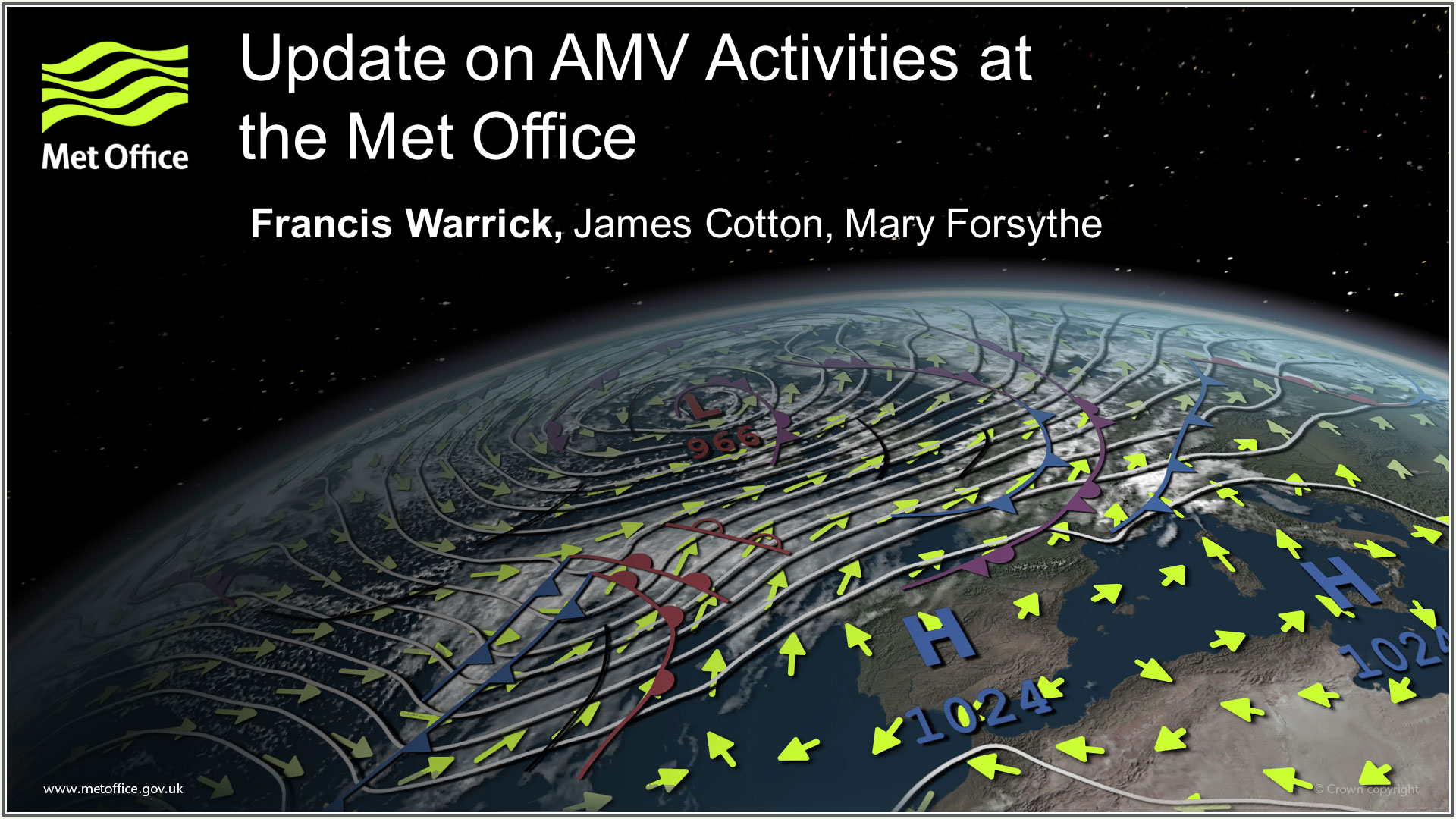
Update on AMV Activities at the Met Office

