

# The New Regional Quality Control System

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Pacific Northwest Weather  
Workshop



# Why Perform Quality Control (QC) on Observations?

- The integrity and value of all verification activities depends on the quality of the data.
- Similarly, as we move to mesoscale initialization for the MM5/WRF quality control of the data is critical.
- Future bias correction will depend on the quality of the observations.
- Currently, only a simple range check is performed on in-coming obs.

# And why do **automated** QC?

- ☞ Can't possibly do manual QC on all of the obs we ingest.
- ☞ No automated QC program will be perfect, and some bad values may slip through. Some non-bad values may get flagged also.

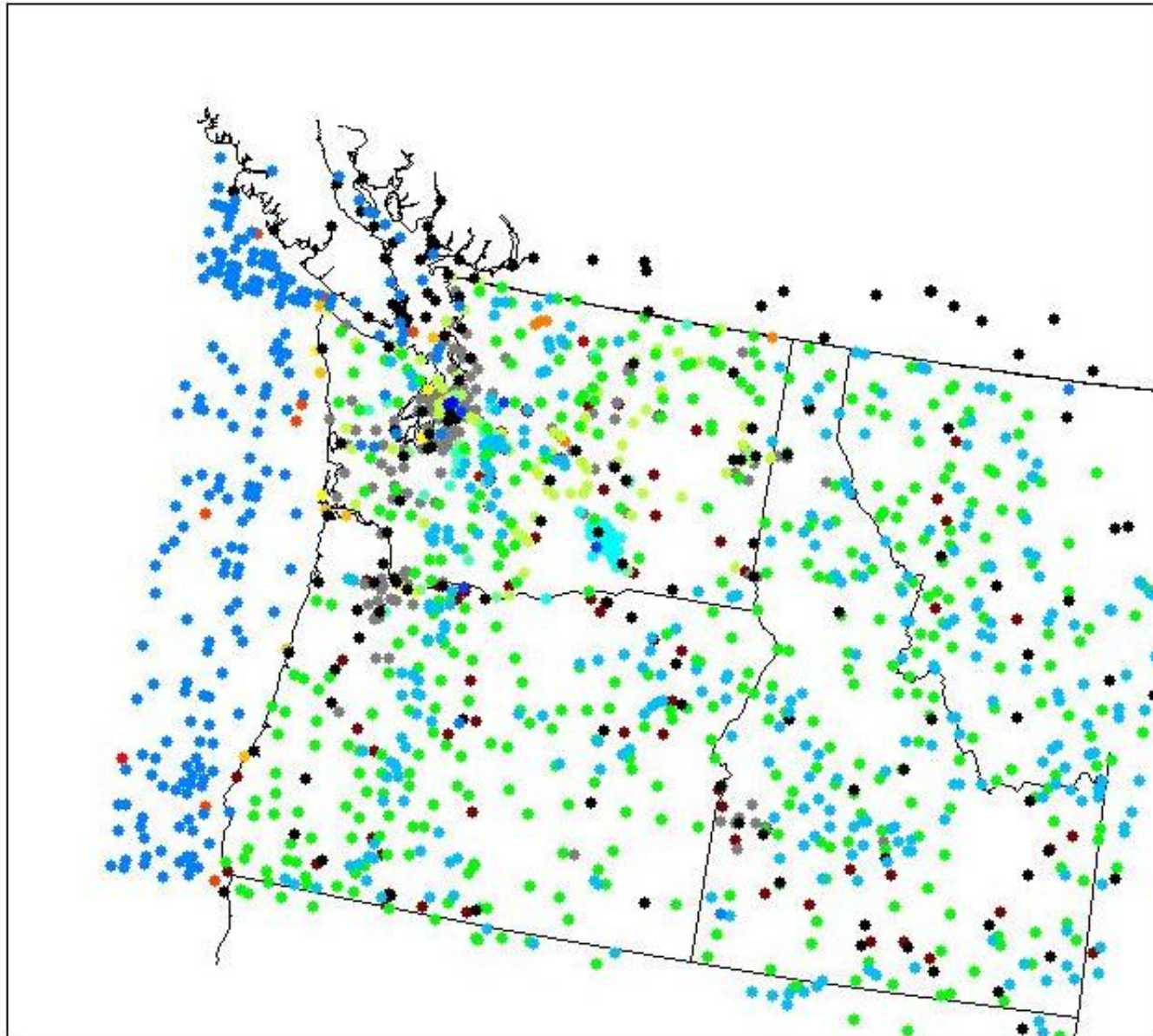
# Description of the Obs

- Many unknowns about individual networks, and generally there's a lack of documentation for them.
- Networks vary in quality :
  - Instrumentation varies, as does accuracy of measurements.
  - Siting varies between networks, including instrument height, surroundings, etc.
  - Calibration standards vary between networks– how many networks perform annual calibration?



All Observations Found for: temp, 2004, total: 1527

- AM: Agrimet Sensors
- AU: Avalanche Obs
- AW: Schoolnet Obs
- BD: Drifting Buoy Obs
- BF: Fixed Buoy Obs
- CL: Seattle City Light Obs
- CM: CMAN Stations
- CU: Coastal US Obs
- DT: RMS Obs
- EC: Ecology Sensors
- GS: USGS Obs
- HN: Hanford Sensors
- RW: RAWS Obs
- SA: Surface Aviation Obs
- SN: Snotel Obs
- SS: Ship Synoptic Obs
- UW: UW Roof Obs



# The Flags

- No data is thrown out– it is only flagged.
- Each test has a flag, which can be “pass,” “suspect,” “warning,” and “failure.”
- Only a range test failure can cause a “failure” flag.

