

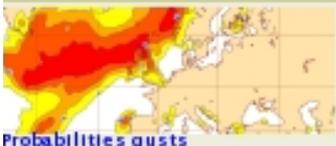
Monitoring for conventional observation systems at ECMWF

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Conventional observations daily monitoring



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Amdar

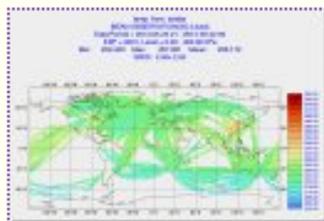
Other charts

[Acars](#)
[Airep](#)
[Amdar](#)

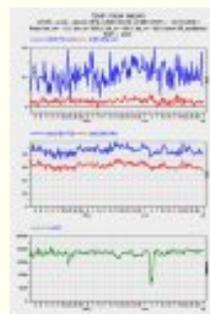
Chart catalogue

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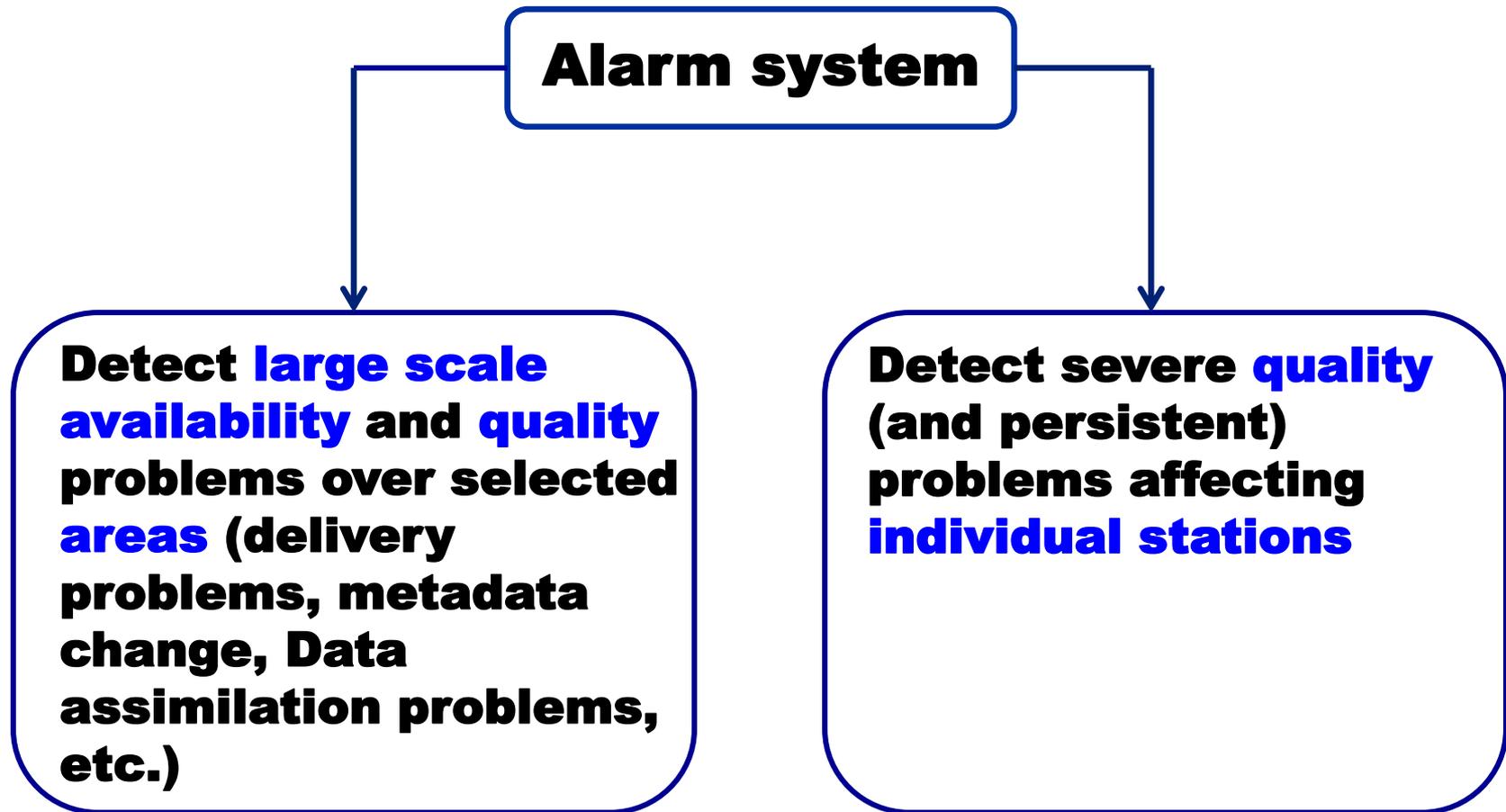
Time-averaged geographical mean fields