Francis Warrick, James Cotton, Mary Forsythe



Outline

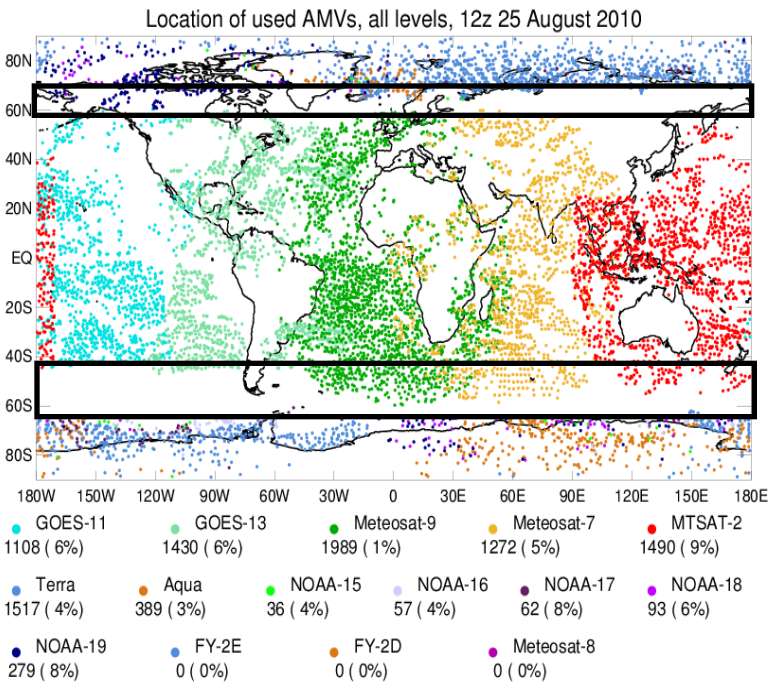
- Assimilation trials of new AMV data since IWW 12

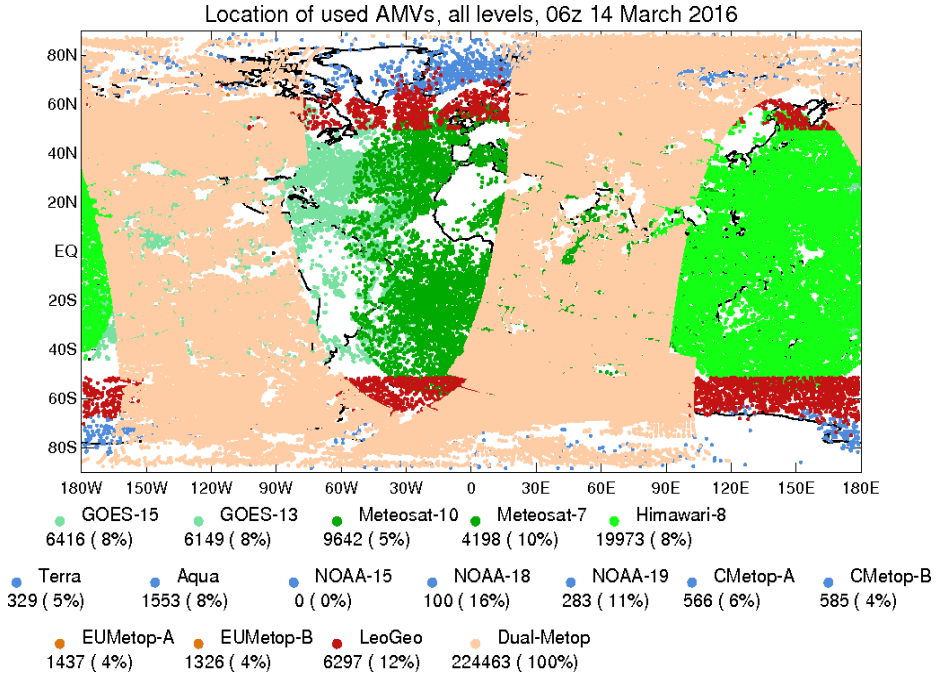
- Use of cloud and cluster information from nested tracking test data for AMV quality control

Trials of New Data

2014 - 16

New Data: LEO-GEO Gap





New Data: LEO-GEO Gap

Change	Impact on NWP Index		Outcome
	Obs	Analyses	
EUMETSAT Single-Metop	+ 0.04 %	+ 0.17 %	Operational Feb 2015
LeoGeo	+ 0.04 %	+ 0.10 %	Operational Feb 2015
EUMETSAT Dual-Metop	- 0.04 %	+ 0.03 %	Also saw worse fit to radiances On hold

