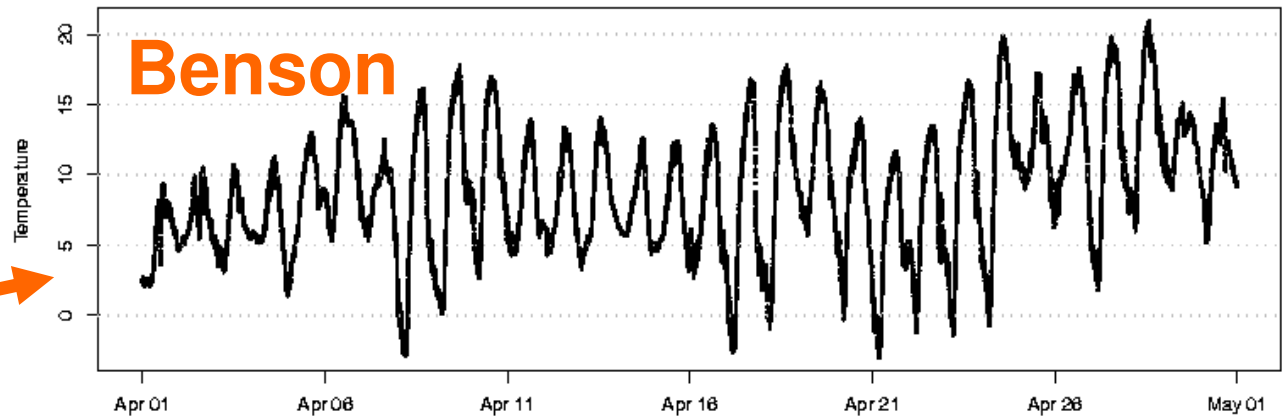
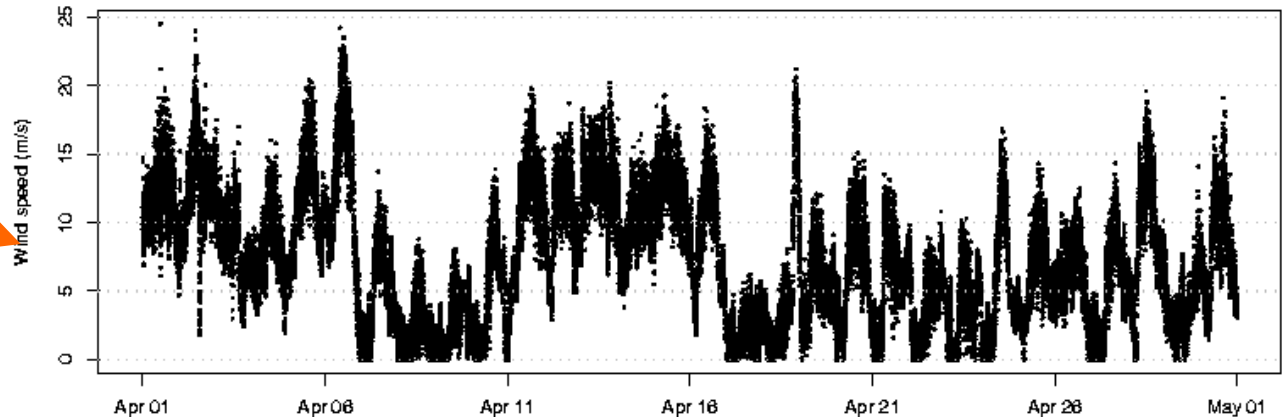


What does sub-hourly look like?

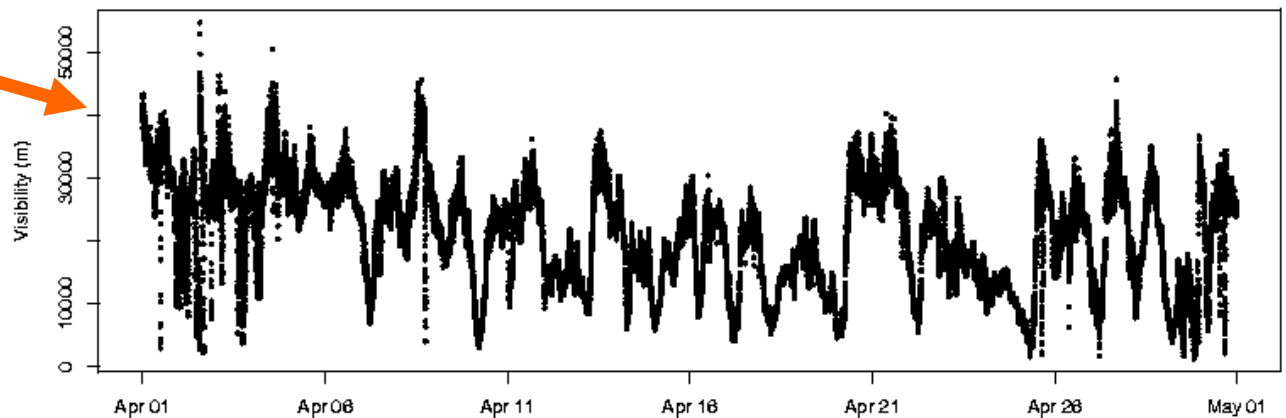
- Some quantities appear smoothly varying