# The Four QC Tests

- ❑ Modeled after Oklahoma Mesonet automated QC procedures (Shafer et al 2000, *J of Oceanic Tech*).
  - ❑ With some differences, due to differences between the Northwest and OK. (Like lots of topography!)
- ❑ Performed on 6 variables: temperature, relative humidity, wind speed and direction, sea level pressure, and 6- and 24-hr precipitation.
  
- **Range check--** simplest of them all; just a sanity check on the value, similar to what we're already doing.
- **Step check--** looks for unreasonably large jumps between hour time steps in the data.
- **Persistence check--** looks for a "flat-lined" time series.
- **Spatial check--** checks value in question versus those surrounding it. The most tricky one to get right!

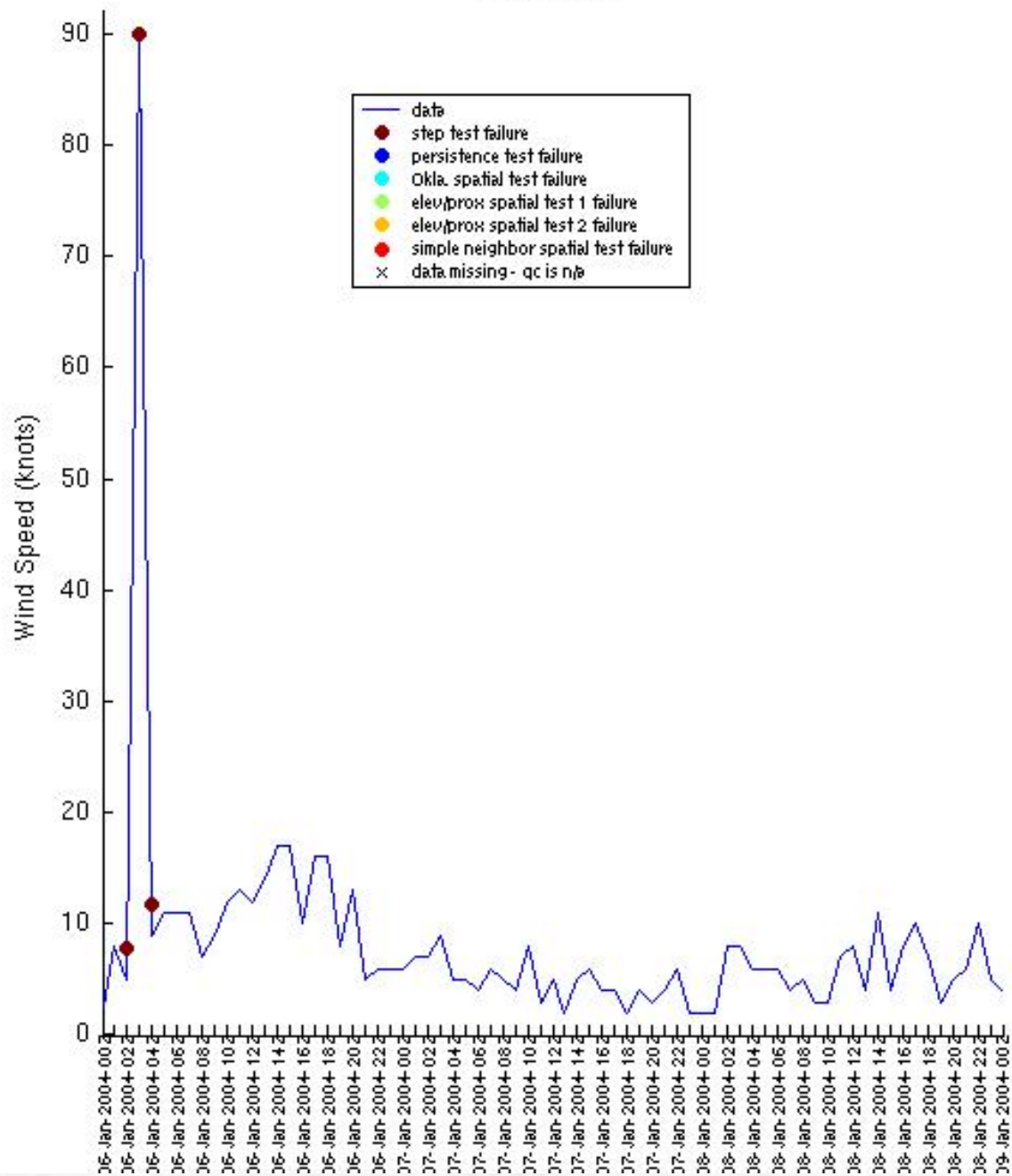


# Step Test– Flagged Threshold between successive obs

Variable	"Suspect"	"Warning"
Temperature (K)	10	15
Relative Humidity (%)	60	80
Sea Level Pressure (mb)	10	15
Wind Speed (m/s)	40	50