Time series of area averages

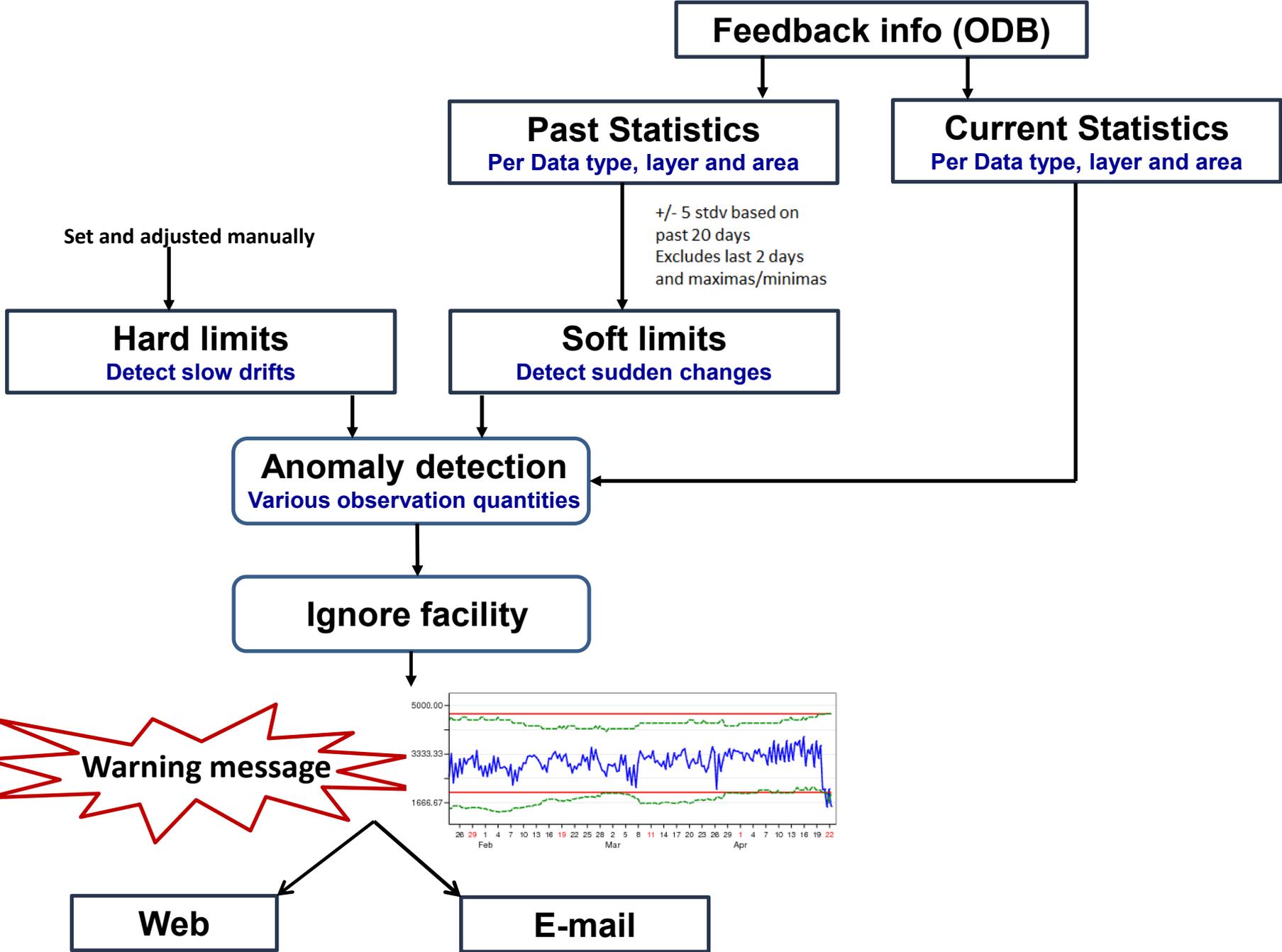


Alarm system for conventional observations



Alarm system for conventional observations

- **Major data types (SYNOP, METAR, SHIP, TEMP, DRIBU, AIREP, AMDAR, ACARS, PROFILERS)**
- **Assimilated variables: Temperature, Pressure, Wind, Q**
- **9 selected geographical areas**
- **Three pressure layers (for upper-air observations)**
- **Monitor : Data counts, bias correction, First guess departures (average and stdev), Analysis departure (stdev)**



Feedback info (ODB)