- Some are quite noisy

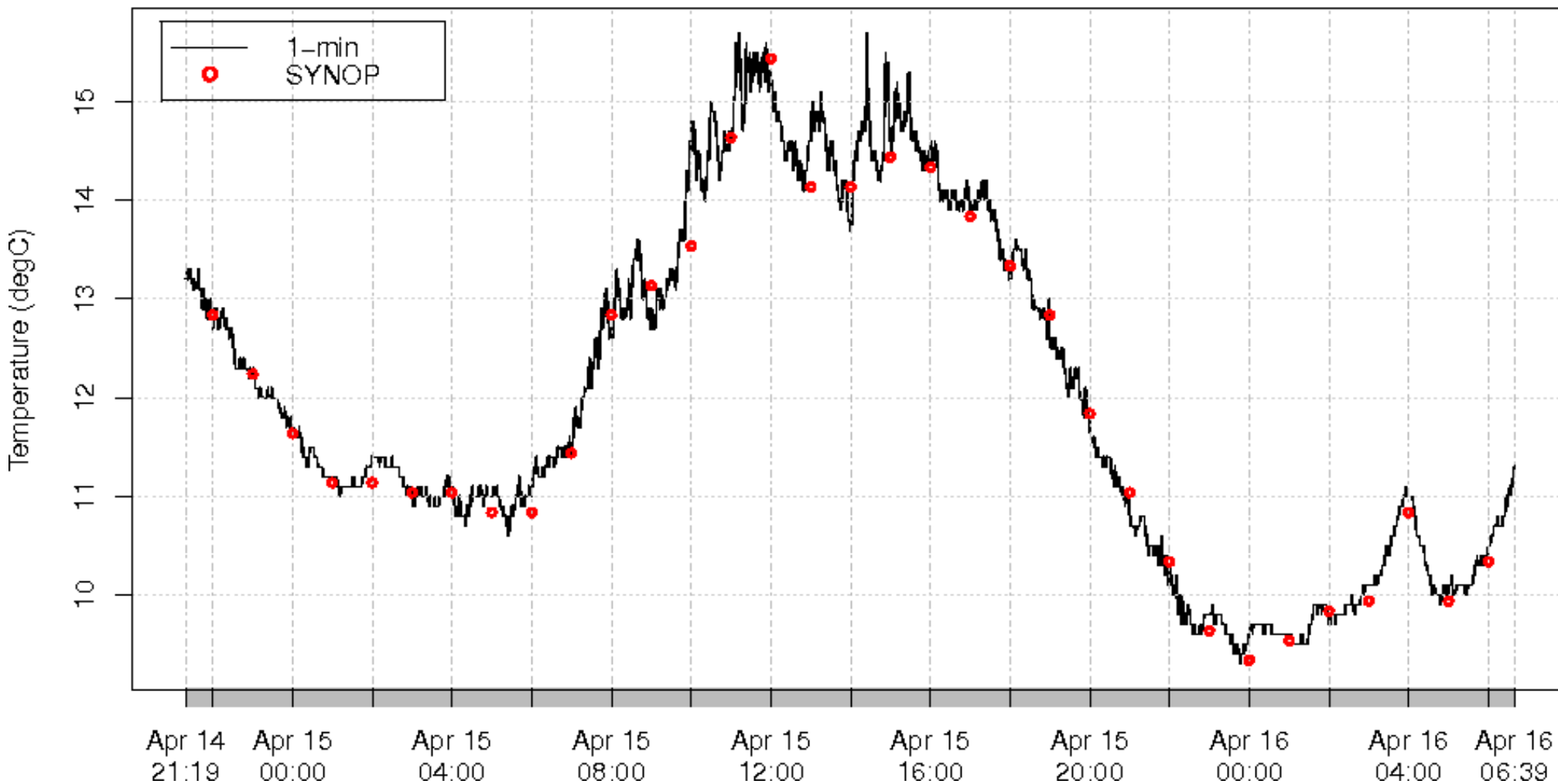


- Others can vary over many orders of magnitude



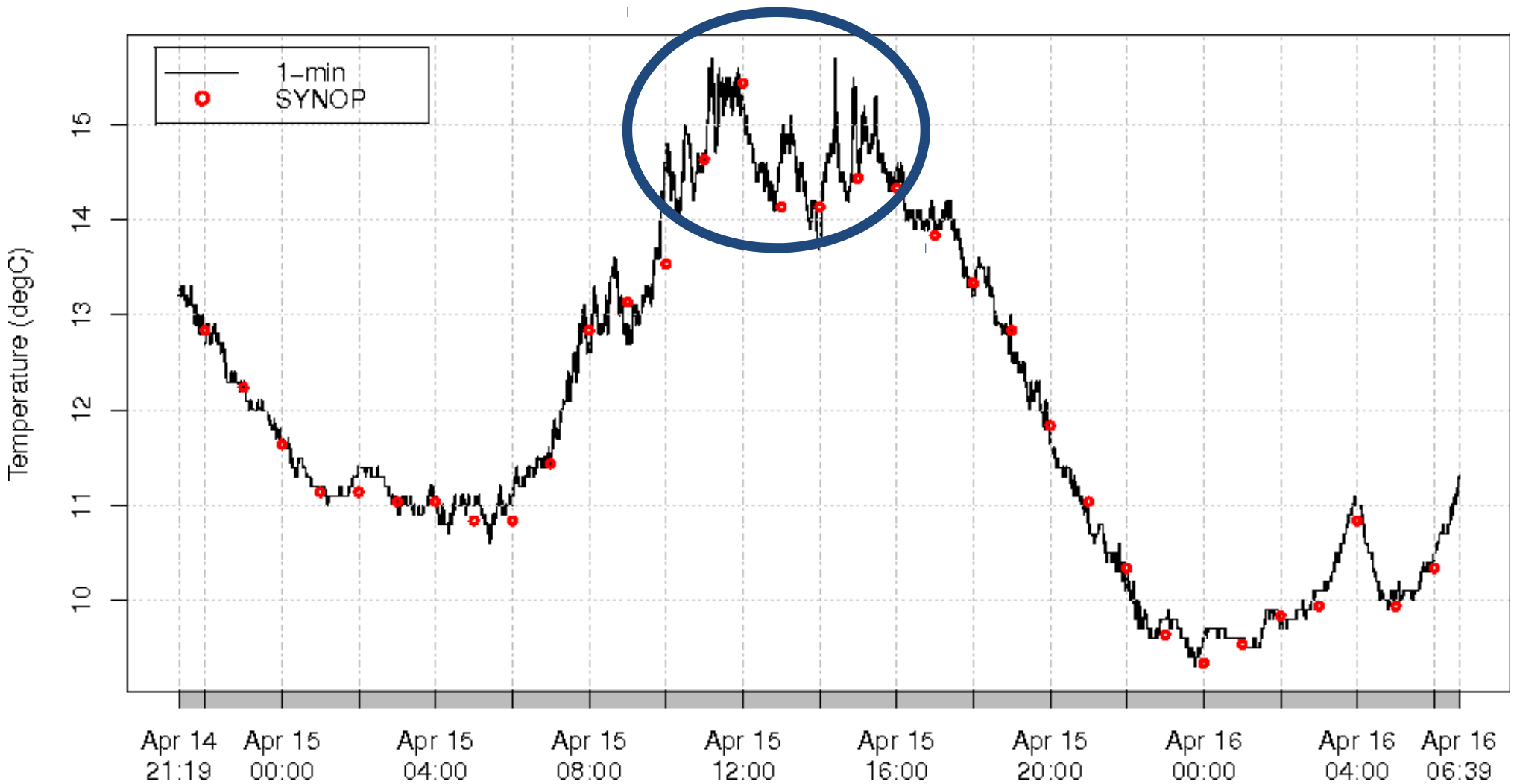
Temperature and representivity

Heathrow, April 2013



Temperature and representivity

Heathrow, April 2013

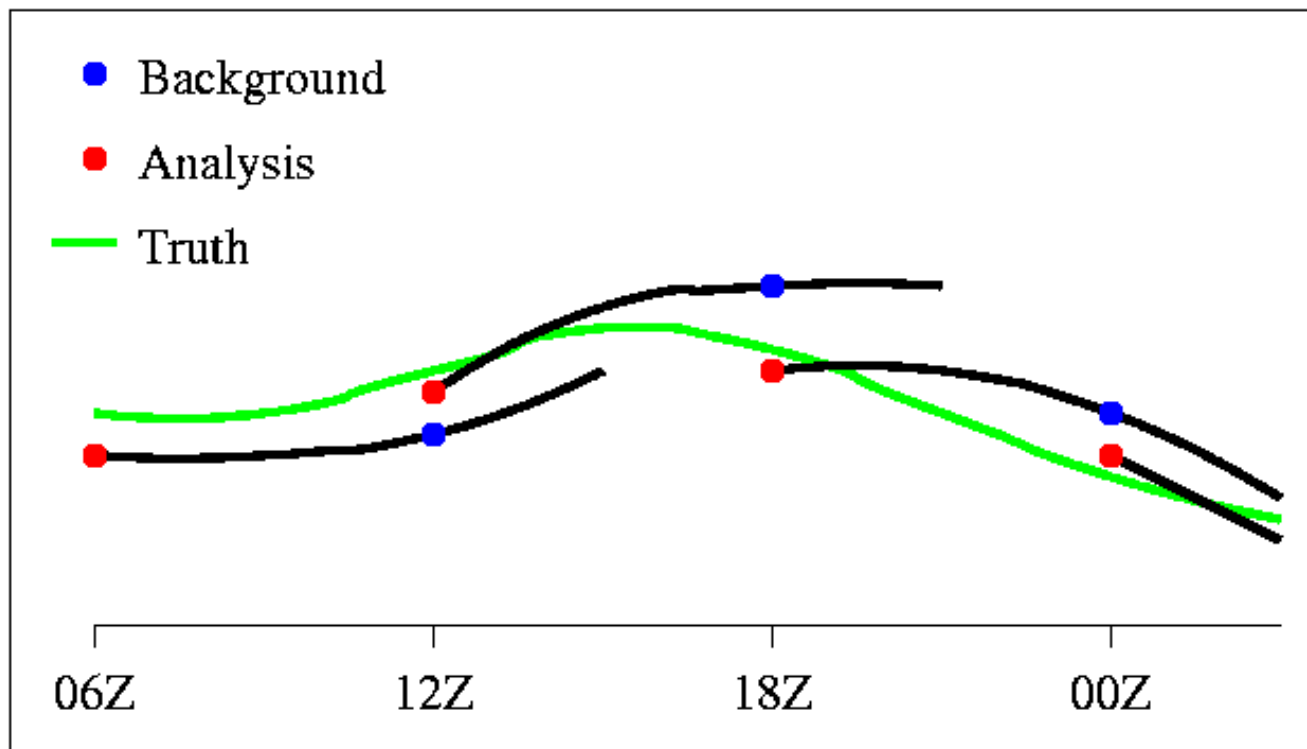


Richard Renshaw, Peter Jermey, Jemma Davie

Model Background

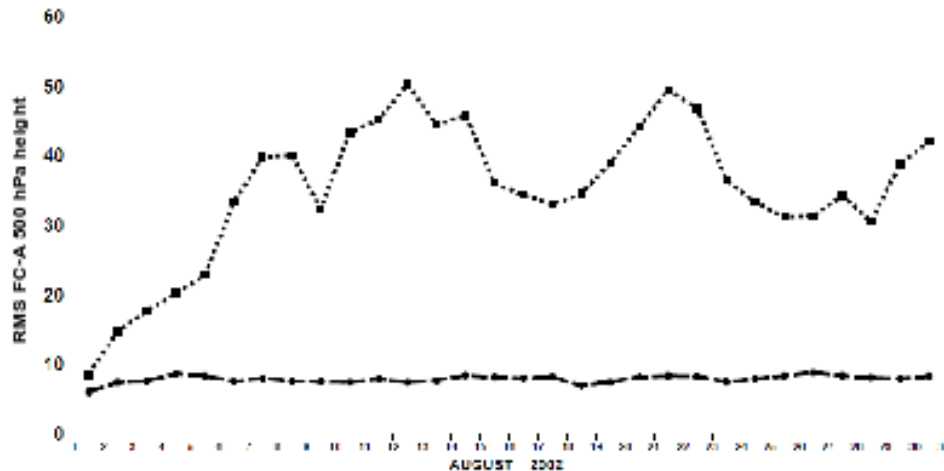
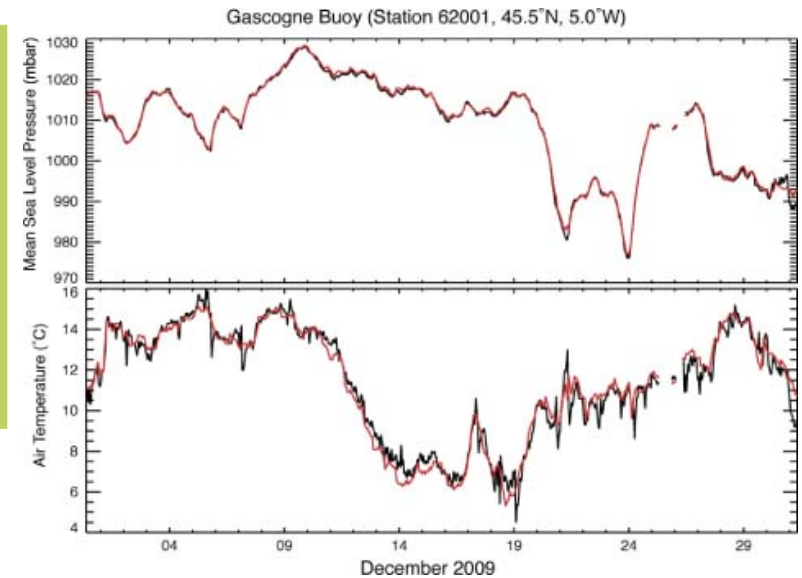
= latest forecast

Intermittent data assimilation cycle



Use of the background

- Comparing observations with the background
- The background is a 6 hour forecast
- It has useful information because it contains observational information from previous analyses



- Left plot shows the rate at which 12-hour 500 hPa height forecast error degrades in ECMWF's system on removal of satellite data. (Fisher 2004)
- It takes ~7 days before the influence of the satellite data is "forgotten".

