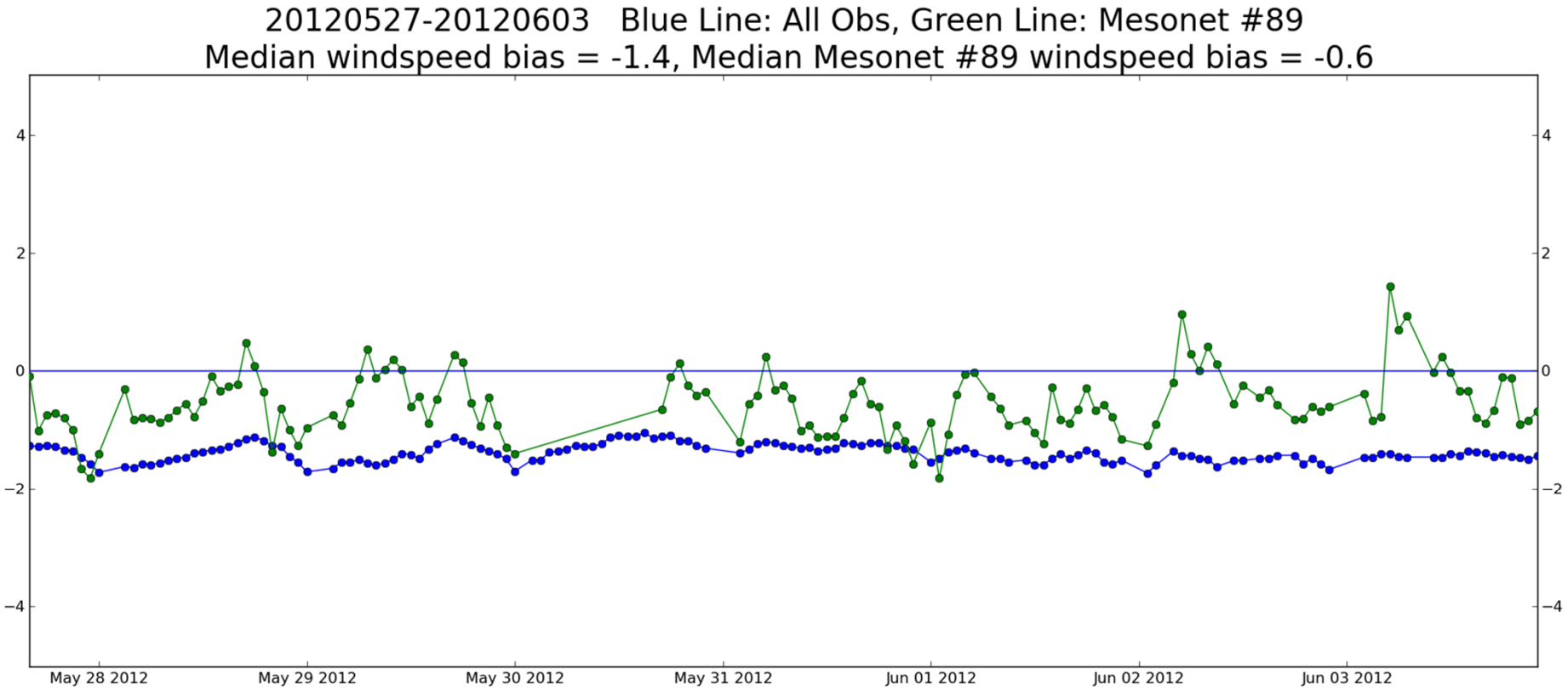


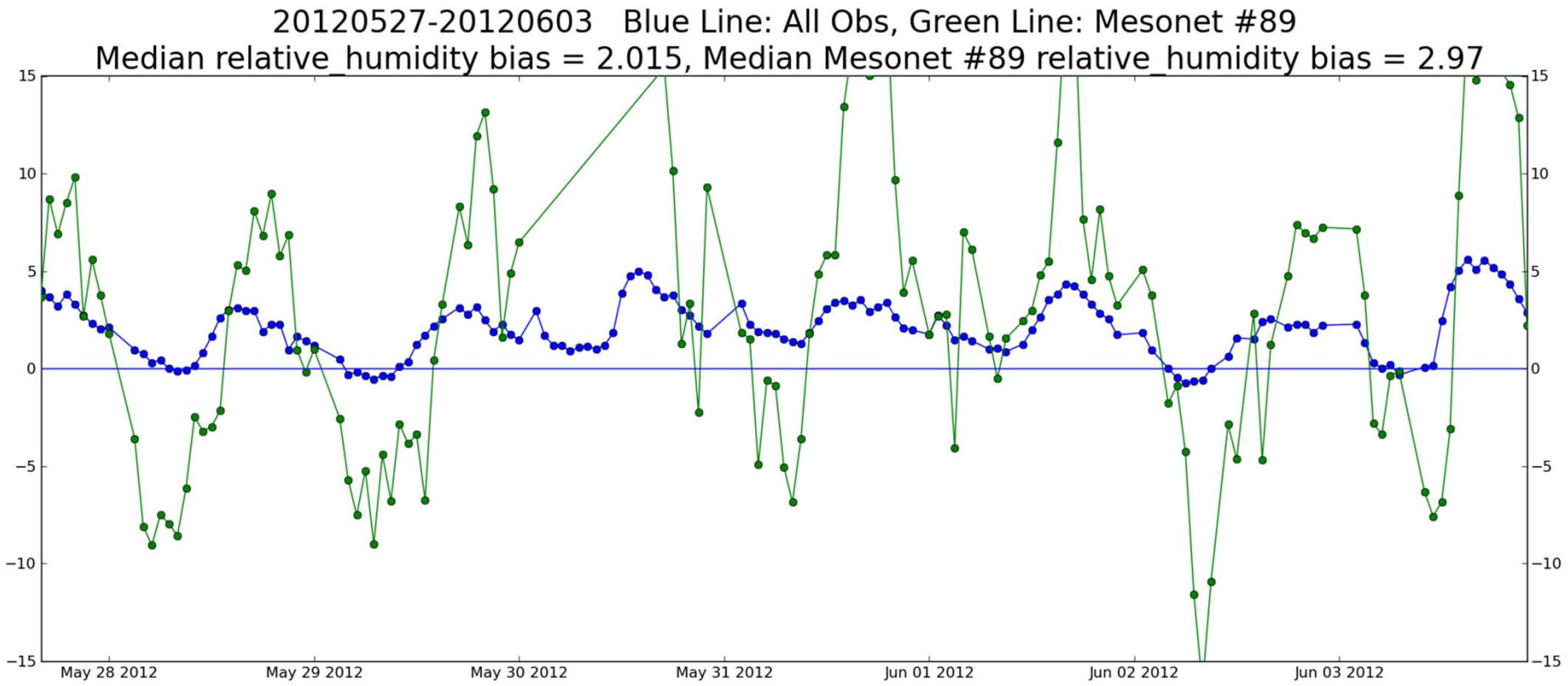
Washington State Department of Ecology Air Quality Network



Oregon DEQ


20120527-20120603 Blue Line: All Obs, Green Line: Mesonet #89
Median windspeed bias = -1.4, Median Mesonet #89 windspeed bias = -0.6
4
2
0
−2
−4
May 28 2012
May 29 2012
May 30 2012
May 31 2012
Jun 01 2012
Jun 02 2012
Jun 03 2012

Oregon DEQ


20120527-20120603 Blue Line: All Obs, Green Line: Mesonet #89
Median relative_humidity bias = 2.015, Median Mesonet #89 relative_humidity bias = 2.97
15
10
5
0
−5
−10
−15
May 28 2012
May 29 2012
May 30 2012
May 31 2012
Jun 01 2012
Jun 02 2012
Jun 03 2012