Past Statistics
Per Data type, layer and area

Current Statistics
Per Data type, layer and area

+/- 5 stdv based on
past 20 days
Excludes last 2 days
and maximas/minimas

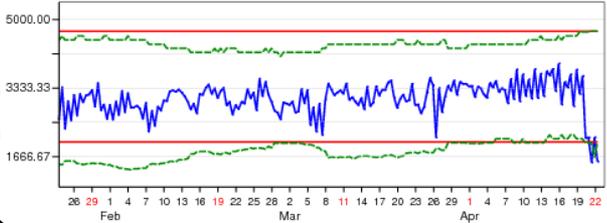
Hard limits
Detect slow drifts

Soft limits
Detect sudden changes

Anomaly detection
Various observation quantities

Ignore facility

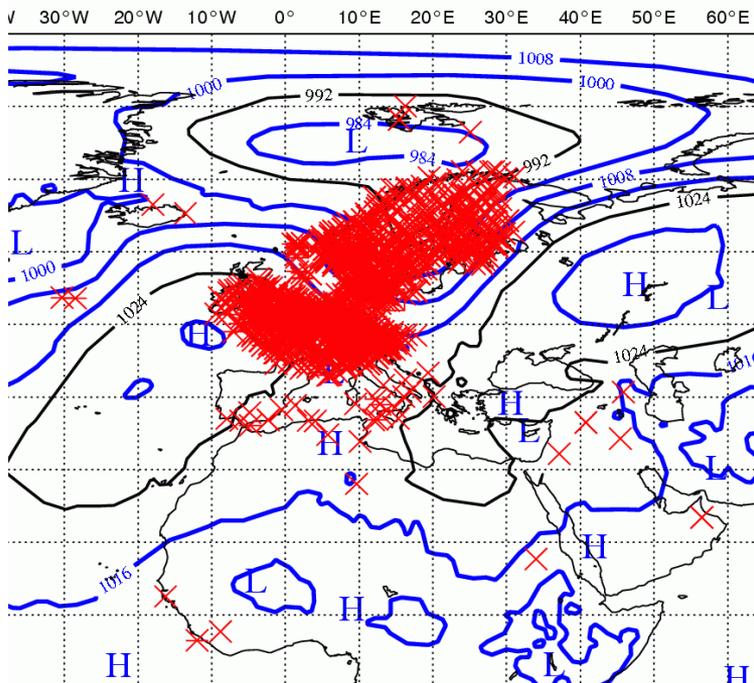
Warning message



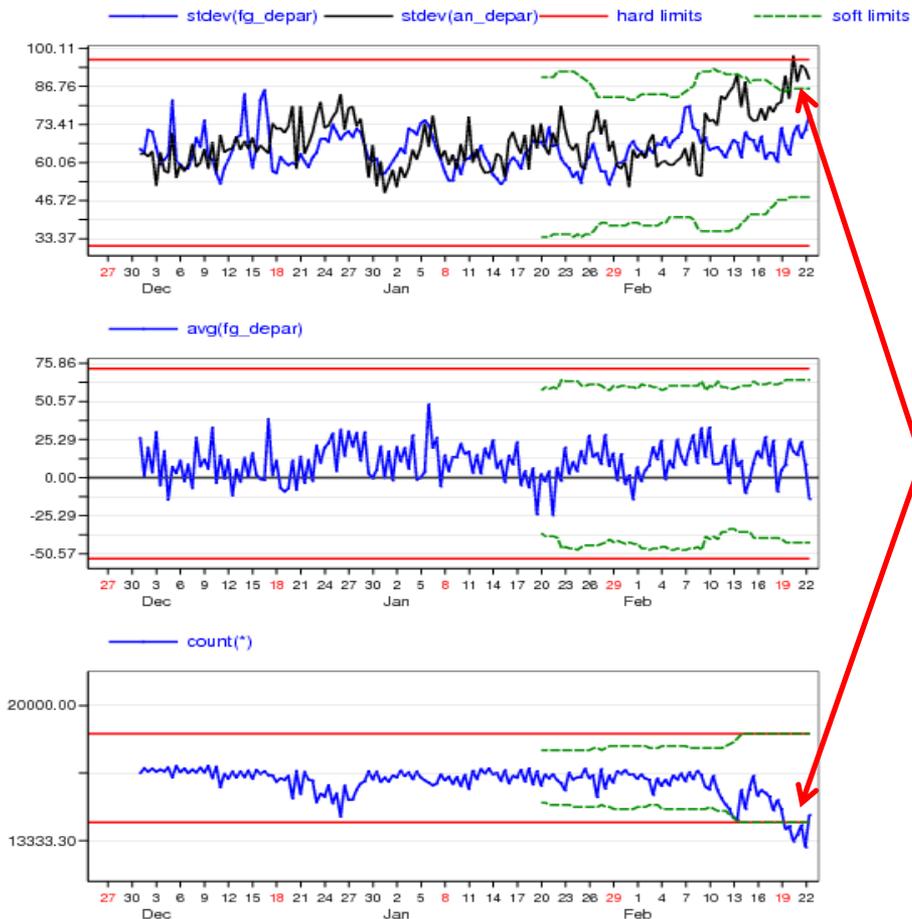
Web

E-mail

Alarm system for conventional observations



SYNOP Surface pressure Europe Surface
Used data, EXP =0001
conv_11_110_2_0



SYNOP Surface pressure Europe Surface : out of range:

(19 times in last 10 days for at least one item)

http://wedit.ecmwf.int/products/forecasts/satellite_check//do/get/satcheck/969/59315?showfile=true

Slightly: count(*)=13632, expected range: 14227.5(H) 18606.9(H)

Severely: stdev(fg_depar)=73.073 < stdev(an_depar)=88.41

AMDAR Wind speed North America 0 40000 : out of range:

(2 times in last 10 days for at least one item)