Variational assimilation



Choose analysis ' \mathbf{x} ' to minimise $J(\mathbf{x}) = J_o(\mathbf{x}) + J_b(\mathbf{x})$

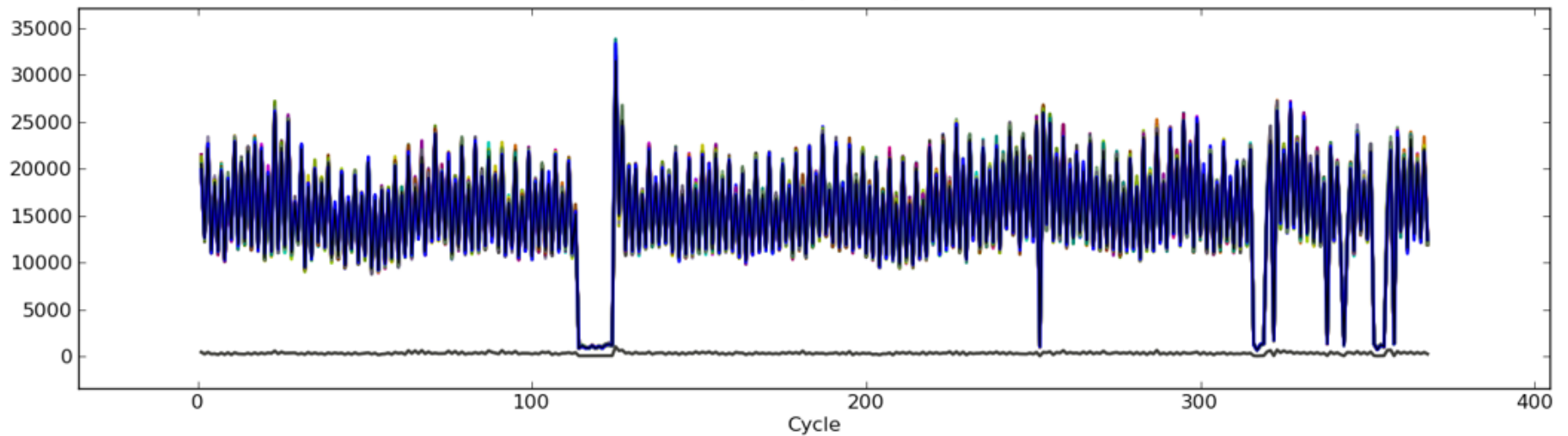
$J_o(\mathbf{x})$ = fit to observations 'ob'
= sum over obs [$(\mathbf{x} - \text{ob})^2 / (\text{ob error variance})$]

$J_b(\mathbf{x})$ = fit to background ' \mathbf{x}_b '
= $(\mathbf{x} - \mathbf{x}_b)^2 / (\text{background error variance})$