New Data: Geostationary

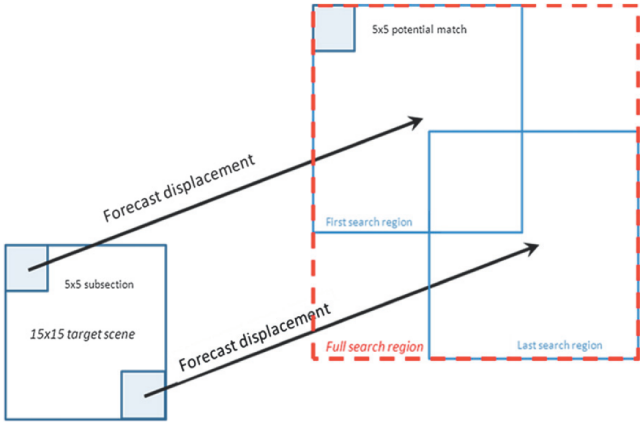
Change	Impact on NWP Index, Verified Against:		Outcome
	Observations	Own Analyses	
Himawari-8 replaces MTSAT-2 • Similar quality control • Reduced height errors	- 0.02 %	0.0 %	Operational Feb 2016
Himawari-8: expanded usage • Add WV 6.2 and WV 7.3 • Reduce QI threshold from 85 to 75 • Remove winter jet stream blacklist of jet IR	Summer + 0.04 % Winter - 0.15 %	Summer + 0.04 % Winter - 0.21 %	Also saw worse fit to radiances Problems in tropics – W250 On hold
GOES Visible	- 0.05 %	- 0.57 %	On hold
GOES Shortwave Infrared	+ 0.06 %	- 0.30 %	Re-trial with inversion correction.

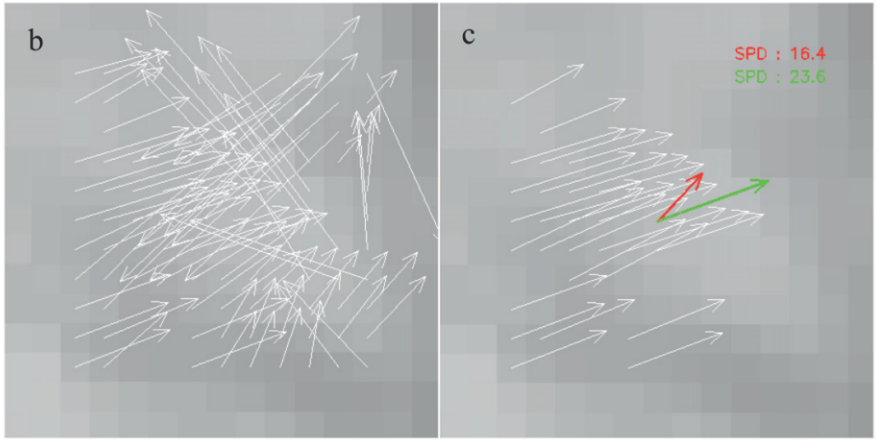
New Data: Polar

VIIRS AMVs (NESDIS + direct broadcast)	Versus Obs	Versus Own Analyses	ECMWF Analyses
Summer	+ 0.11 %	+ 0.13 %	Not available
Winter	+ 0.19 %	+ 0.12 %	+ 0.11 %

Applications of Cloud & Cluster Information from the Nested Tracking AMVs

Nested Tracking: Quick Background





Green – average motion of largest cluster
Red – operational motion vector

- Small (5x5) target boxes to minimise spatial averaging.

- Nesting reduces random error.

- Field of local vectors

- Cluster analysis

(Plots from Bresky et al. 2012)