Air Quality Variables

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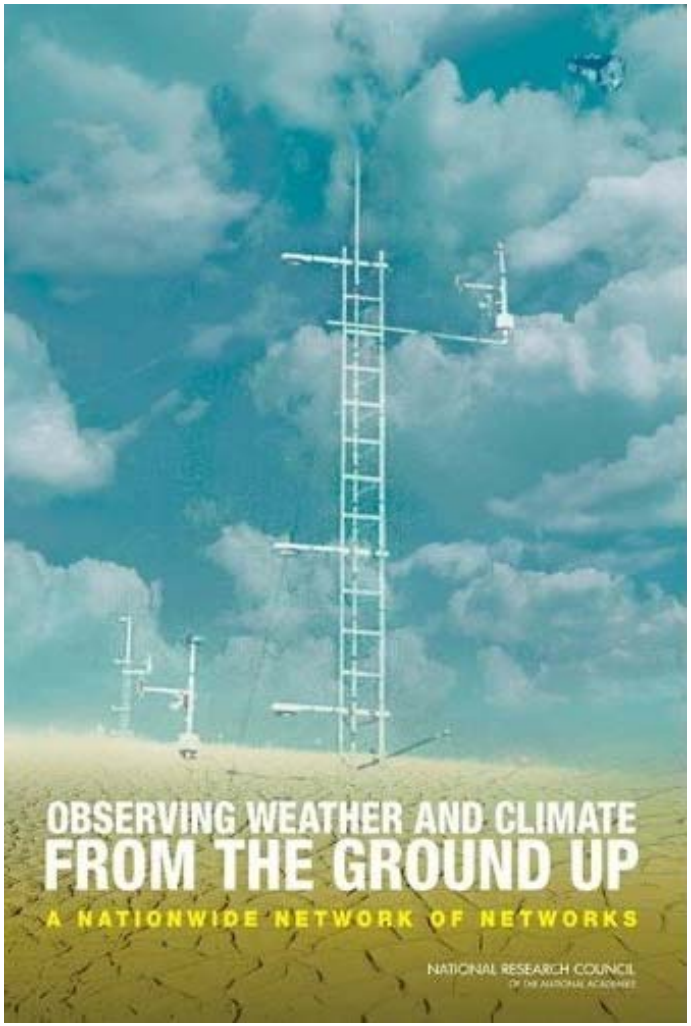
- We have the capabilities to acquire, store, and display constituent concentrations
- But, currently process only atmospheric variables from air quality networks
- We have not been asked to store and display air quality data

- National Academy of Science (2009) recommendation to build national network of networks from existing and future mesonets
- Agencies under pressure to reduce costs: BLM may cut 20% of their fire weather stations
  - "What is the Appropriate RAWS Network?" (Brown et al. 2011)



Improving the Utilization of Infrastructure Already in Place

- Why do people & organizations install weather stations?
  - Diverse needs and objectives
  - Operating a network is like raising a child; it requires constant attention, and the kid never leaves home *(Kelly Redmond. WRCC DRI)*
- Why not require single standard for all observations?
  - There are many standards developed within subdisciplines (aviation, fire weather, air quality, climate)
- What makes an observation valuable?
  - Provide accurate relevant information not available from other sources
- How can valuable observations be distinguished from questionable ones?
  - Manual and automated quality control procedures
  - Examine impact of observations from differing sources and locations over many cases through cross-validation or other means
  - Conduct OSE/OSSE studies on network design

For More Details:

IMPACTS OF MESONET OBSERVATIONS ON METEOROLOGICAL SURFACE ANALYSES

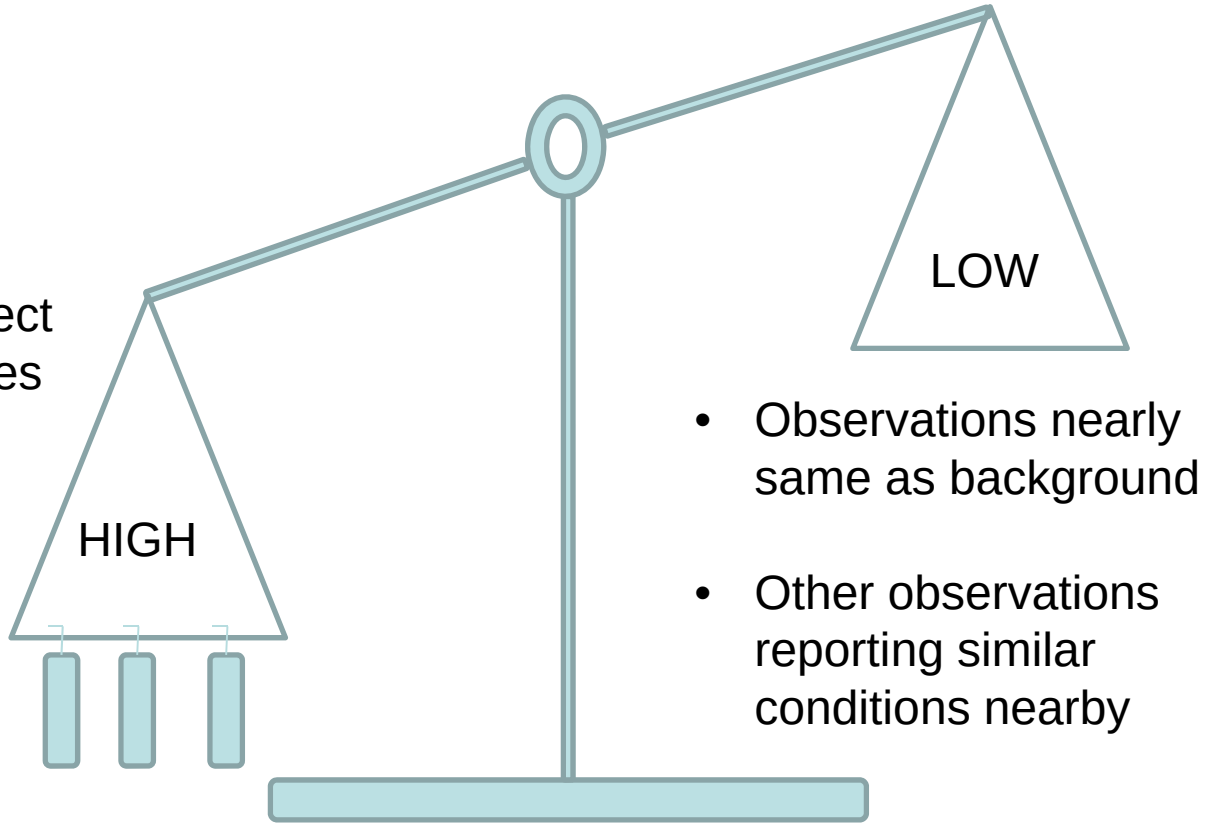
Tyndall and Horel (2012)