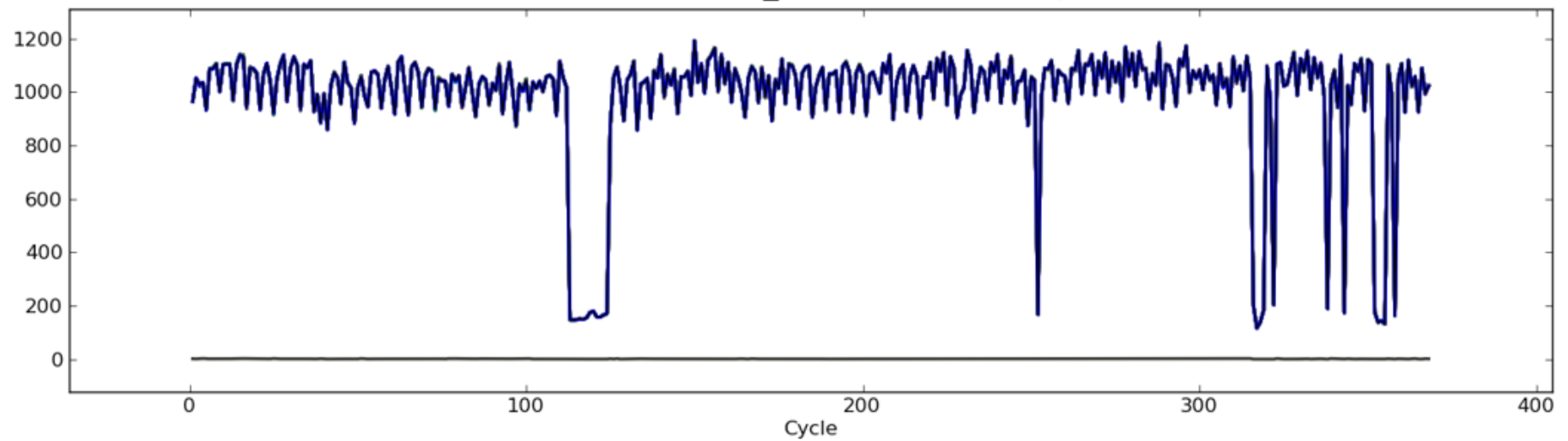
J, Ob count T_{2m} March/April/May 1979



Total penalty



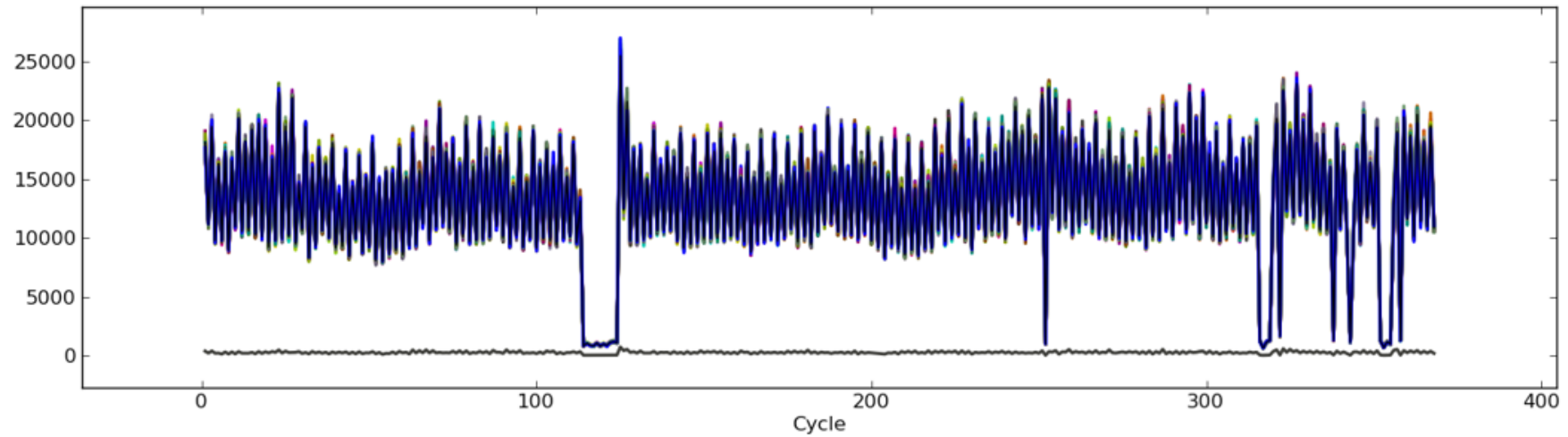
Count Mean m_ob-ob Surface temp



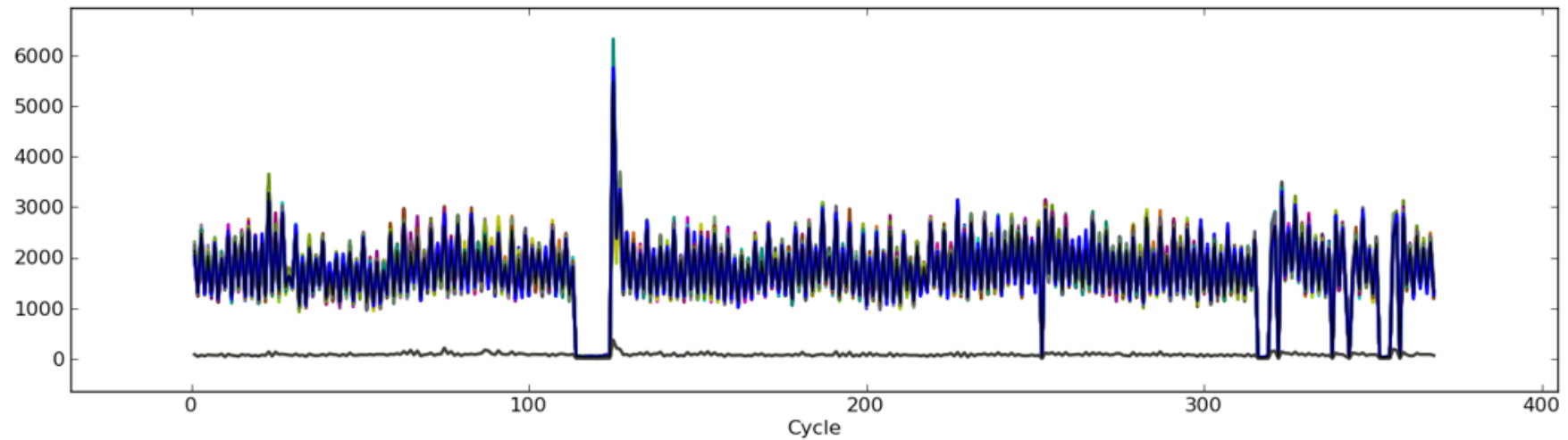
Jo & Jb



Obs penalty



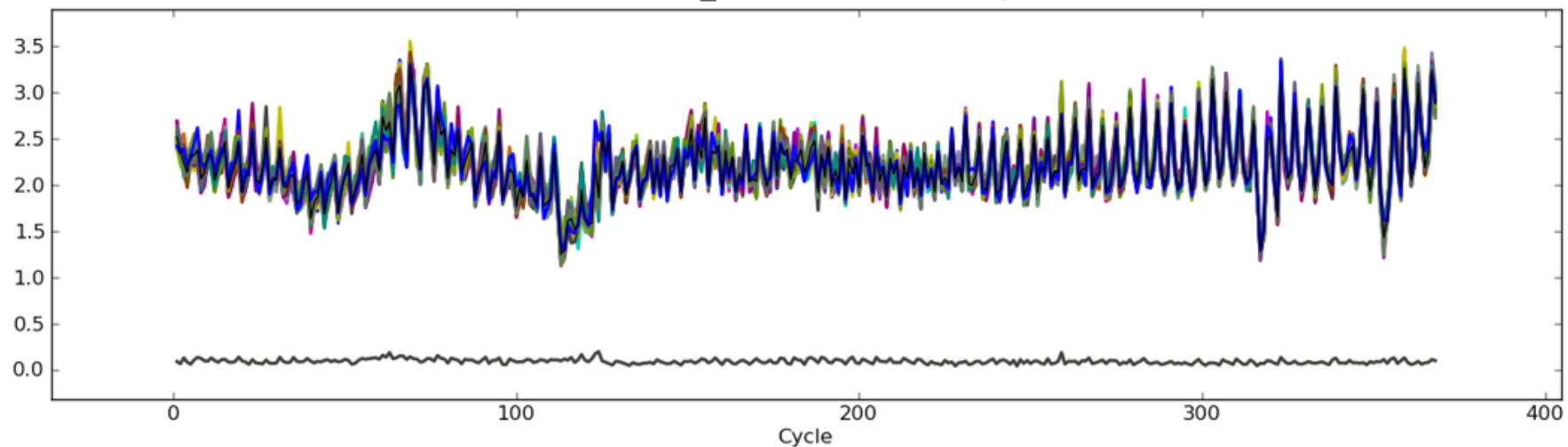
Bg penalty



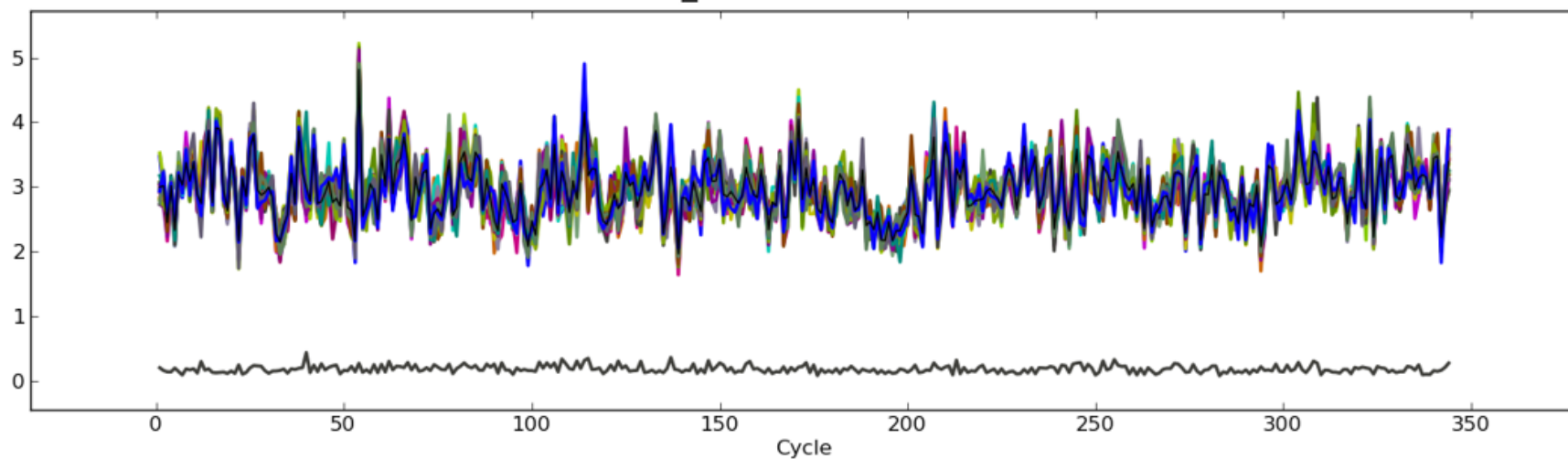
rms O-B T2m, sonde U 200m



RMS m_ob-ob Surface temp



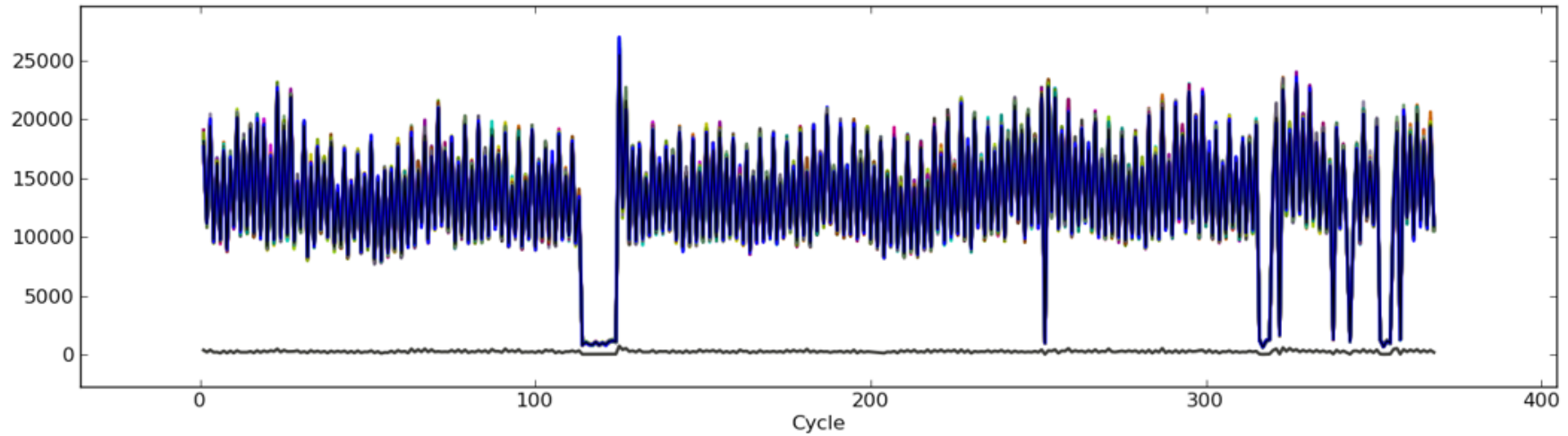
RMS m_ob-ob sonde U level 5



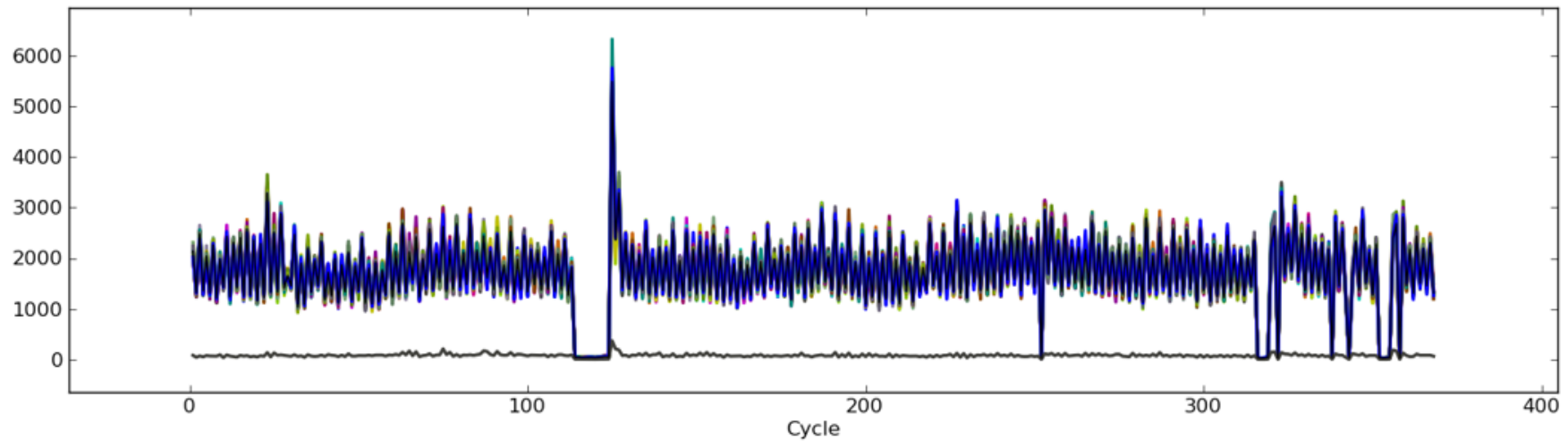
Jo & Jb



Obs penalty

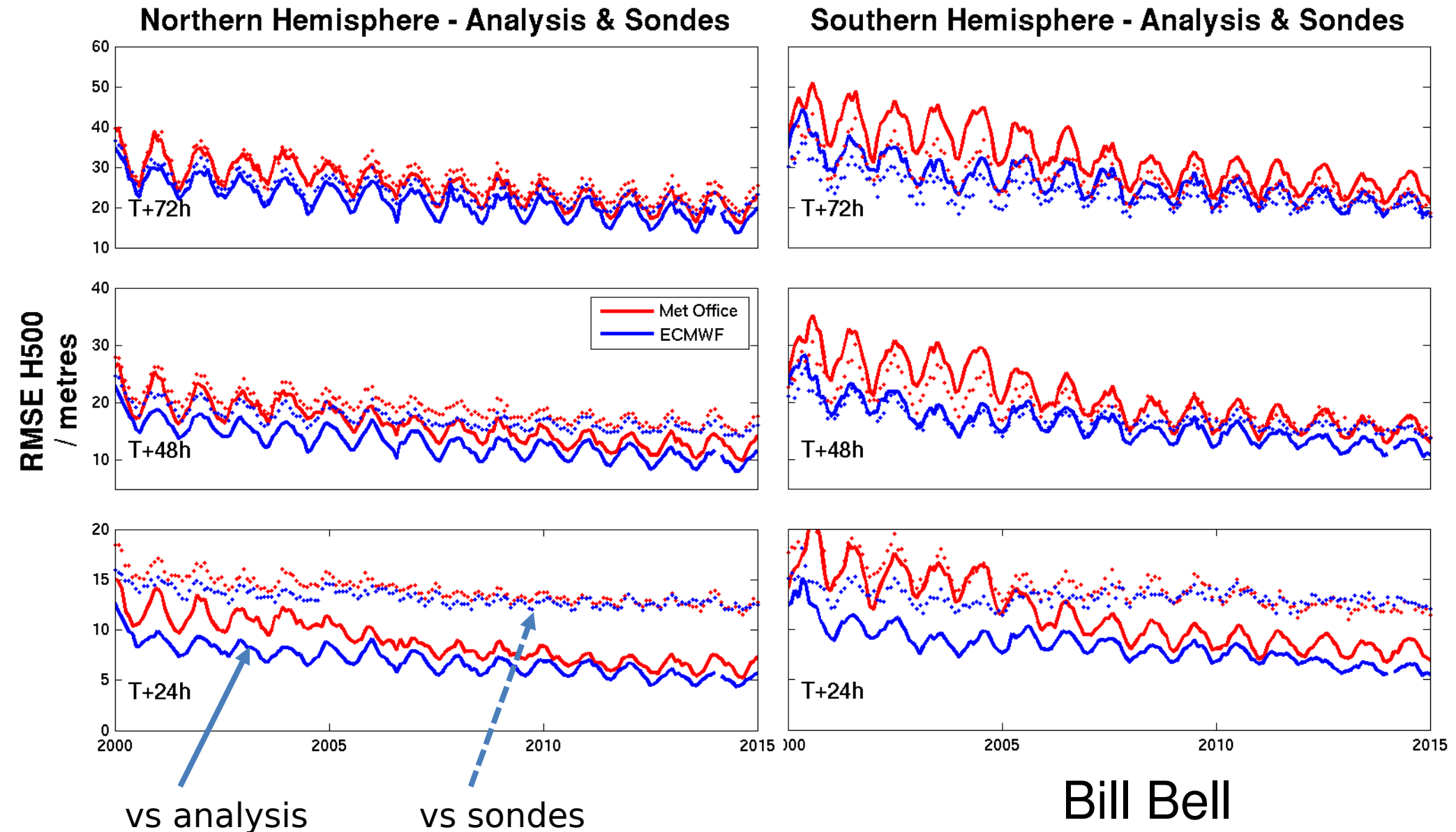


Bg penalty



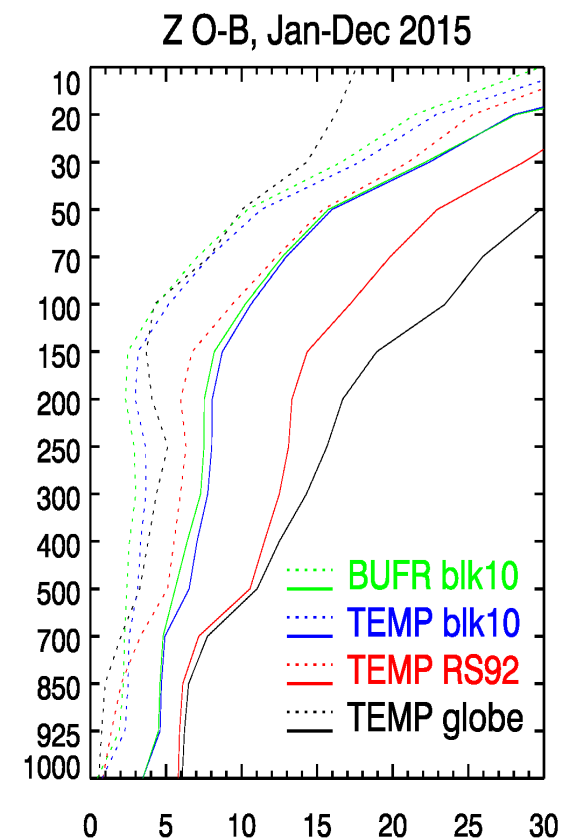
Are radiosonde measurements reference quality ?

Example: radiosonde-based verification of H500