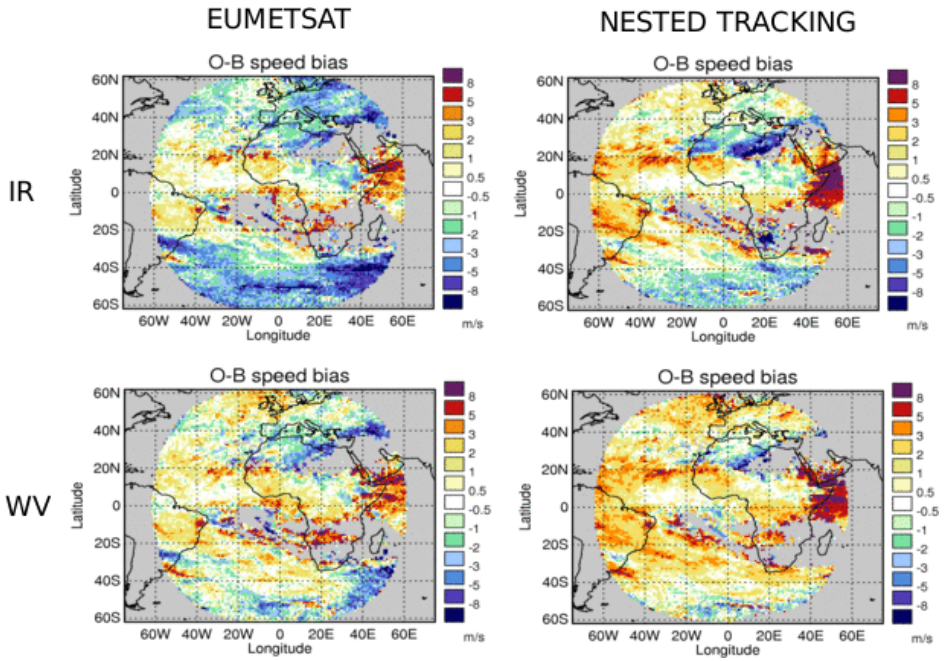
The Test Data

- AMVs derived using nested tracking algorithm on Meteosat-10 imagery, for June 2014.

- Cloud and cluster properties of the AMVs included

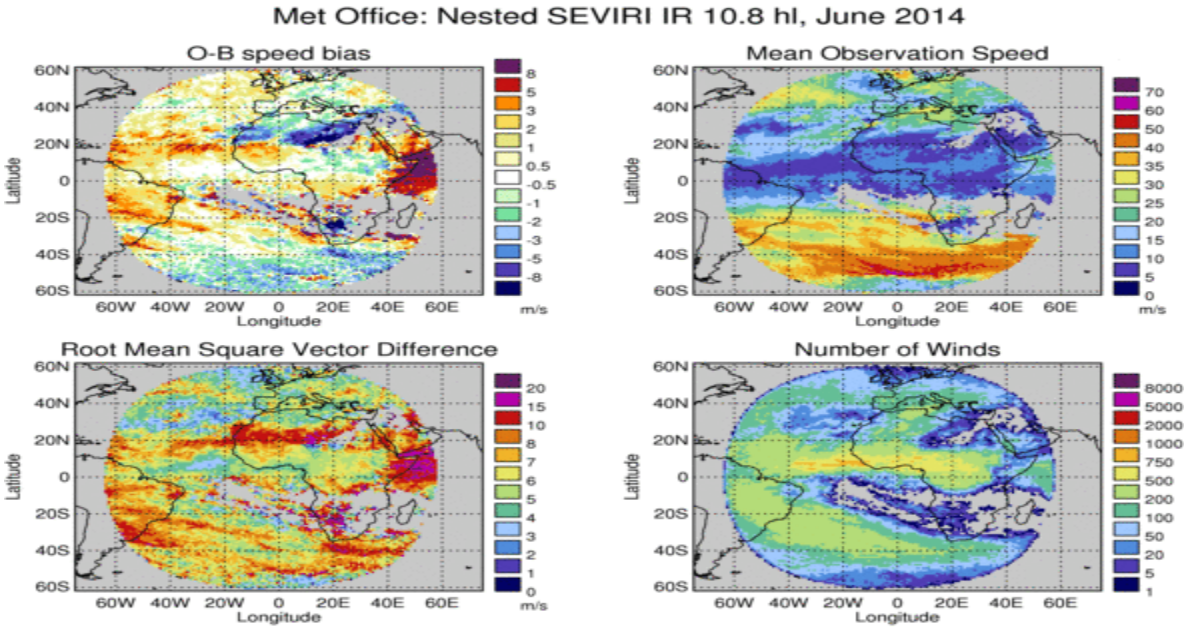
- O-Bs show larger fast bias in the tropics, smaller slow bias in the extra-tropics.

- Can the extra quality information be used to reduce O-Bs without losing too much spatial coverage or fast winds?