Station: KHIF



# Persistence Test

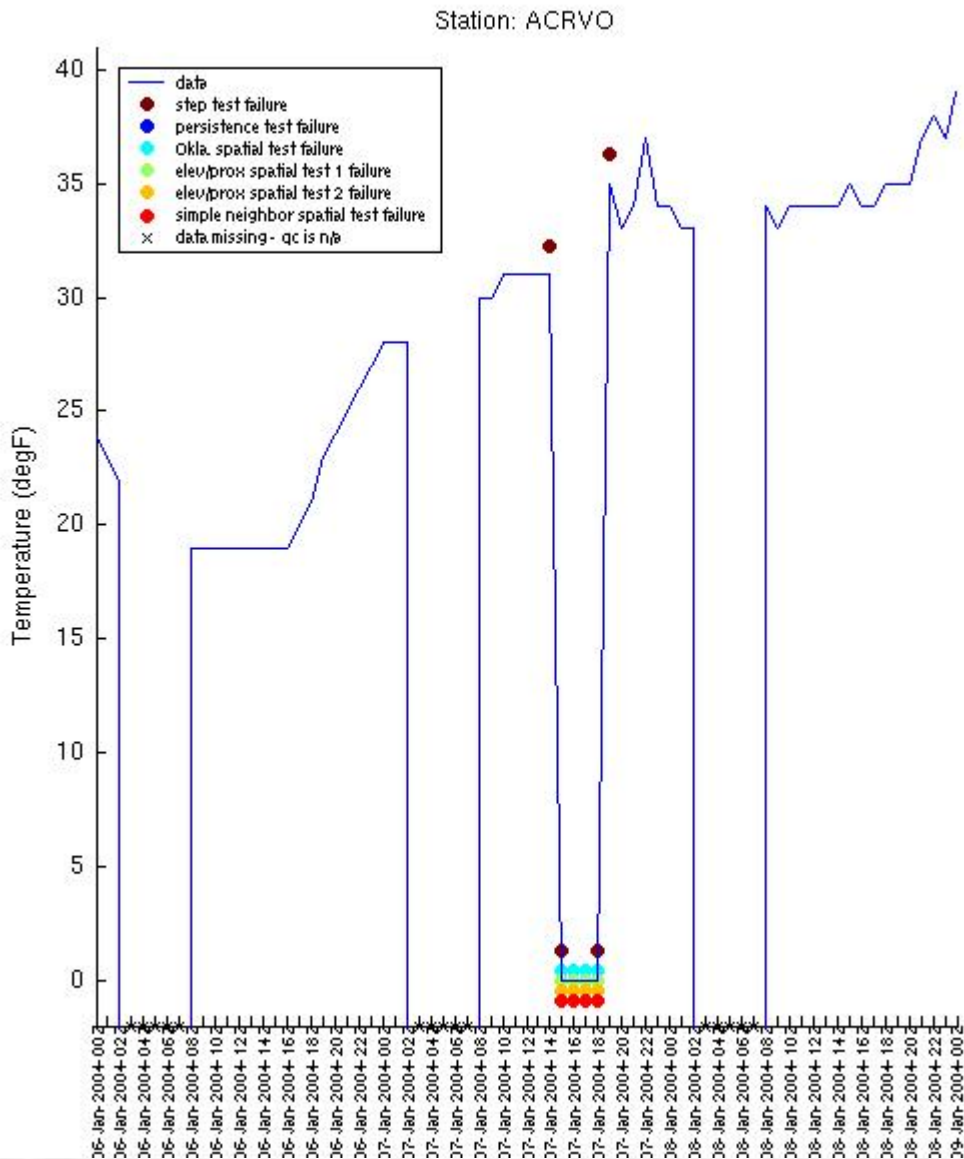
- Looks at 24 hours (18 hours for temperature) of consecutive data for a variable.
- Calculates standard deviation over the 24 hours, and if it's below a set threshold, the entire day is flagged.
- Also checks the largest delta between successive obs and if it is below a set threshold, the entire day is flagged.