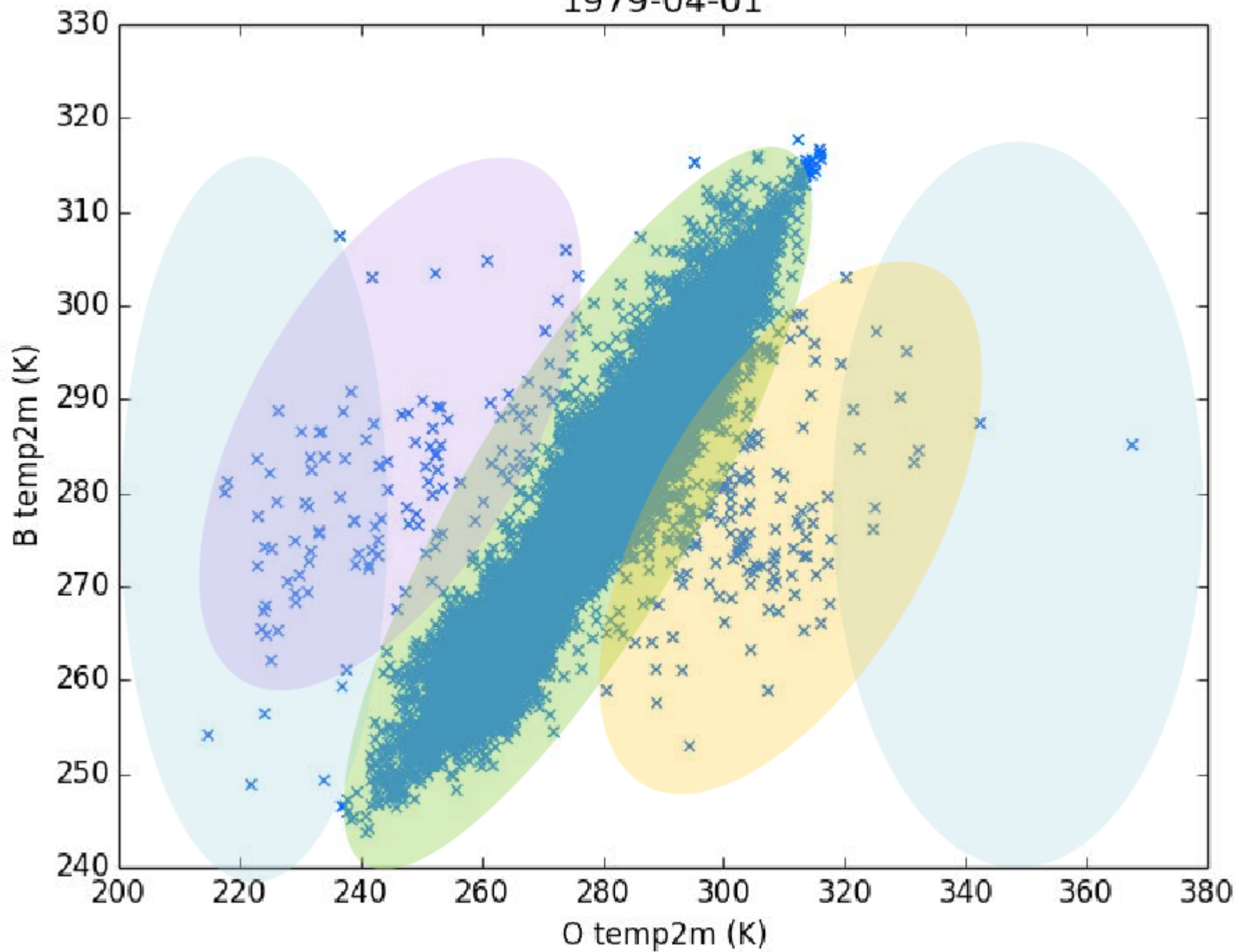
Verification against radiosonde geopotential height

- Complaints that radiosonde Z500 uncertainties (~ 11 m) are too large to measure changes in short range forecasts (~ 5 m uncertainty)
- **But** Dirksen et al (2014) suggest an uncertainty of 3-4 m for RS92 Z500!?
- Biggest problem (I think) is large biases (>15 m) from $\sim 10\%$ of radiosondes.
- Some are \sim constant in troposphere: station height error
- Bias correction or exclusion needed!
- One type reports geometric height!!
- Extra precision in BUFR helps a bit:
- German (block 10) uncertainty < 5 m:

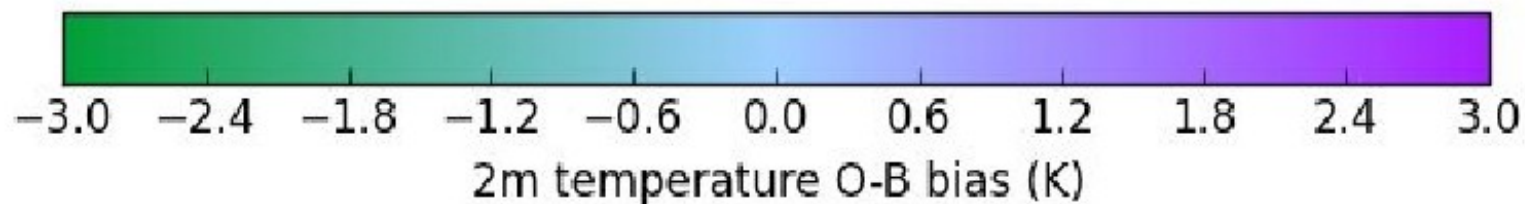
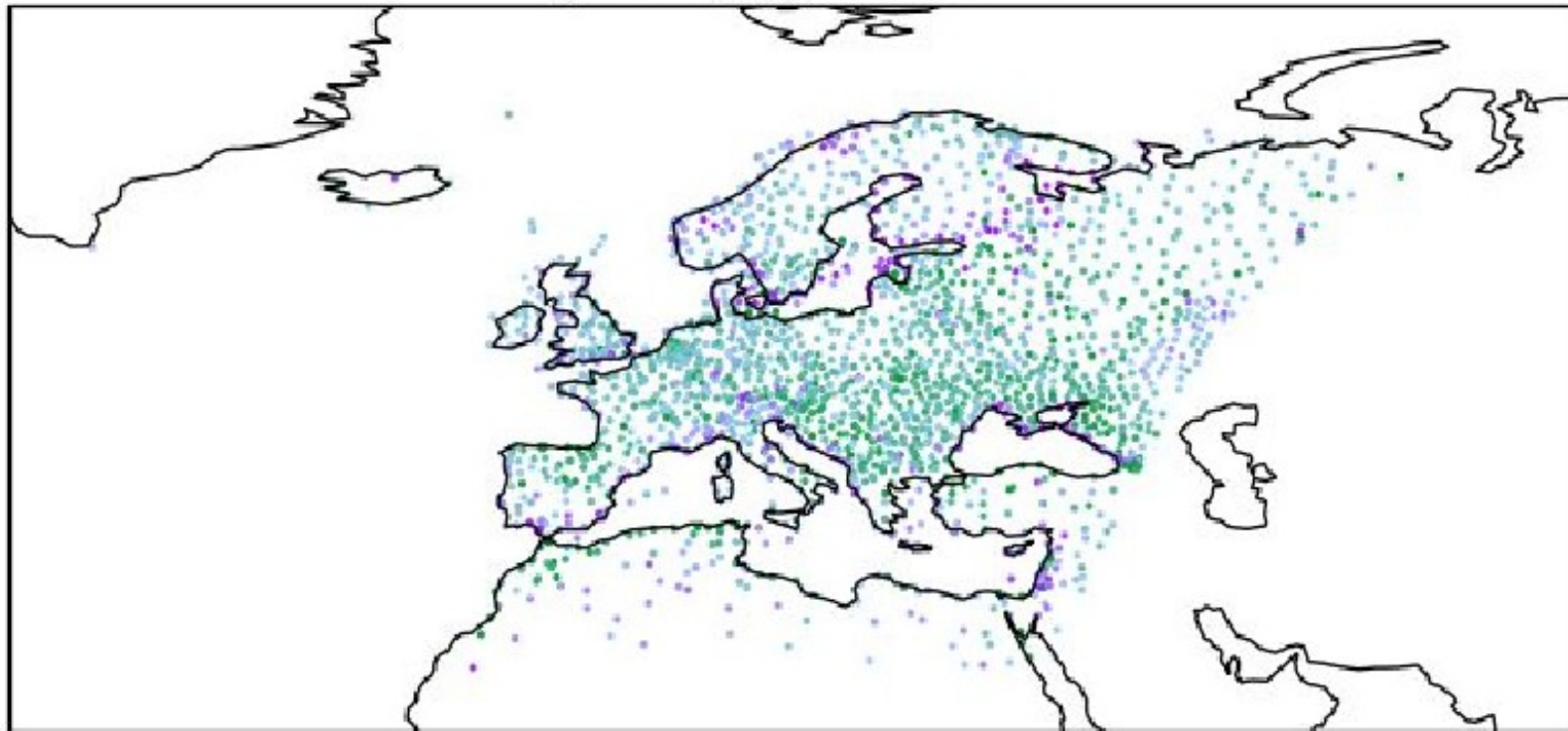