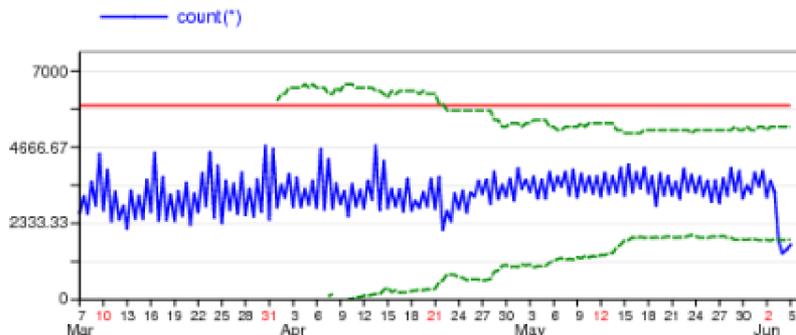
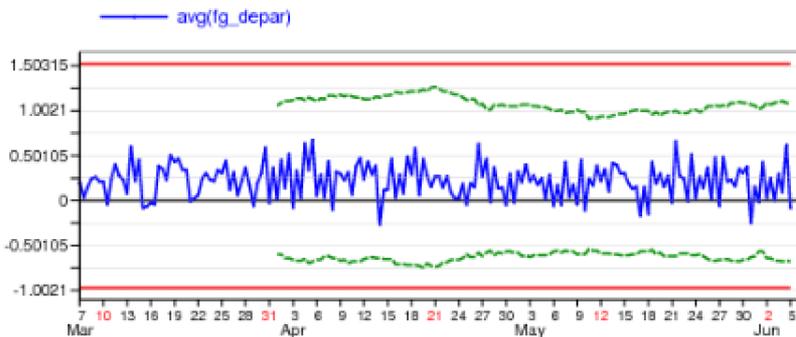
conv_144_5_1_0_40000.png

Slightly: count(*)=1520, expected range: 1820 5300

AMDAR Wind speed North America 0 40000
Used data, EXP =0001
conv_144_5_1_0_40000

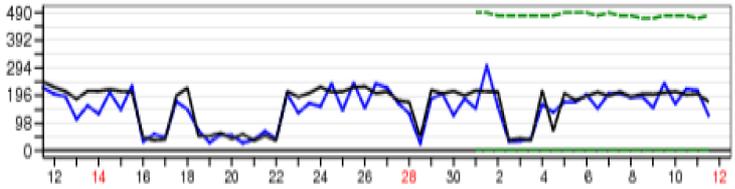
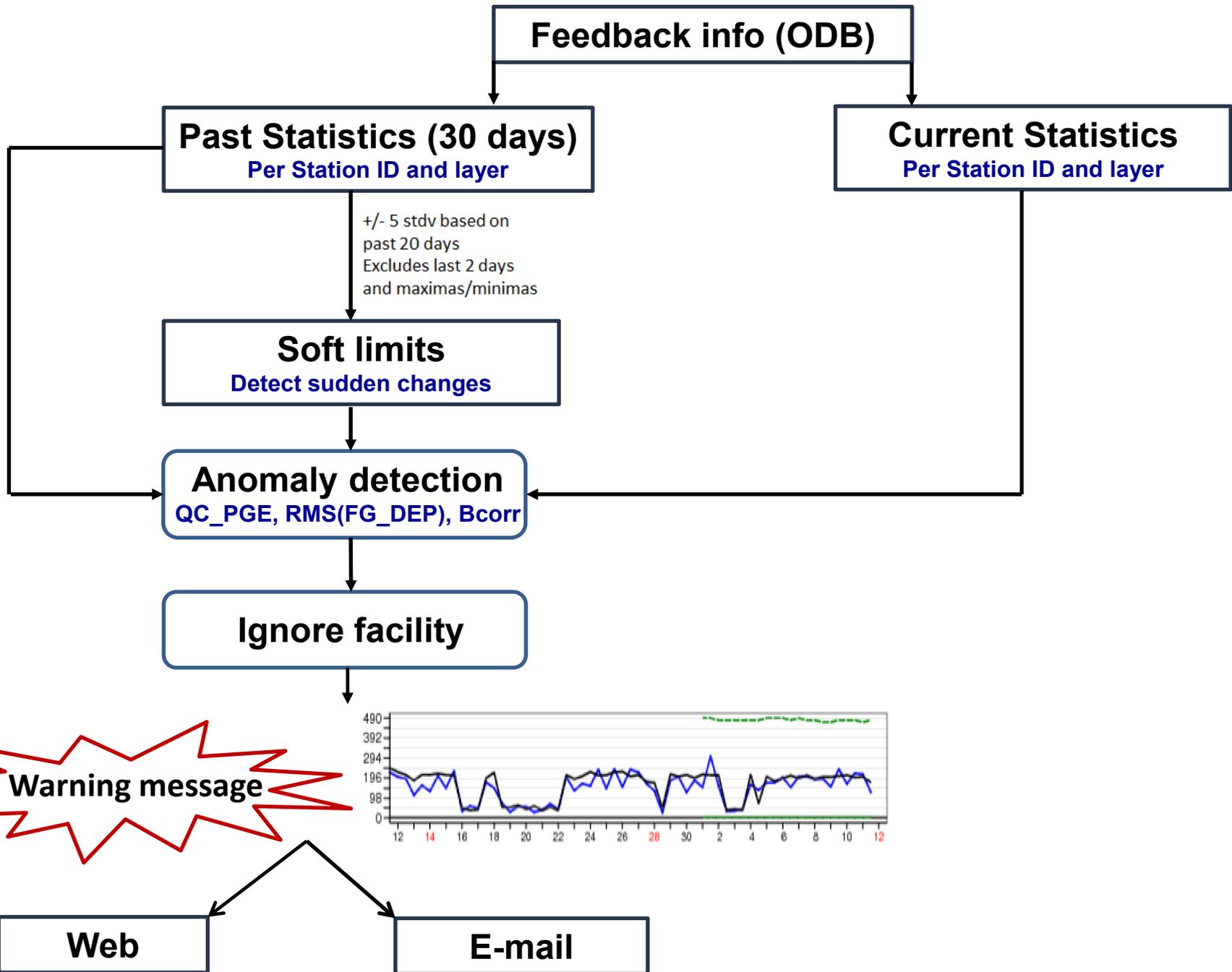
All AIREP North Atlantic 0 40000 missing