Submitted to: *Weather and Forecasting*

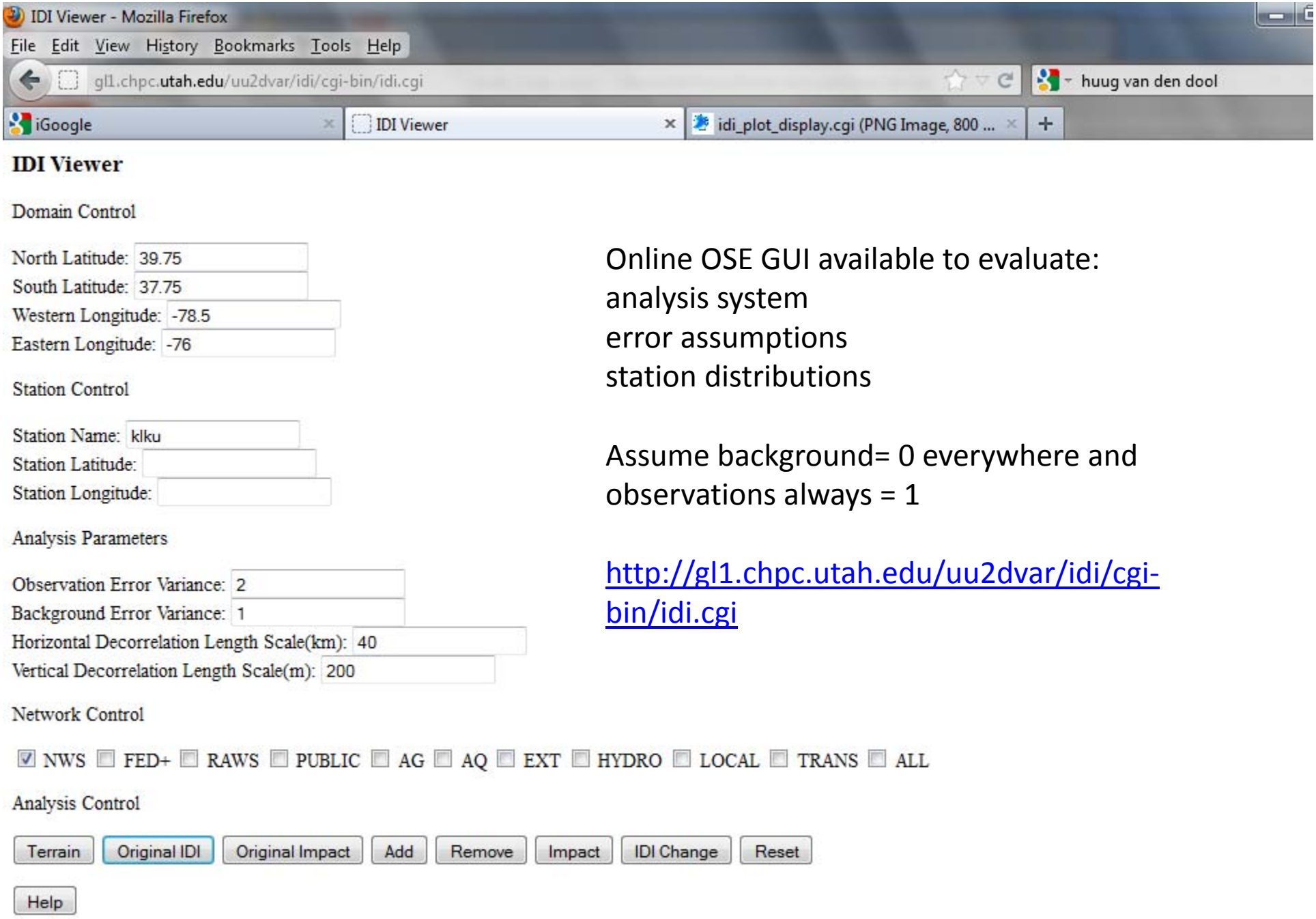
http://chpc.utah.edu/~u0035056/Tyndall_2012.pdf

What leads to high impact of observations on analysis?

- Observations detect mesoscale features missing from background
- Bad observations
- Background poor