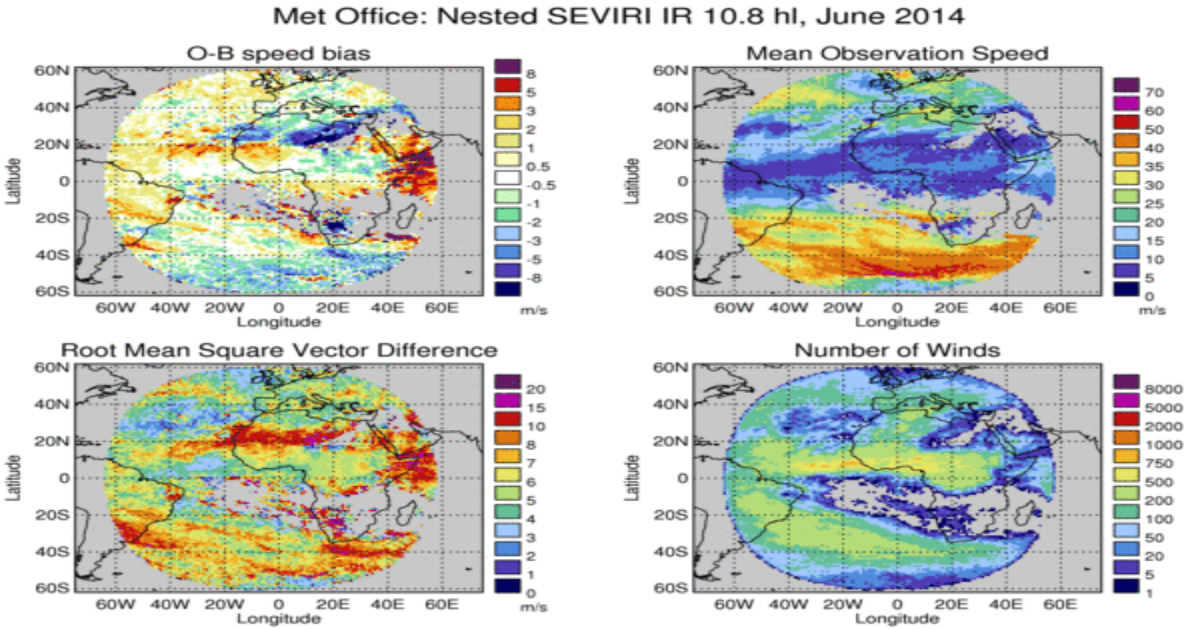
Optical Depth : All Data

IR
Above 400 hPa



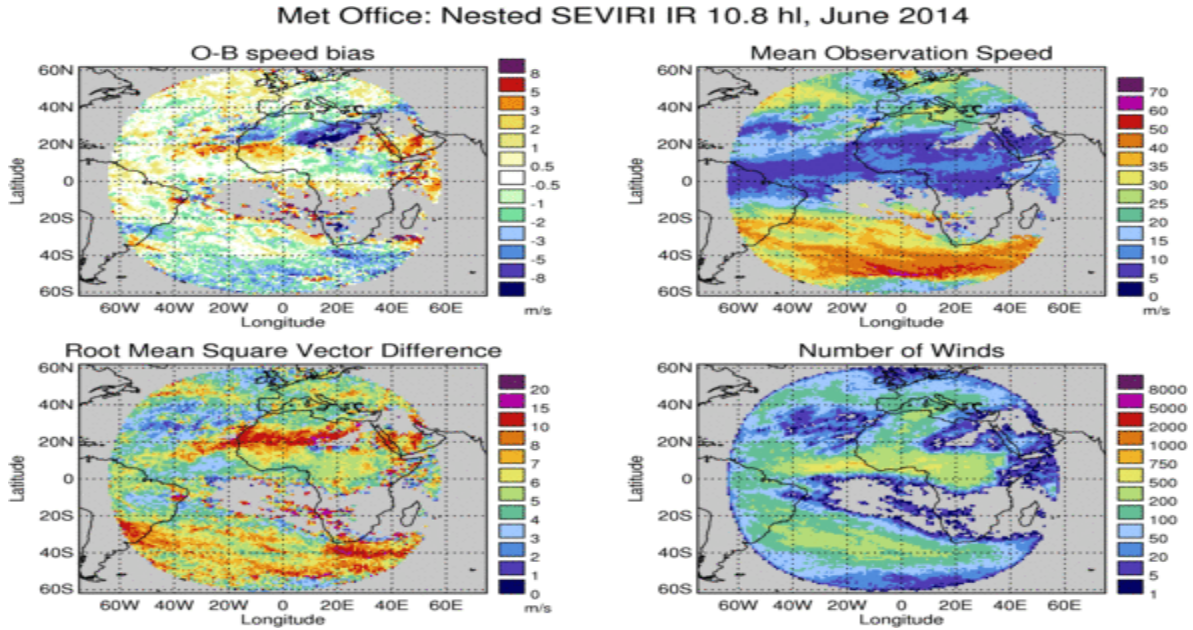
Optical Depth : >0.5

IR
Above 400 hPa



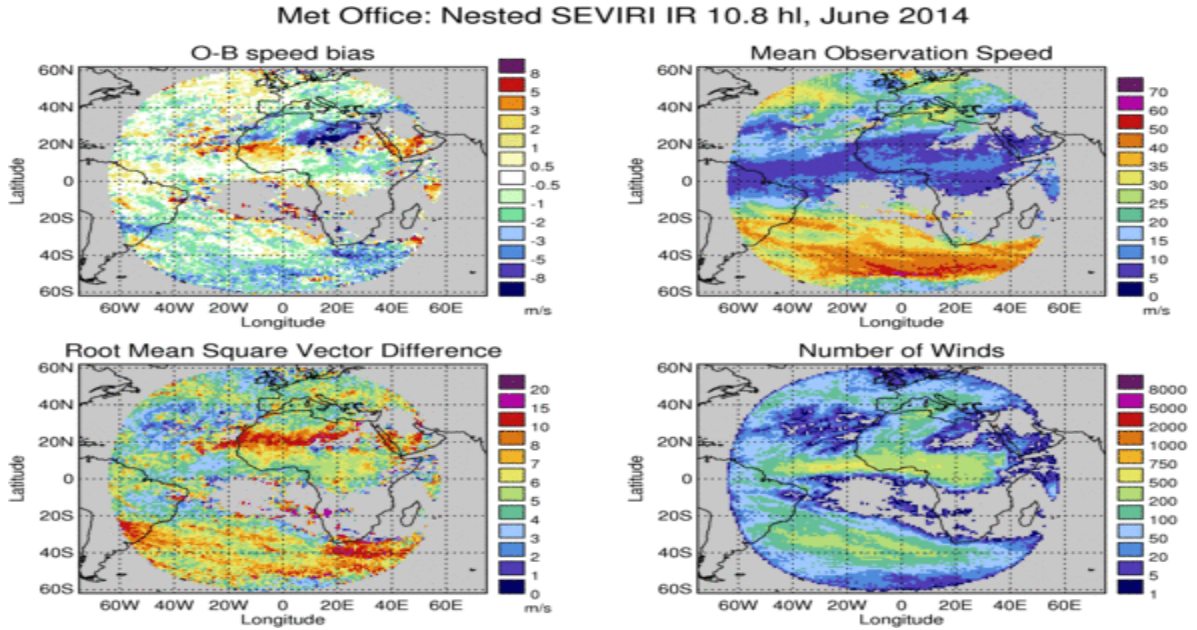