All AIREP South Pacific 0 40000 missing



temp from airep
Level =0.00 - 400.00 hPa, Used data [time step = 12 hours]
Area: lon_w= 0.0, lon_e= 360.0, lat_s= -90.0, lat_n= 90.0 (over All_surfaces)
EXP = 0001





Alarm system for conventional observations

Anomaly detection

Time series analysis (for all un-blacklisted stations) of:

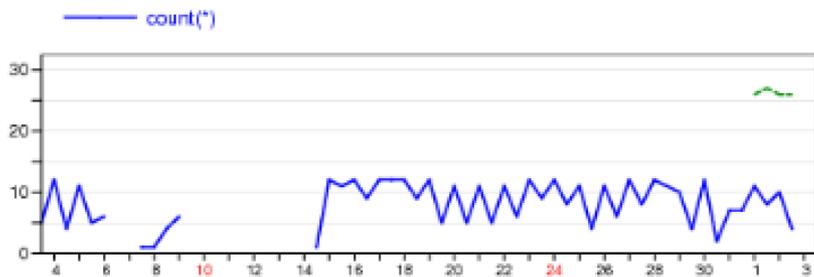
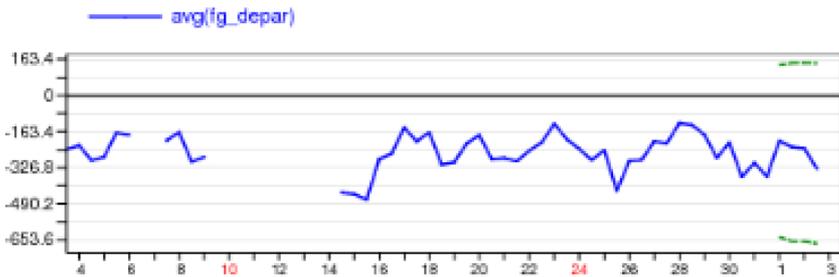
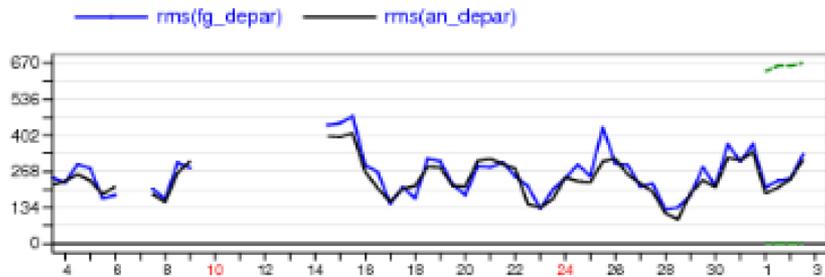
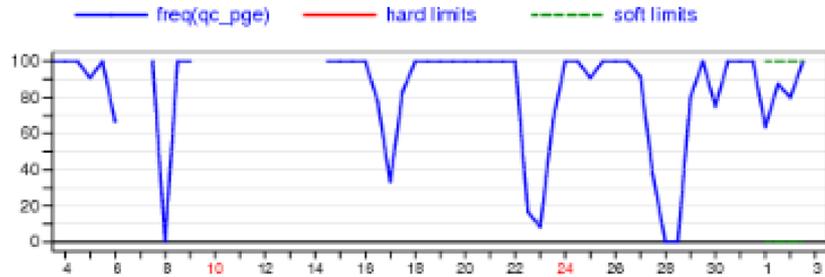
- **Probability of Gross Error (PGE):** What's the percentage of having large PGE during the past months?
- **RMS of FG departures (when sufficient data available):**
Detects sudden changes
- **Bias correction (when applicable):** **Detects sudden changes**

Alarm system for conventional observations

- **Severe** and **persistent** problems : Blacklisting purposes.
- **Severe** problems of the day : Daily report investigations (model issues, etc.)
- **Slight** problems of the day : Data monitoring purposes

Tuning work is needed to agree on appropriate definition of severity levels

ID 16058 Land Automatic Report Surface pressure 0 0
 Used data, EXP =0001
 synop_16058_14_110_0_0