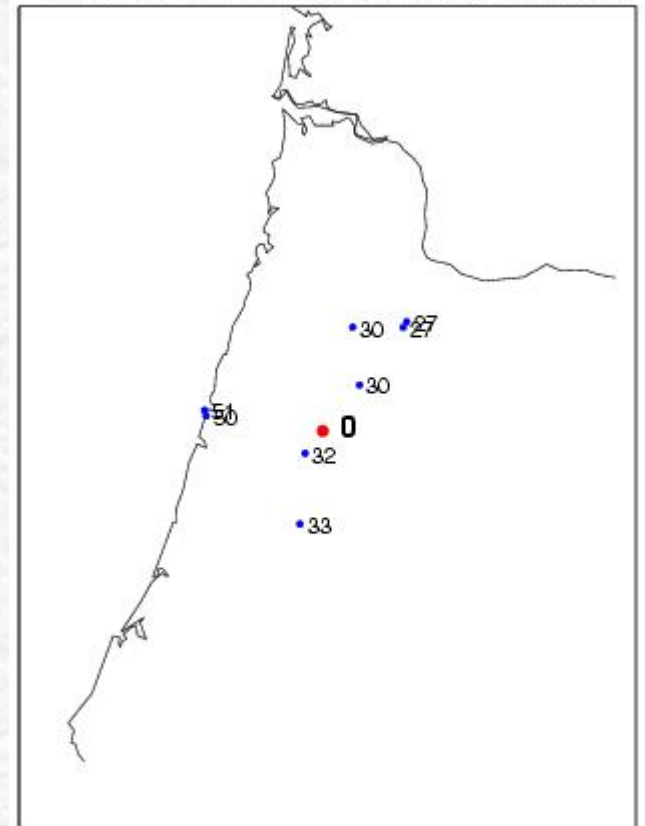


# Spatial Test

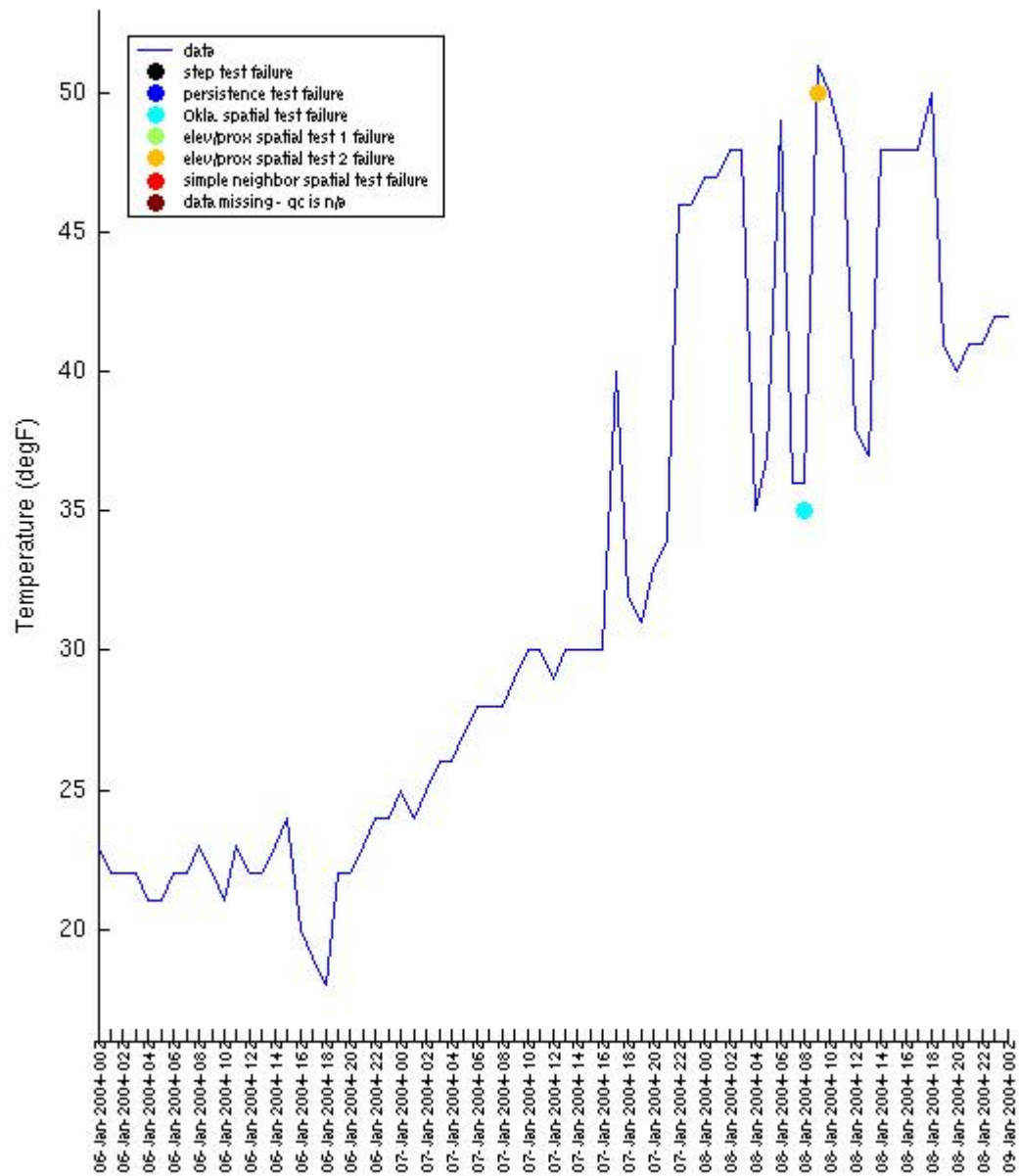
- ☛ Tested multiple spatial tests; settled on the simplest.
- ☛ For each station, looks at all stations within 100-km horizontal distance and within an elevation band (varies by variable).
  - Minimum of 5 stations required for test to be performed.
- ☛ If no station has a value reasonably close to value in question, value is flagged.
- ☛ If not enough stations are found in 100-km radius, test is performed again for a 150-km radius, but with constraints eased.



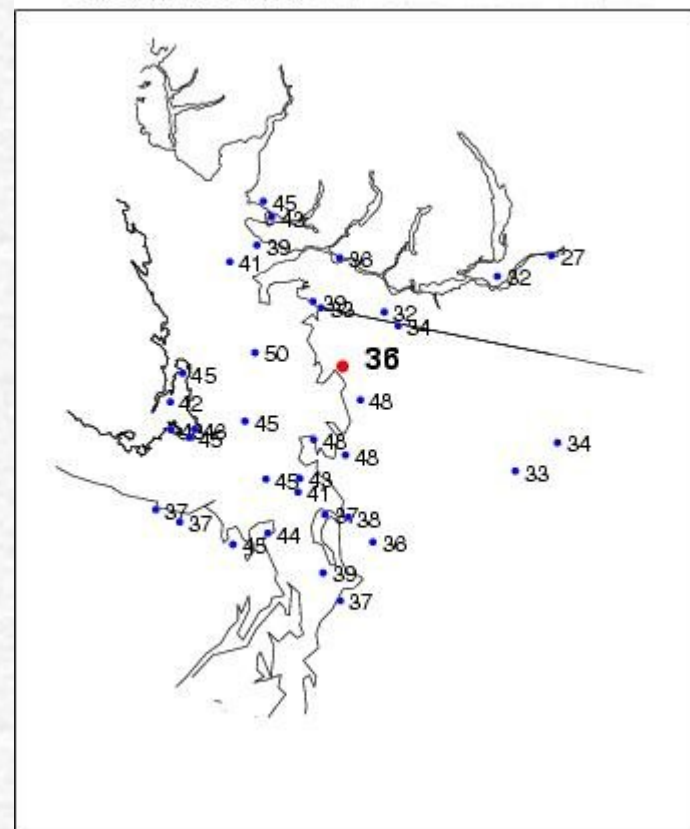
Station: ACRVO, 2004010717, value flagged as: "Warning"