Optical Depth : >0.75

IR
Above 400 hPa



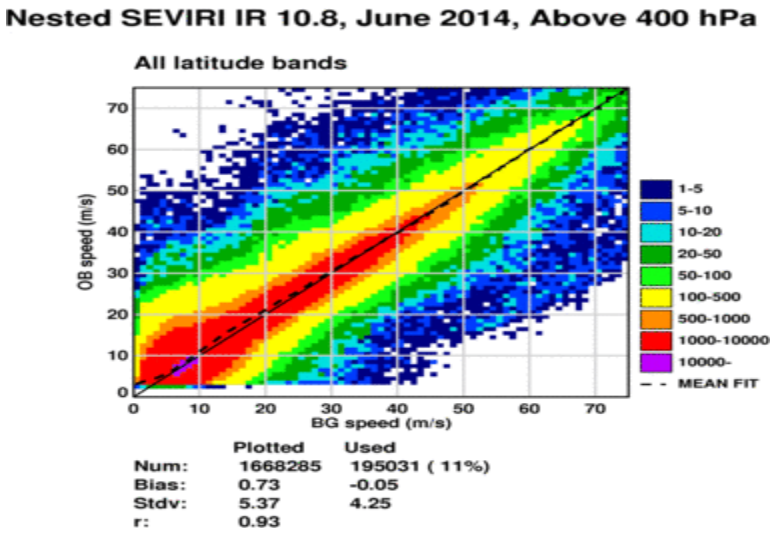
Optical Depth : >1.00

IR
Above 400 hPa



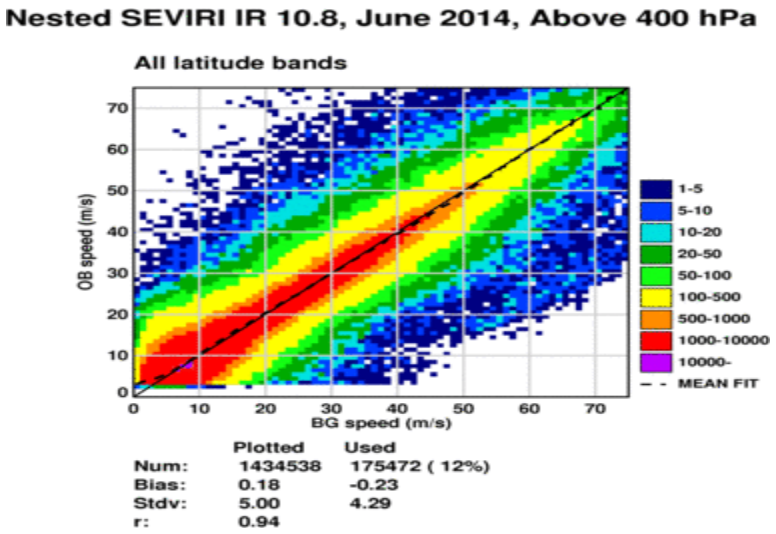
Optical Depth : All Data