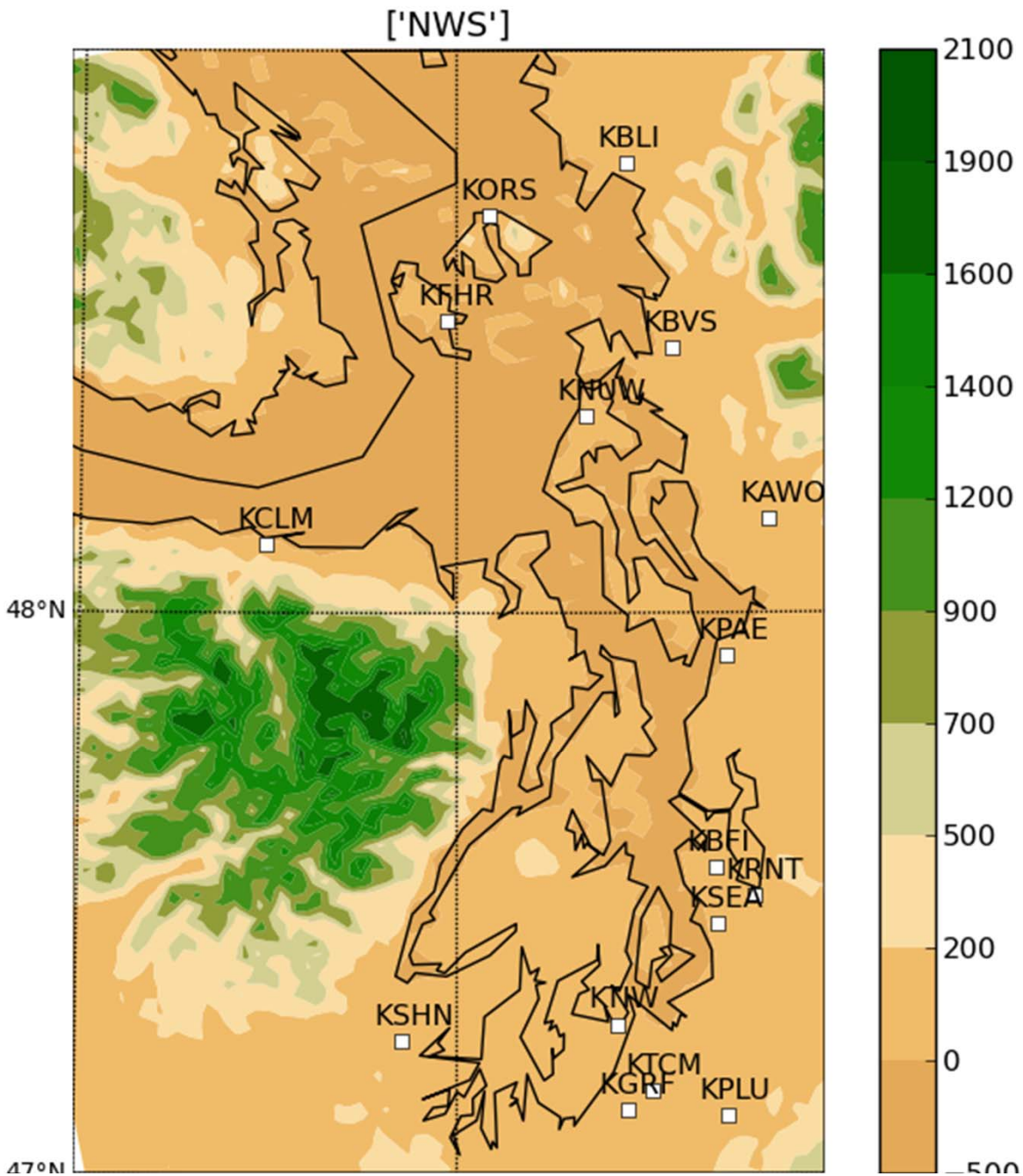
- Observations nearly same as background
- Other observations reporting similar conditions nearby



Online OSE GUI available to evaluate:
analysis system
error assumptions
station distributions