Station: KBLI



Station: KBLI, 2004010808





var	n flagged	percent flagged (n/n_all_ flagged)
dir	102632	26.54
pcp24	344	0.09
pcp6	426	0.11
rh	105602	27.31
slp	625	0.16
spd	138611	35.84
temp	38479	9.95

test	n flagged	percent flagged (n/n_all_flagged)
persistence	352369	91.12
range	5928	1.53
spatial	22473	5.81
step	5949	1.54

network	n flagged	percent flagged (n/n_all_flagged)
AV	5890	1.52
AW	73636	19.04
CC	1330	0.34
CM	818	0.21
CU	1498	0.39
DT	30104	7.78
EC	865	0.22
GS	1952	0.50
HN	724	0.19
RW	230457	59.59
SA	21396	5.53
SN	10796	2.79
UW	398	0.10



# Future Work

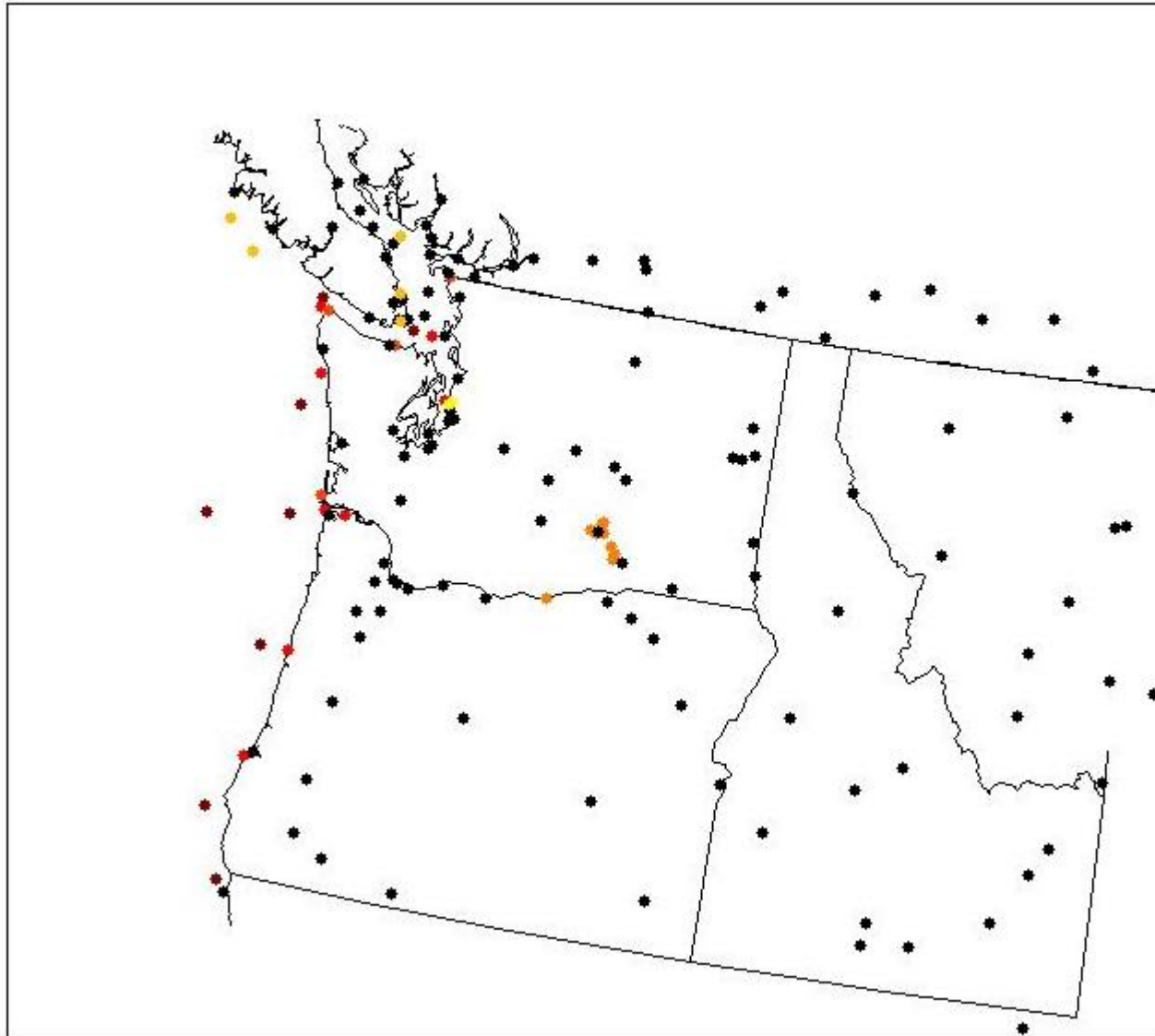
- Implement QC procedures (happening this week).
- <http://www.atmos.washington.edu/~jbaars/>