Bruce Ingleby

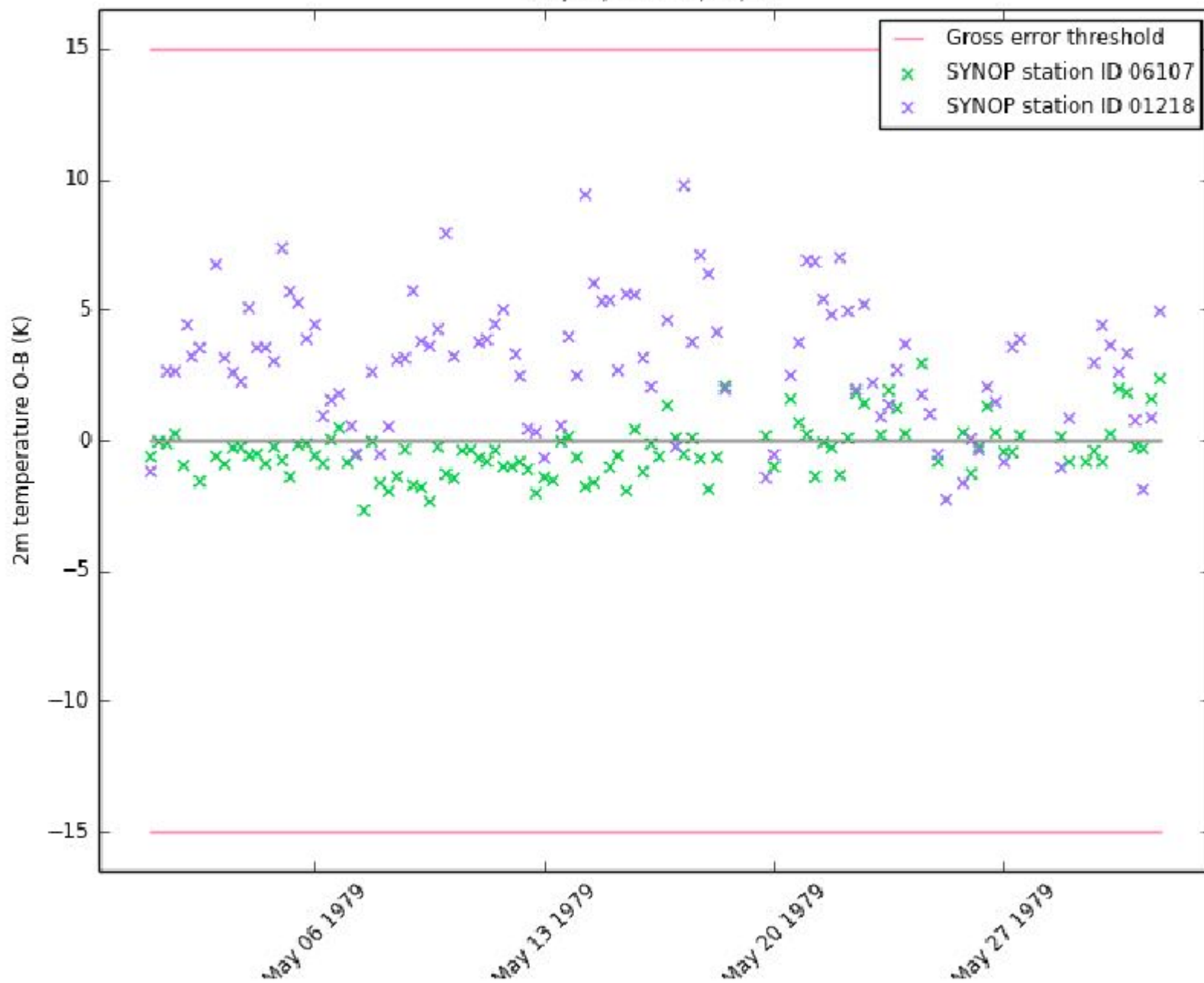
SYNOP temp2m
1979-04-01



O-B Bias for SYNOP stations with 2m temperature reports
during 01/05/79 until 01/06/79
ignoring gross errors



Example of station O-B value time series from Met Office reanalysis
01/05/79 - 31/05/79



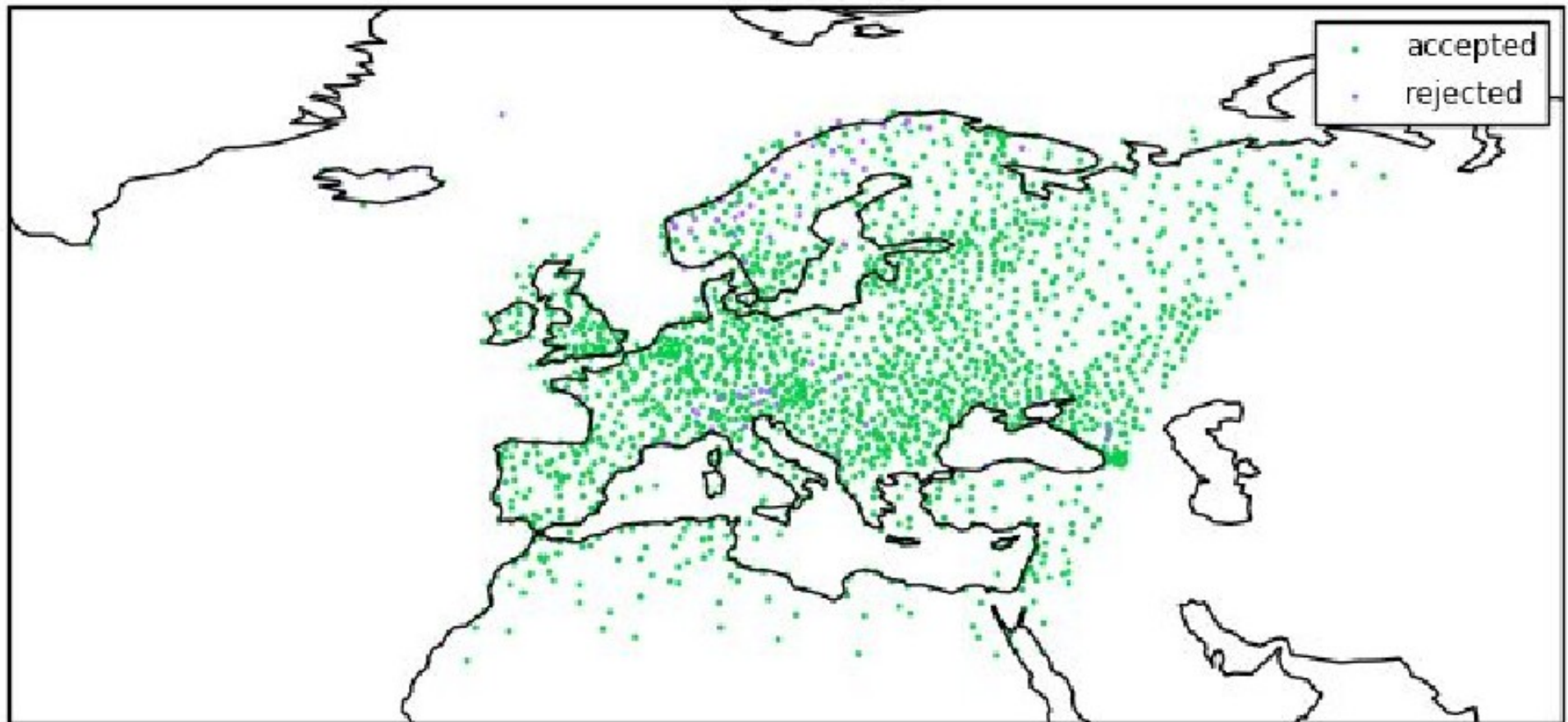
Station Lists

- Contain information about which observations should or should not be rejected, bias corrections, probabilities of gross error, thinning and observation errors
- Station lists for different observation types (surface, aircraft, sonde etc.) are updated in different ways

For surface stations:

- Calculate O-B statistics from previous month
- Make a decision about whether to reject reports from the station