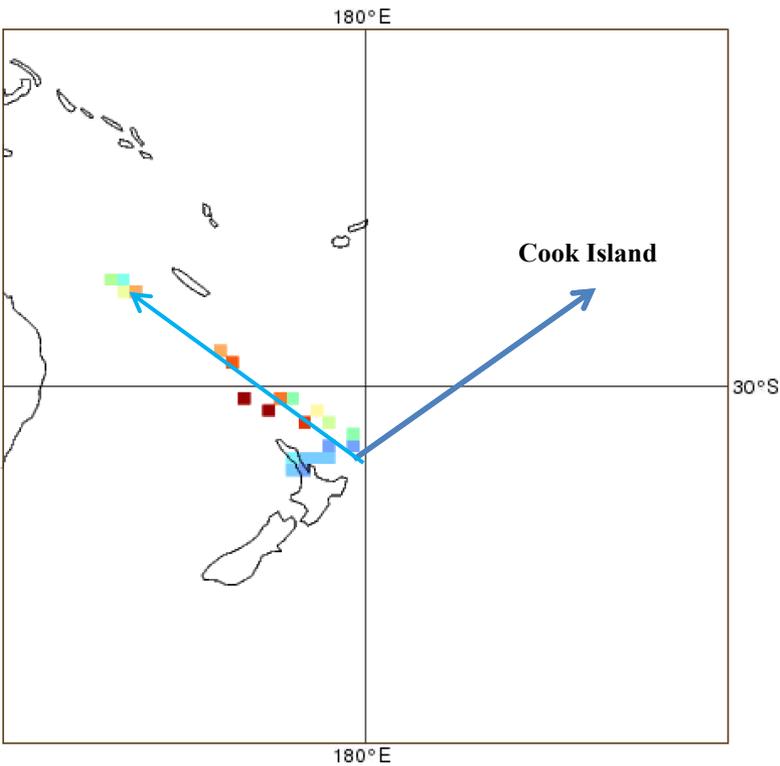
16058 Land Automatic Report Surface pressure 0 0 : out of range:

(7 times in last 3 days for at least one item)

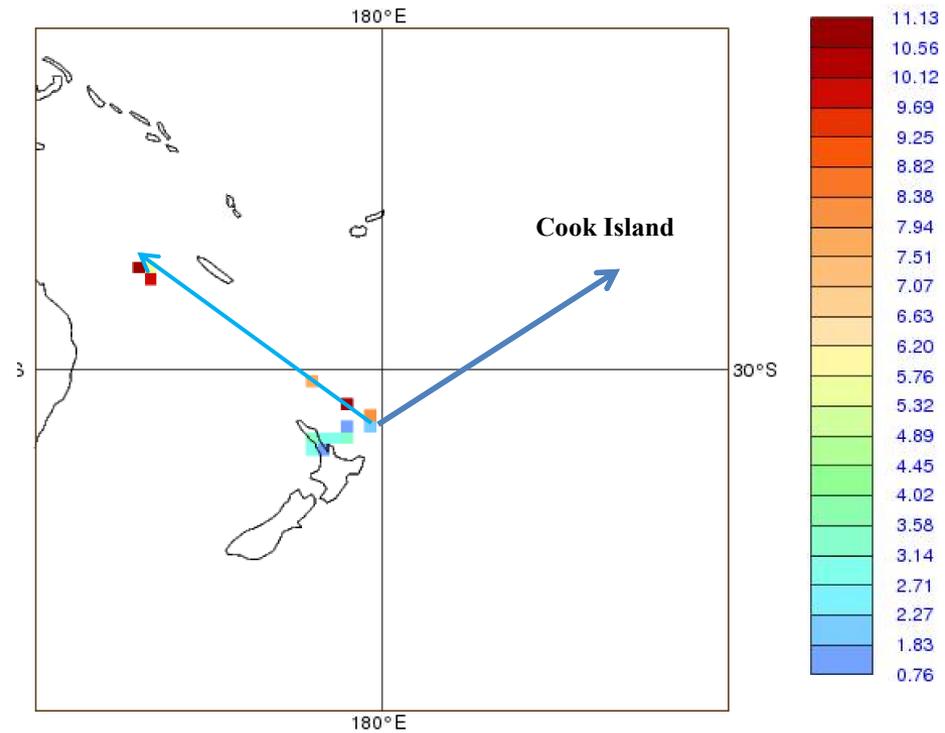
[synop_16058_14_110_0_0.png](#)

Severely_persistent: freq(qc_pge)=79.79, expected range < 30

VECTORDIFF FROM AMDAR
MEAN FIRST GUESS DEPARTURE (OBS-FG) (ALL)
DATA PERIOD = 2013-04-10 21 - 2013-04-11 09
EXP = 0001, LEVEL = 0.00 - 1000.00 HPA
Min: 0.765 Max: 35.603 Mean: 6.945
GRID: 1.00x 1.00