# Extra's

All Observations Found for: slp, 2004120500, total: 161

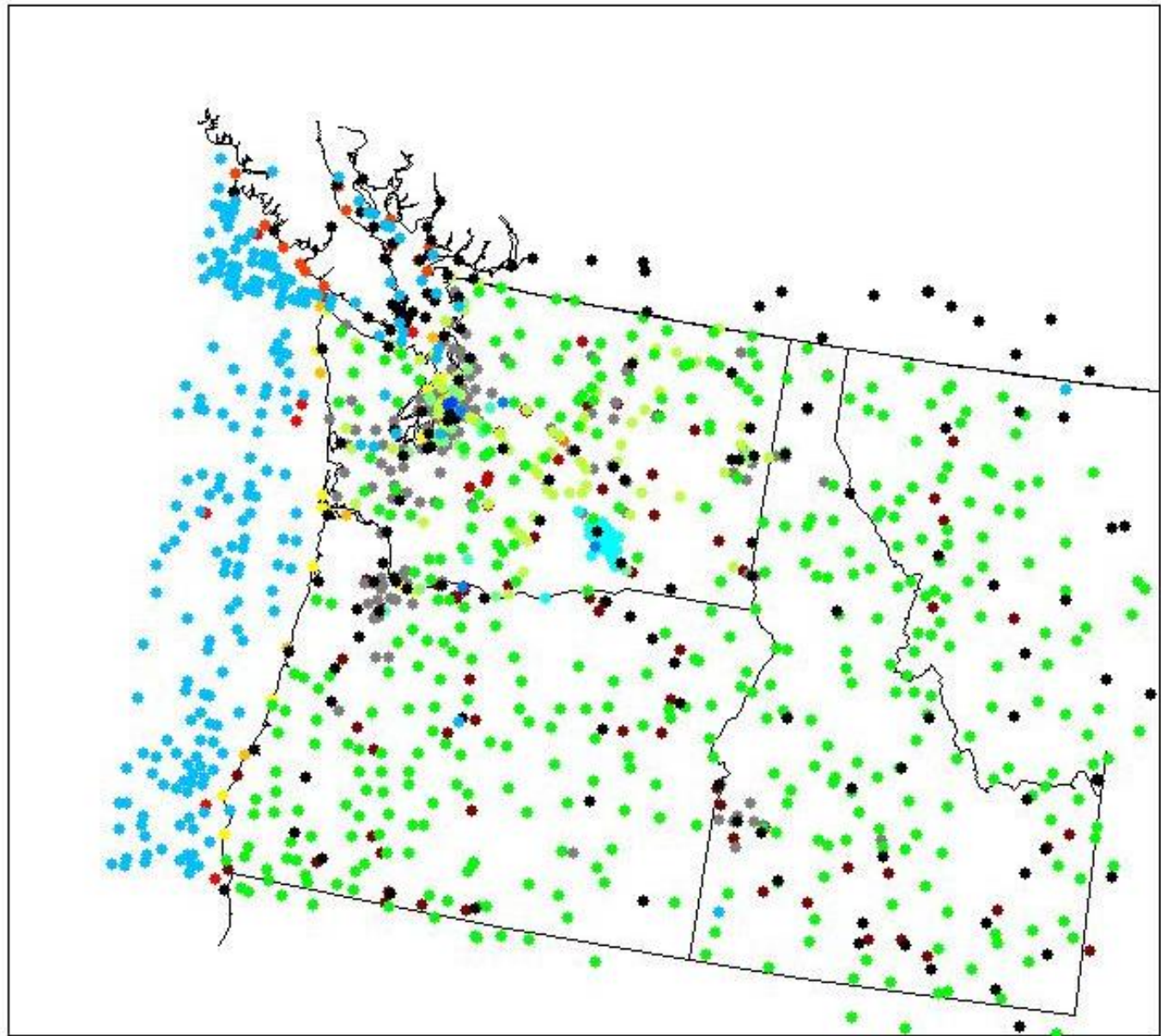
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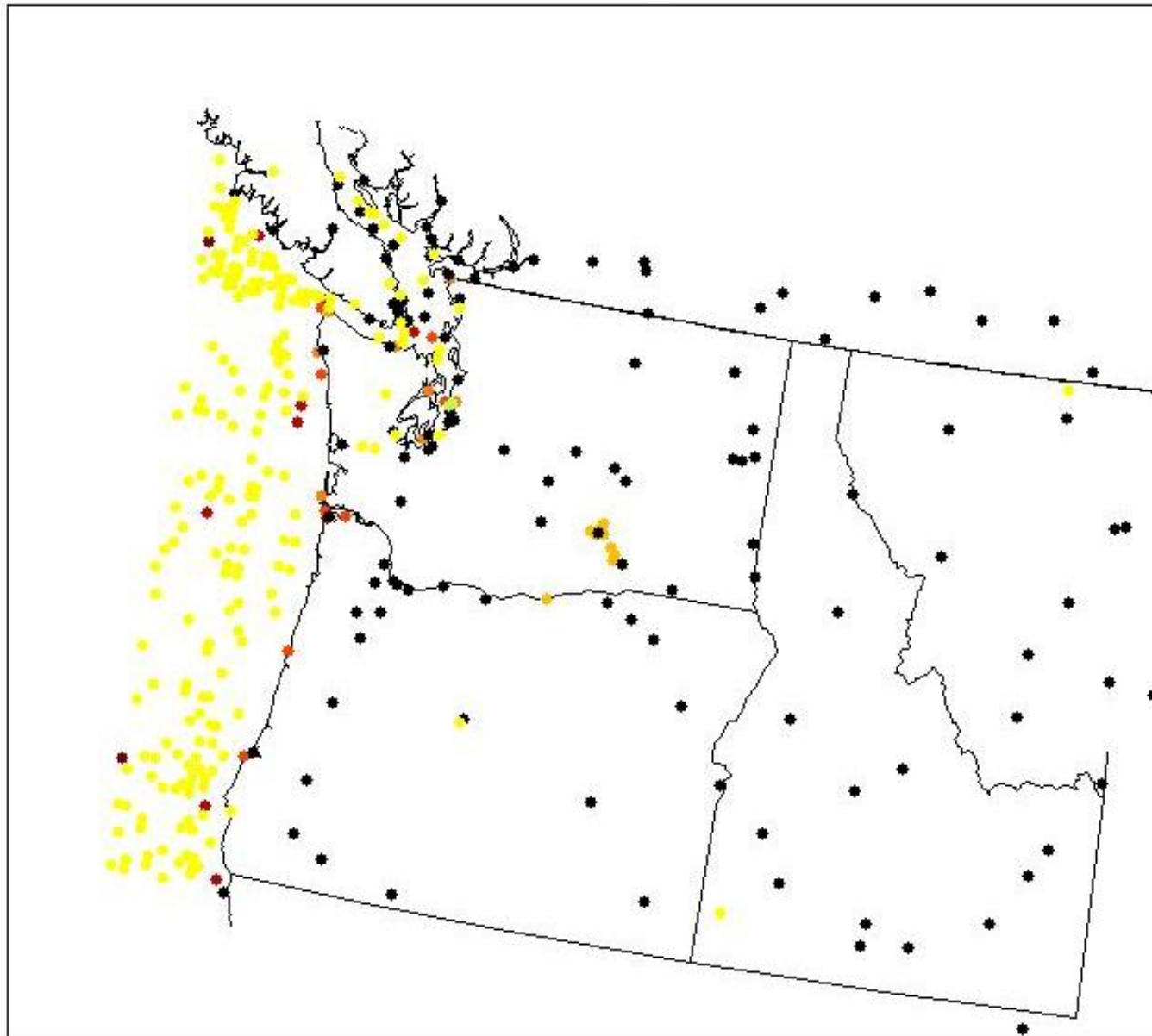
All Observations Found for: spd, 2004, total: 1239