Decisions Plot (197901) SYNOP temp2m



IMDAA (Indian reanalysis) 10m wind O-B



Wind speed (m/s) Departures - MAY2013_APRIL2014
498 stations

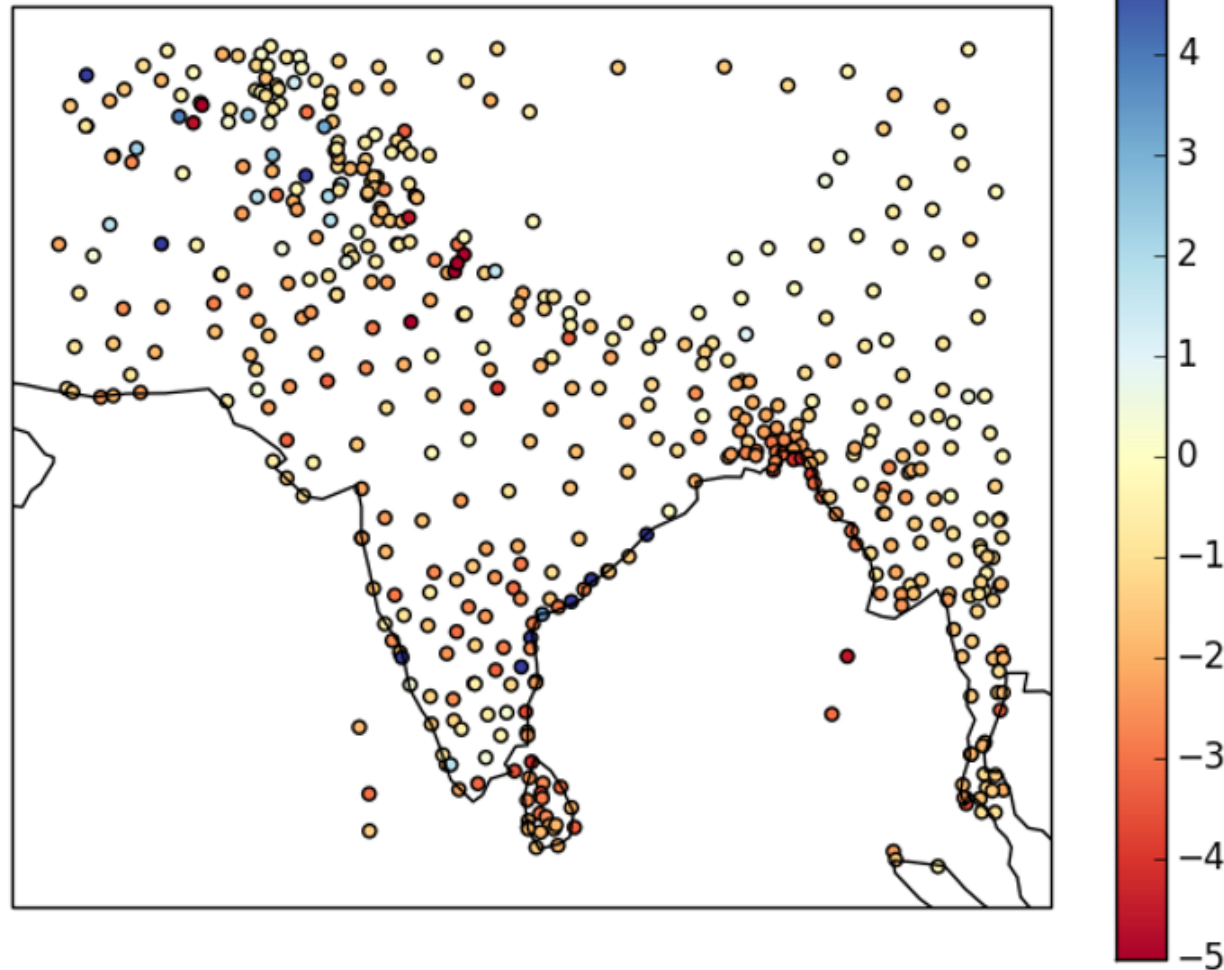


Figure 9: Map of mean wind speed (m/s) O-B for SYNOP from May 2013 to April 2014 for the region 60E-100E, 5N-40N

IMDAA - Indian reanalysis 10m wind reports

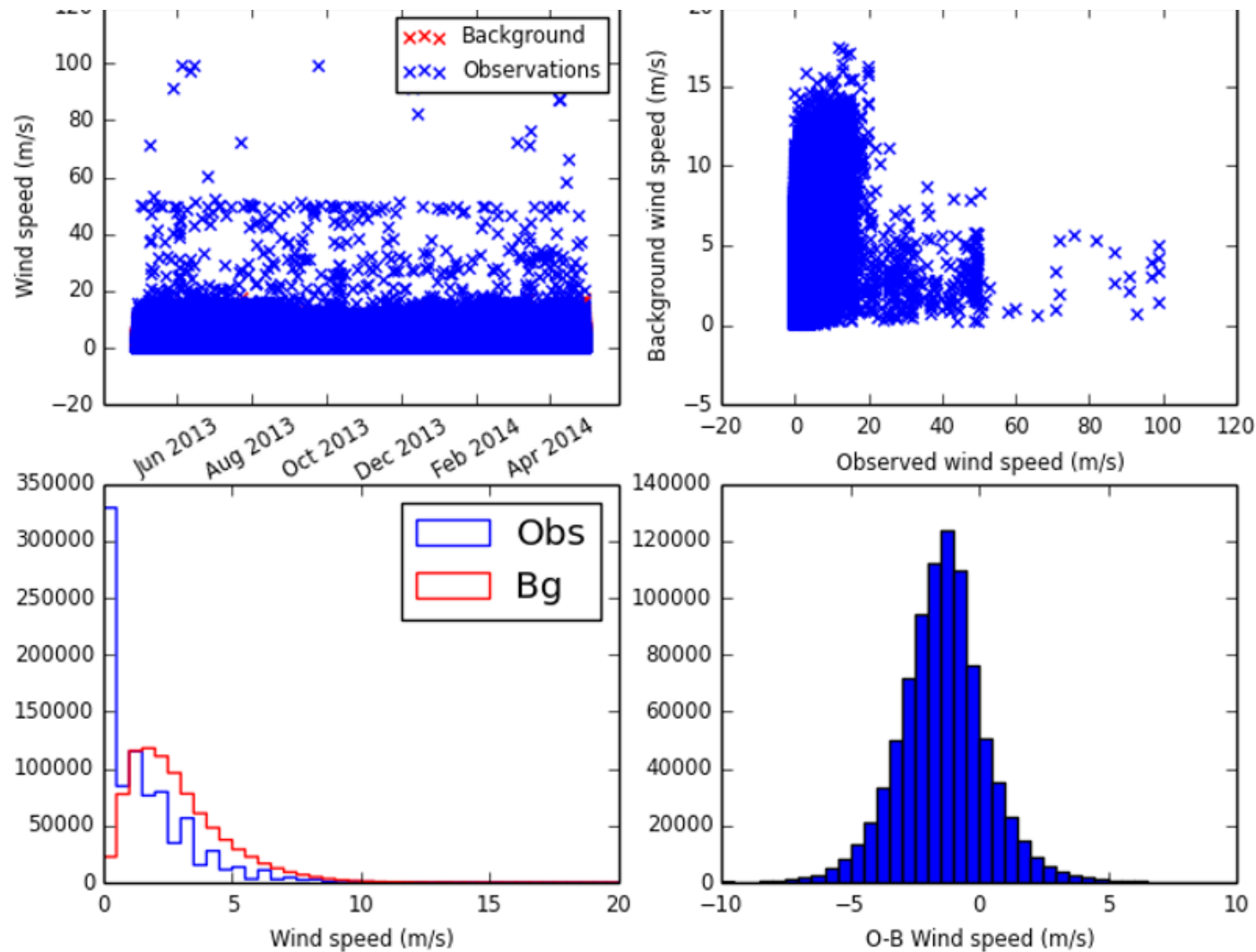


Figure 8: Scatter plot of observed and background 10m wind speed values (top left), scatter plot of observed values against background values (top right), histograms of observed and background values (bottom left) and histogram of O-B values (bottom right)

Core-Climax Coordination Meeting Towards Exchanging Reanalysis Observation Feedback and Blacklists