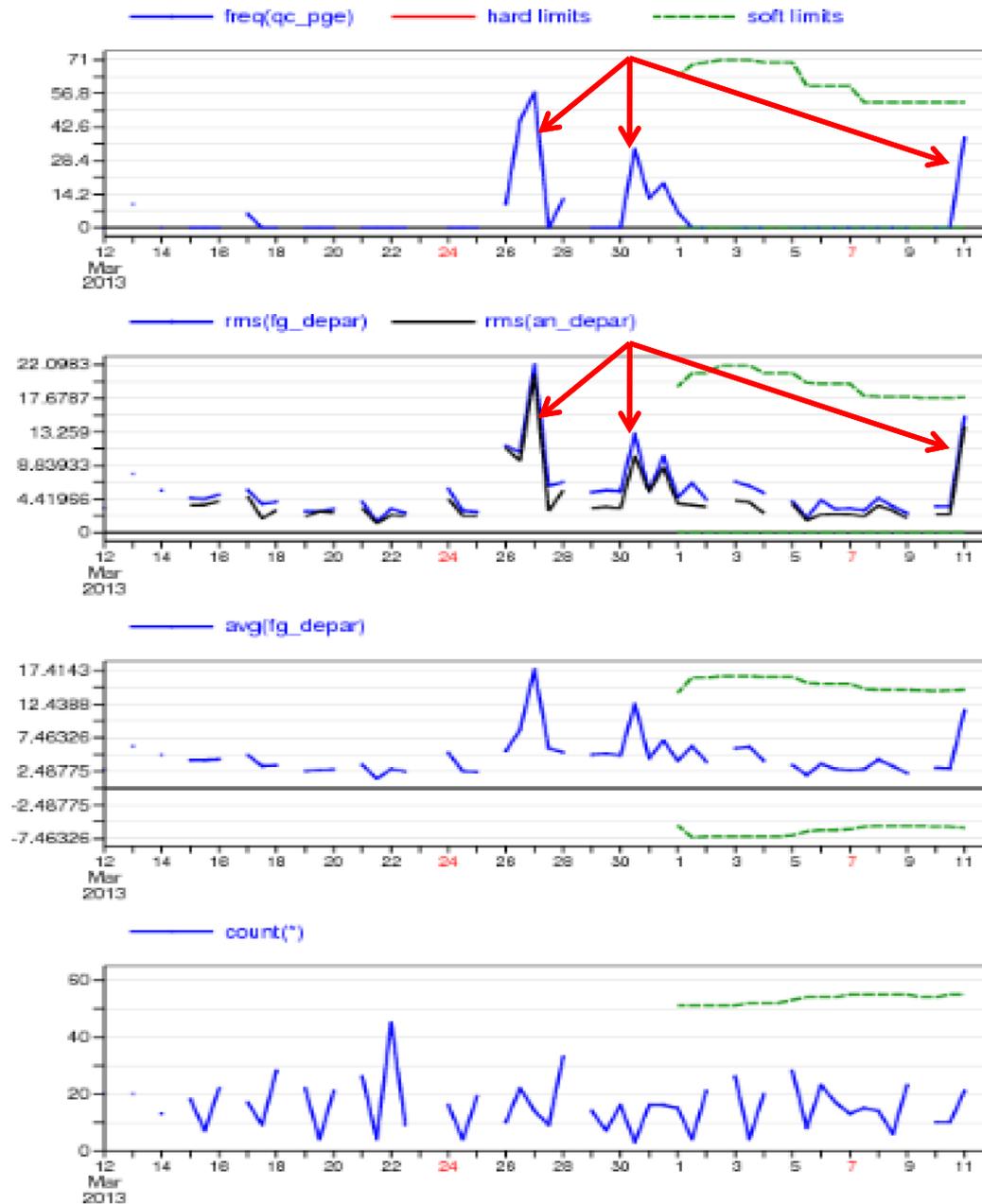
VECTORDIFF FROM AMDAR
MEAN FIRST GUESS DEPARTURE (OBS-FG) (USED)
DATA PERIOD = 2013-04-10 21 - 2013-04-11 09
EXP = 0001, LEVEL = 0.00 - 1000.00 HPA
Min: 0.765 Max: 11.126 Mean: 4.534
GRID: 1.00x 1.00



ID NZL020 AMDAR Wind Vector difference 0 40000

Used data, EXP =0001

amdar_NZL020_144_6_0_40000



Alarm website

- Publishing by data type
- Time series provided
- Severity highlighted
- Time limited Archive

Check Actions

 [Edit Check](#)

 [Delete Check](#)

 [Print Check](#)

Date

June 17

Time

12
00

Prev/Next

◀ [2013-06-17 00](#)

▶ [2013-06-18 00](#)

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TEMP

26781 TEMP Wind Vector difference 40000 101325 : out of range:

[temp 26781 35 6 40000 101325.png](#)

Considerably: rms(fg_depar)=10.311, expected range: 0 7

Severely: freq(qc_pge)=53.8462, expected range < 35

91376 TEMP Wind Vector difference 40000 101325 : out of range:

[temp 91376 35 6 40000 101325.png](#)

Severely: freq(qc_pge)=60, expected range < 35

72357 TEMP Wind Vector difference 40000 101325 : out of range:

[temp 72357 35 6 40000 101325.png](#)

Severely: freq(qc_pge)=50, expected range < 35

34467 TEMP Wind Vector difference 40000 101325 : out of range:

[temp 34467 35 6 40000 101325.png](#)

Severely: freq(qc_pge)=37.5, expected range < 35

57131 TEMP Temperature 40000 101325 : out of range:

[temp 57131 35 2 40000 101325.png](#)

Slightly: rms(fg_depar)=2.74196, expected range: 0 2.5

Severely: freq(qc_pge)=40, expected range < 35

85442 TEMP Temperature 40000 101325 : out of range:

[temp 85442 35 2 40000 101325.png](#)

Severely: freq(qc_pge)=37.5, expected range < 35

32477 TEMP Temperature 40000 101325 : out of range:

[temp 32477 35 2 40000 101325.png](#)