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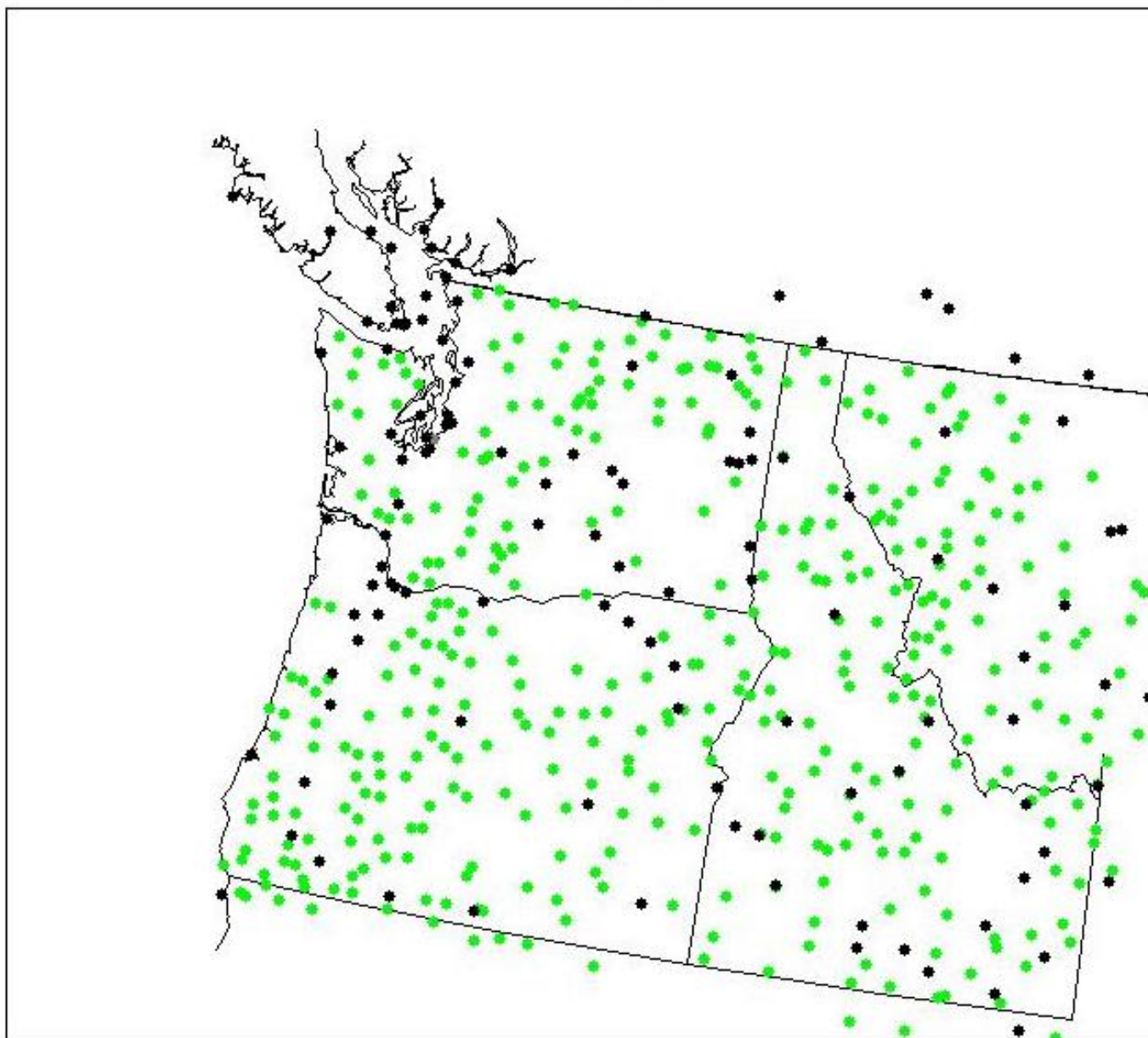
All Observations Found for: slp, 2004, total: 399