Assume background= 0 everywhere and observations always = 1

http://gl1.chpc.utah.edu/uu2dvar/idi/cgi-bin/idi.cgi


['NWS']
KBLI
KORS
KBVS
KCLM
KAWO
48°N
KPAE
KBFI
KRNT
KSEA
KSHN
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KPLU
47°N
2100
1900
1600
1400
1200
900
700
500
200
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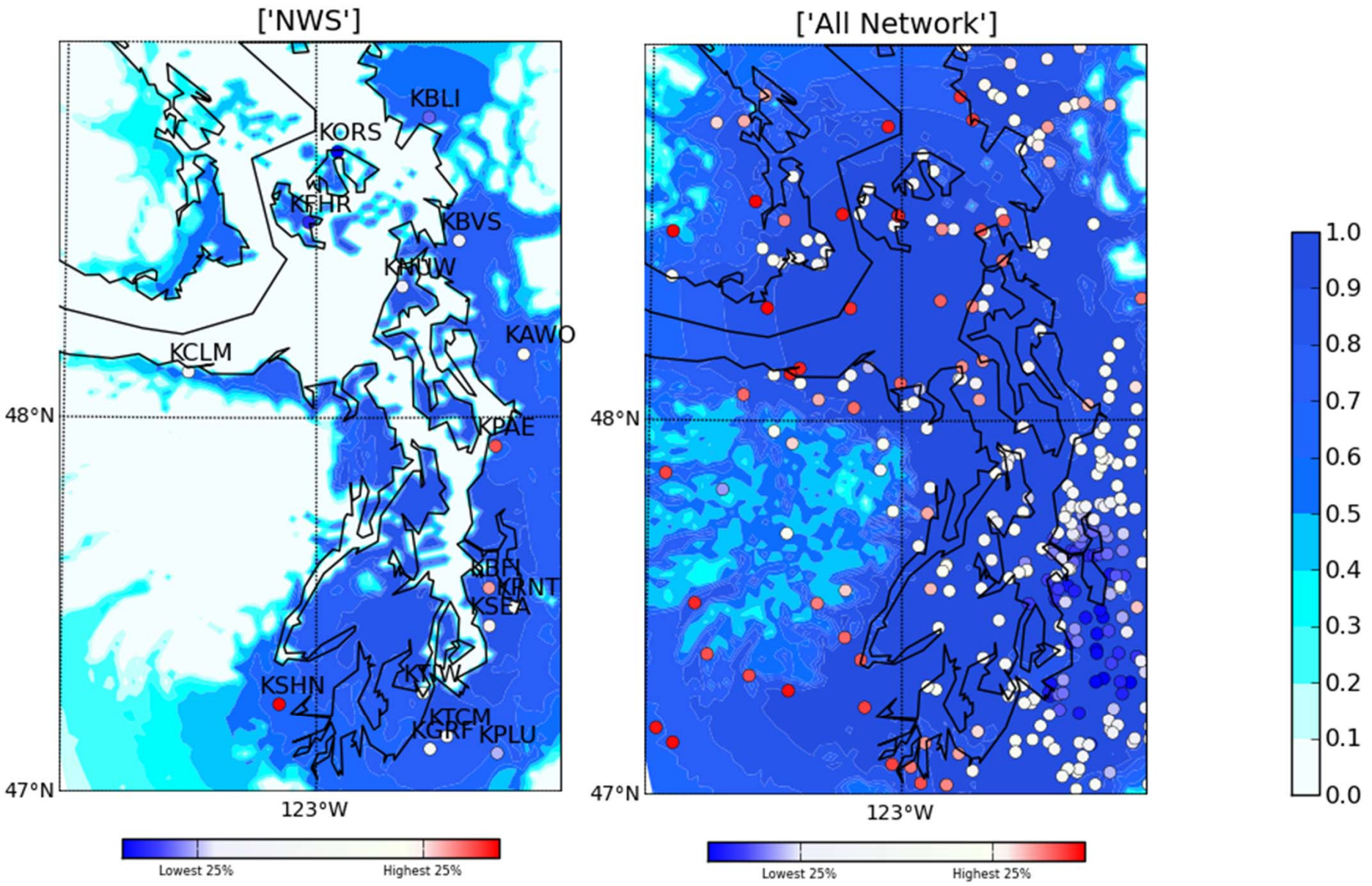

Stations with largest impact tend to be ones where not as many observations

Key Points

- Station impact can be high if corroborates other nearby observations
- Stations in otherwise data voids are not necessarily the ones with the largest impacts
- Depends on observation spacing relative to assumed spatial scales of background errors

Summary

- MesoWest helps in the acquisition, archival, dissemination of environmental observations and develops software required to do so
- If you know of additional sources of data, we'd be happy to work with you to archive, display, and transmit to other users
- The "value" of observations in the context of impact on analyses depends:
  - more on the number of other observations available in that area and the weather variability in that area
  - less on the network type
- CONUS scale analyses can help provide additional metrics to develop automated quality control checks
- If there is interest and support, displays could be made to show constituent concentrations

The open resource for environmental monitoring networks

- forum for the continually growing and diverse community of owners, operators, and users of environmental monitoring networks
- way to let others know what's new. Have stations been added or moved or have sensors been added?
- foster the exchange of ideas and information on best practices and standards developed within specific user communities (weather, water, air quality, soil, off shore, alternative energy, etc.).
- open virtual community that addresses some of the goals expressed in the U.S. National Research Council report— Observing the Weather and Climate From the Ground Up: A Nationwide Network of Networks— including to help foster a U.S. network of networks for meeting multiple national needs related to environmental data.