<http://www.coreclimax.eu/?q=Feedback>

ResearchGate 



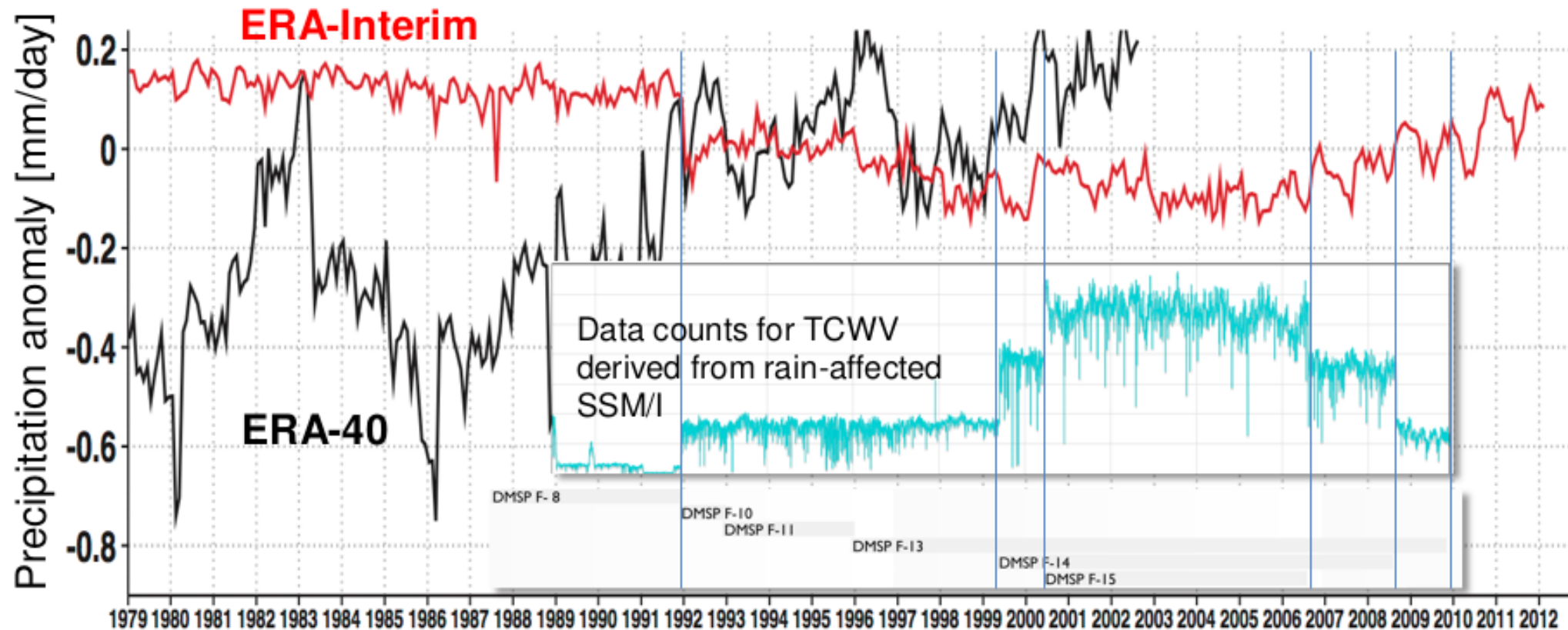
Paul Poli

Meteo France, Brest · Centre de Météorologie Marine

29.13 · Doctor of Philosophy

Assimilation feedback example 1

understanding the shifts in ERA-Interim water cycle

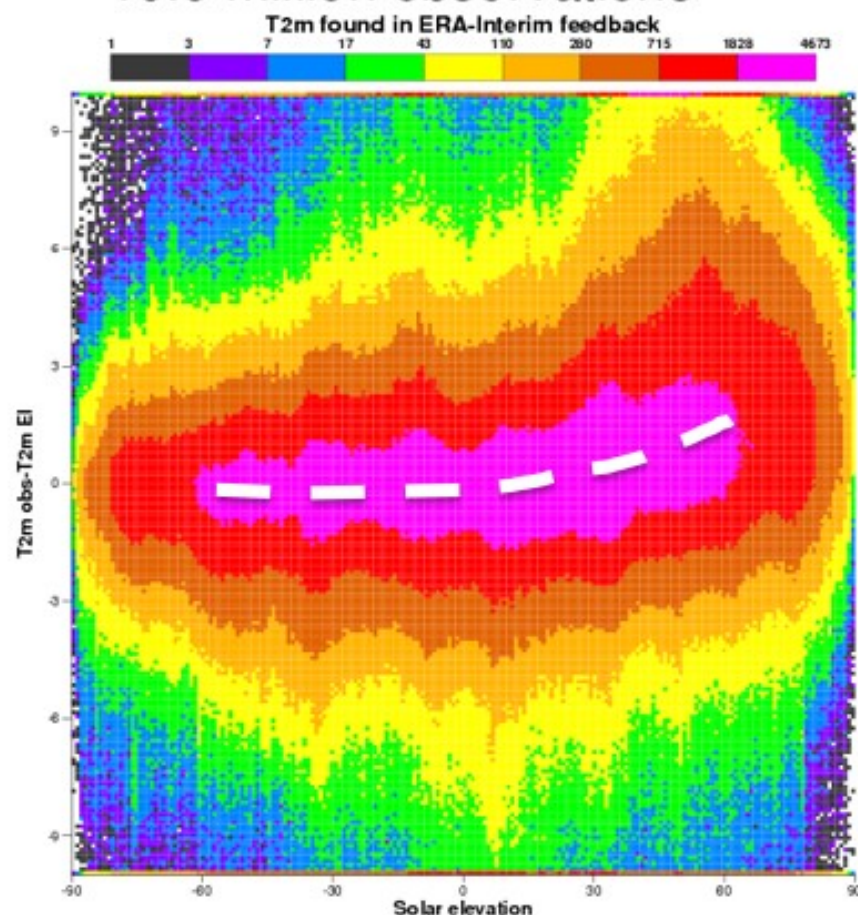


- Due to assimilation of rain-affected radiances from SSM/I, now fully understood (*Geer et al. 2008*)
- Effect scales (non-linearly) with the N. of assimilated SSM/I data

Assimilation feedback example 3

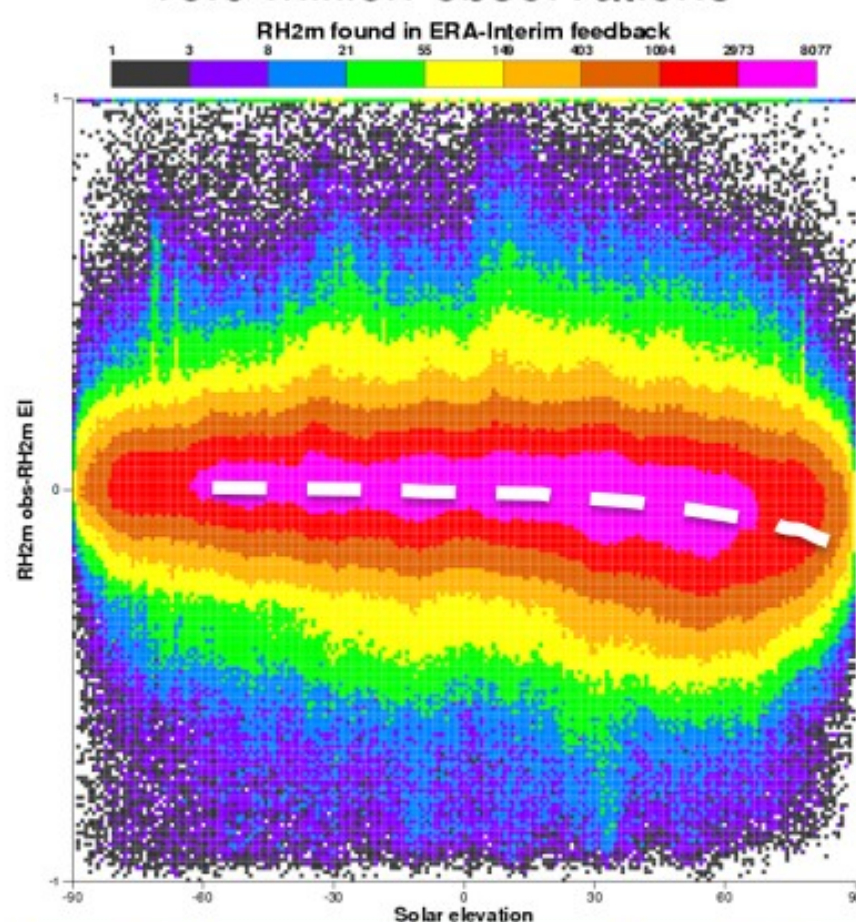
effect of solar radiation on temperature and relative humidity biases

19.9 million observations



- T obs. mean departures from ERA-Interim analyses increase with solar angle: where is the bias, in obs. or ERA-Interim?

18.9 million observations



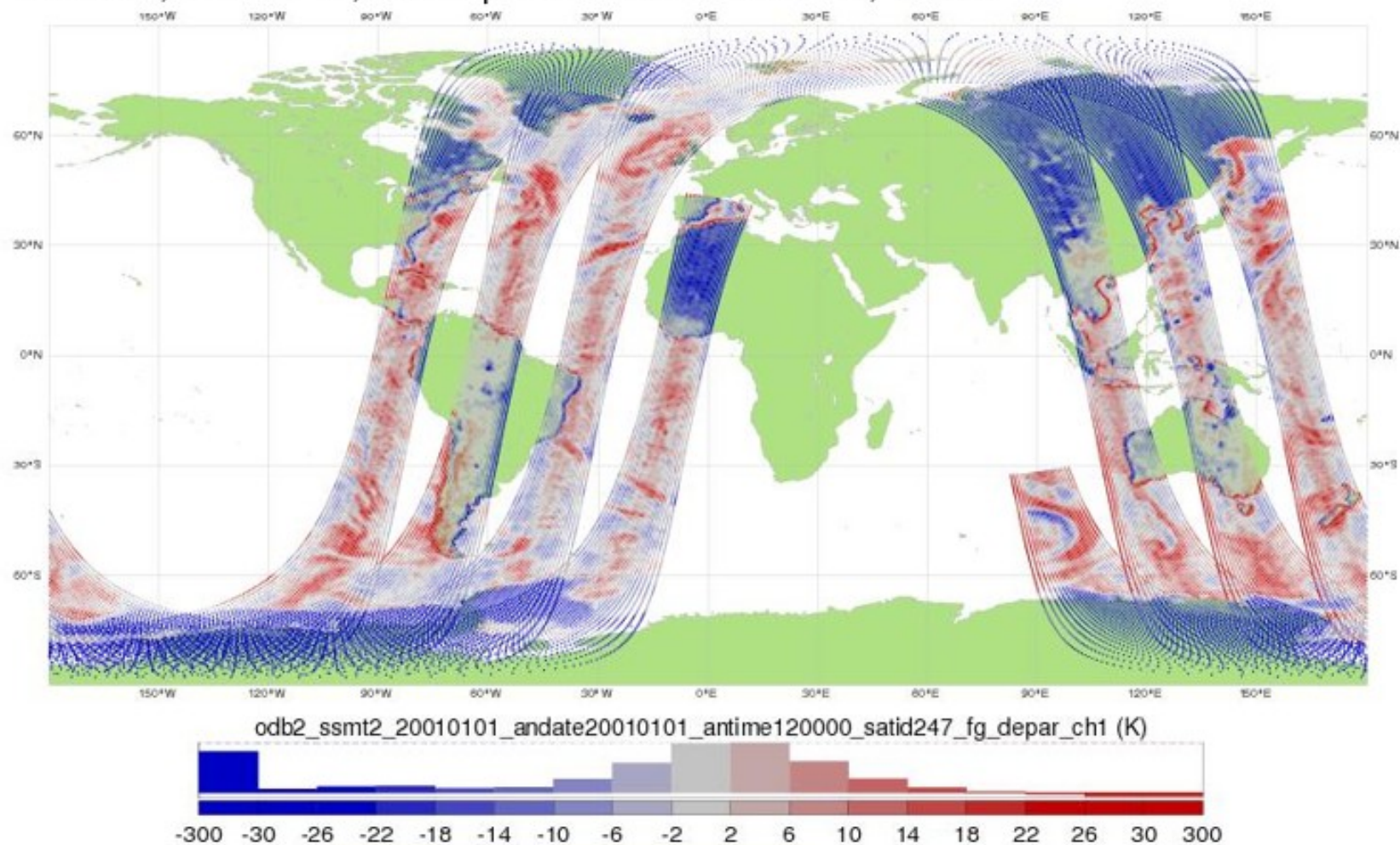
- RH obs. mean departures from ERA-Interim analyses decrease with solar angle: where is the bias, in obs. or ERA-Interim?

Based on land surface observations found in ERA-Interim obs. feedback, latitudes 20S-90S, Oct 1978-Jan 1989

Independent feedback example 1

Spotting inconsistencies in SSMT2 observations by comparing with an instrument simulator (RTTOV)

SSM/T-2, DMSP F14, 6-hour period around 20010101, 12UTC



Inaccurate geolocation?

This is all very nice, but ...

Has anybody here seen reanalysis
observational feedback before?



Thank you