- BD: Drifting Buoy Obs
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All Observations Found for: pcp6, 2004, total: 527

- AW: Schoolnet Obs
- RW: RAW5 Obs
- SA: Surface Aviation Obs

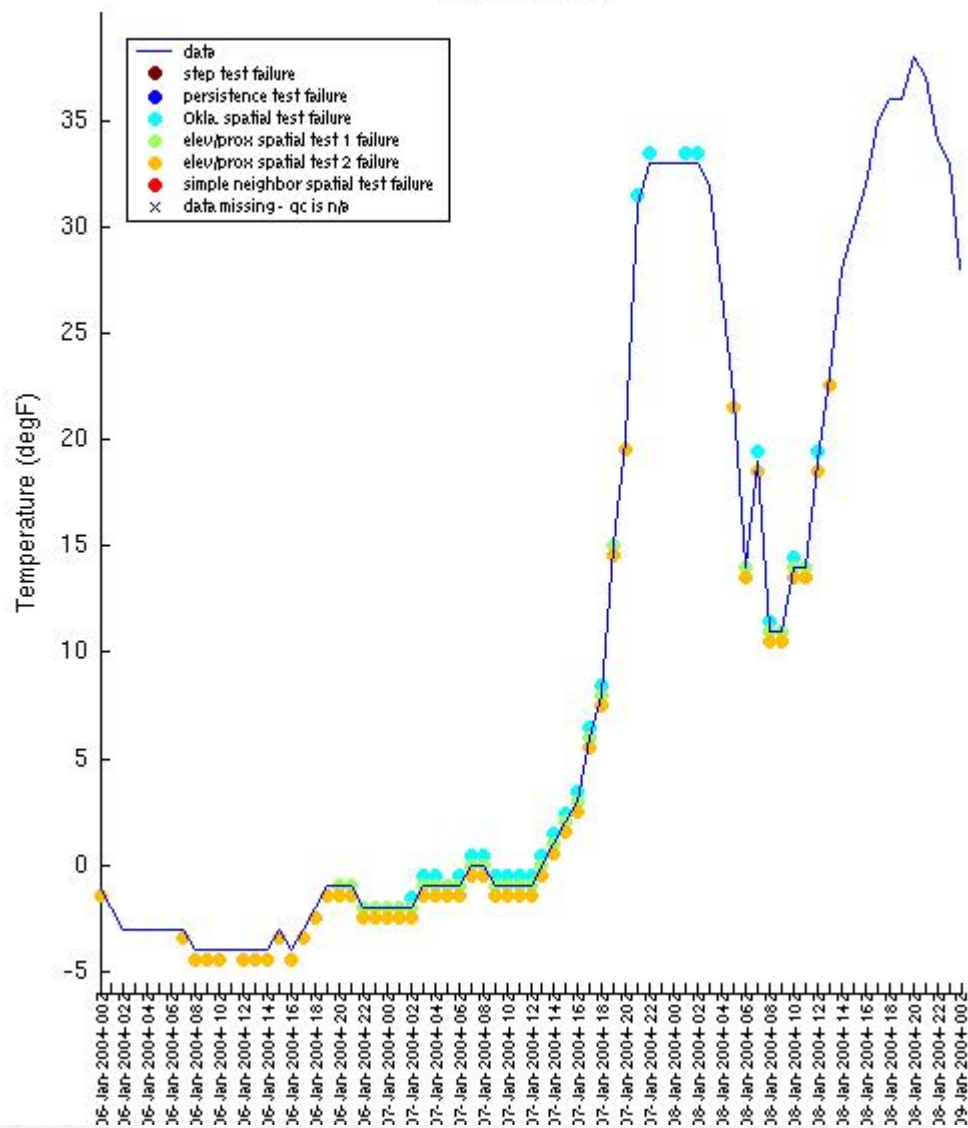




network	test	n flagged	percent flagged (n/n_flagged_this_network)
AW	persistence	72544	98.52
AW	range	2	0.00
AW	spatial	161	0.22
AW	step	929	1.26
RW	persistence	212885	92.38
RW	range	134	0.06
RW	spatial	15522	6.74
RW	step	1916	0.83
SA	persistence	19310	90.25
SA	range	40	0.19
SA	spatial	1453	6.79
SA	step	593	2.77
HN	persistence	74	10.22
HN	range	79	10.91
HN	spatial	314	43.37
HN	step	257	35.50
EC	persistence	323	37.34
EC	range	16	1.85
EC	spatial	384	44.39
EC	step	142	16.42
DT	persistence	24426	81.17



Station: BLUER



Station: BLUER, 2004010715