Severely: freq(qc_pge)=38.4615, expected range < 35

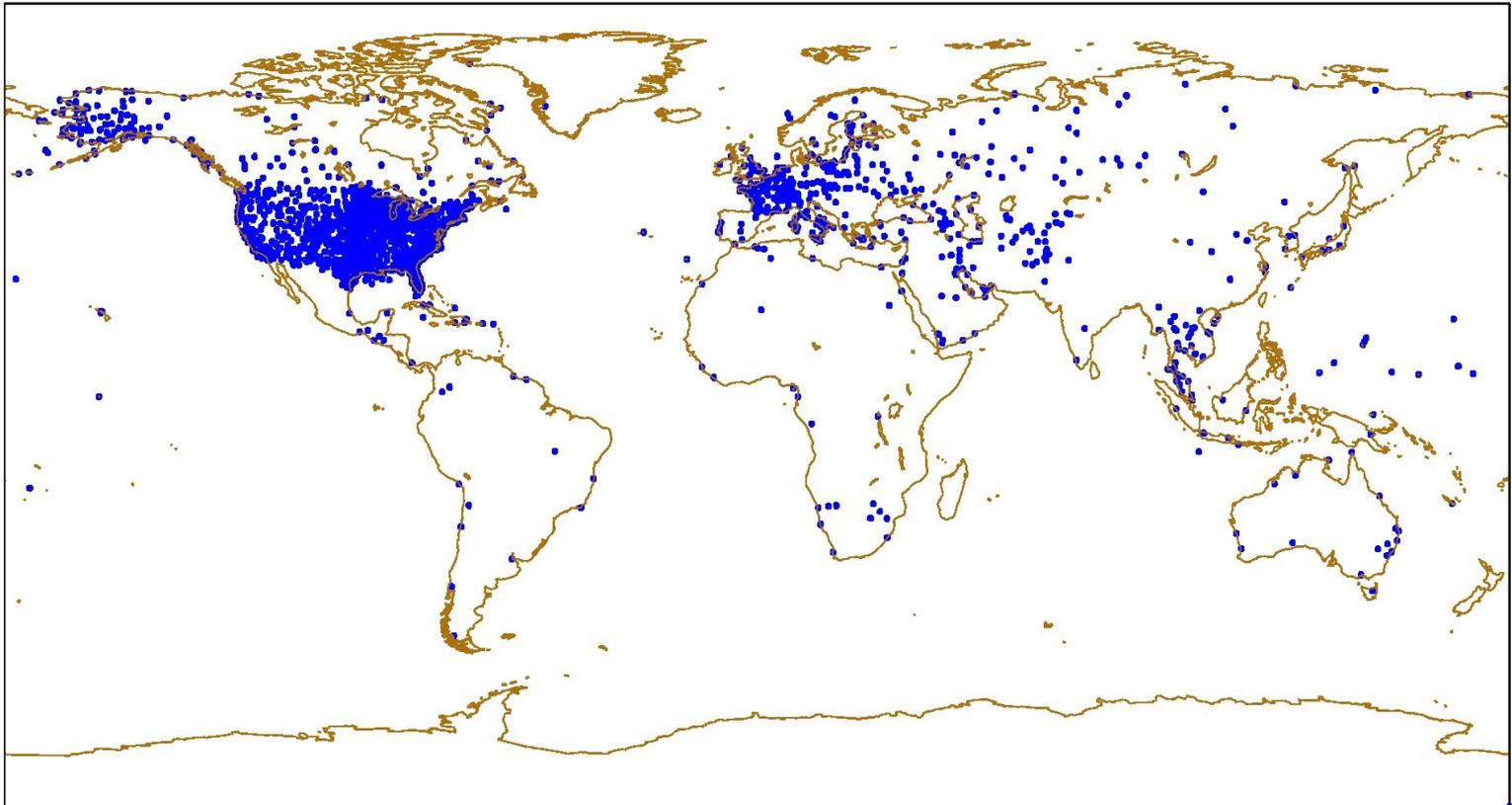
Way forward

- **Perform extensive tuning (periods to check, thresholds, definition of severity levels)**
- **Operational implementation (including web publishing and dissemination)**
- **Extend the system to check blacklisted data (looking for improvements)**
- **Improve the usage of the alarms: blacklisting, data assimilation monitoring**

More conventional observations at ECMWF

- Primarily by resolving acquisition and decoding errors and problems at ECMWF
- Updating WMO station list resulted in 432 “new” SYNOP and 12 “new” TEMP stations
- Updating WMO station lists again for SYNOP and METAR resulted in more than 1400 moved or new stations
- The WMO anemometer height information for SHIP had not been updated for many years – resulted in many changes
- A data usage comparison with UK MetOffice showed ECMWF only decoded 40% of the METAR observations acquired
- The error was because ECMWF did not decode automatic METAR observations (this was resolved in June 2013)

Additional METAR stations at MetOffice compared to ECMWF 2120 extra stations for 30 January 2013



Some questions and issues for discussion

- Do all NWP centres receive the same data?
- Use, quality, blacklisting. Cross-checking with other centres can be useful in confirming observation problems
- Monthly reports insufficient to pick up quickly developing serious problems.
- Improve feedback to data providers - data providers should be easily able to check for themselves
 - up-to-date web site (ideally showing consolidated results from different monitoring centres?) together with alerts for significant changes would be a big advance
 - Any restriction on access to the monitoring information?
- Include bias correction information in monitoring reports