IR
Above 400 hPa



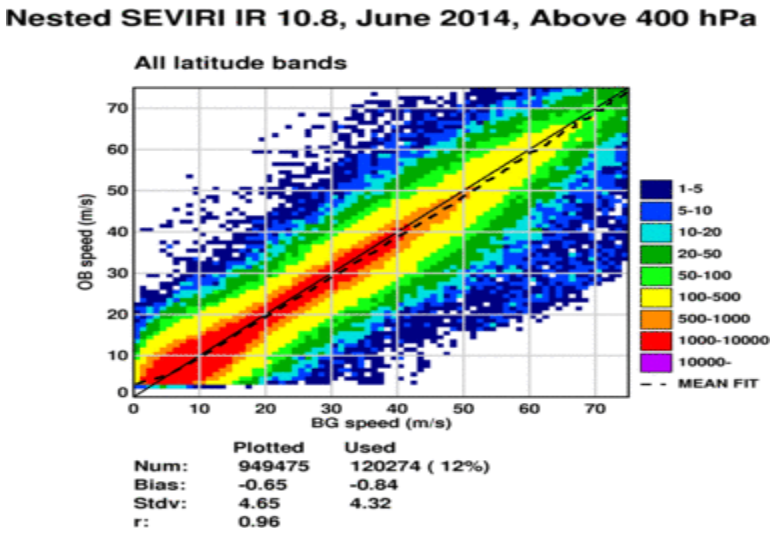
Optical Depth : >0.5

IR
Above 400 hPa



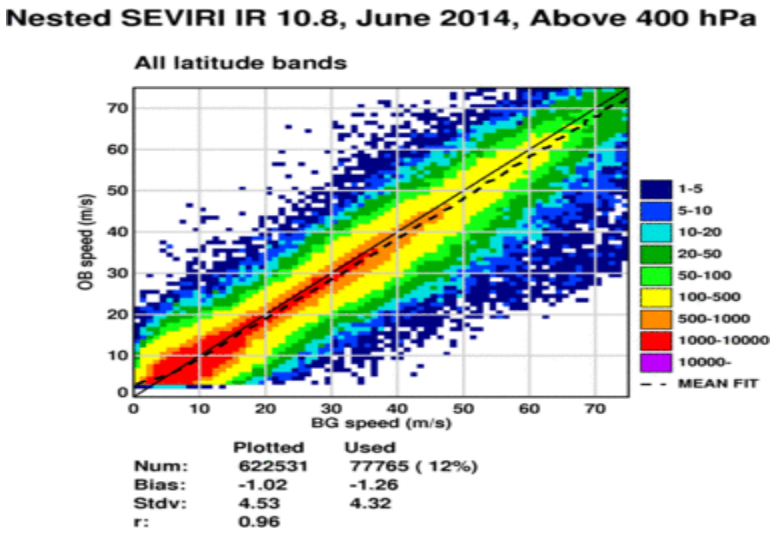
Optical Depth : >1.0

IR
Above 400 hPa



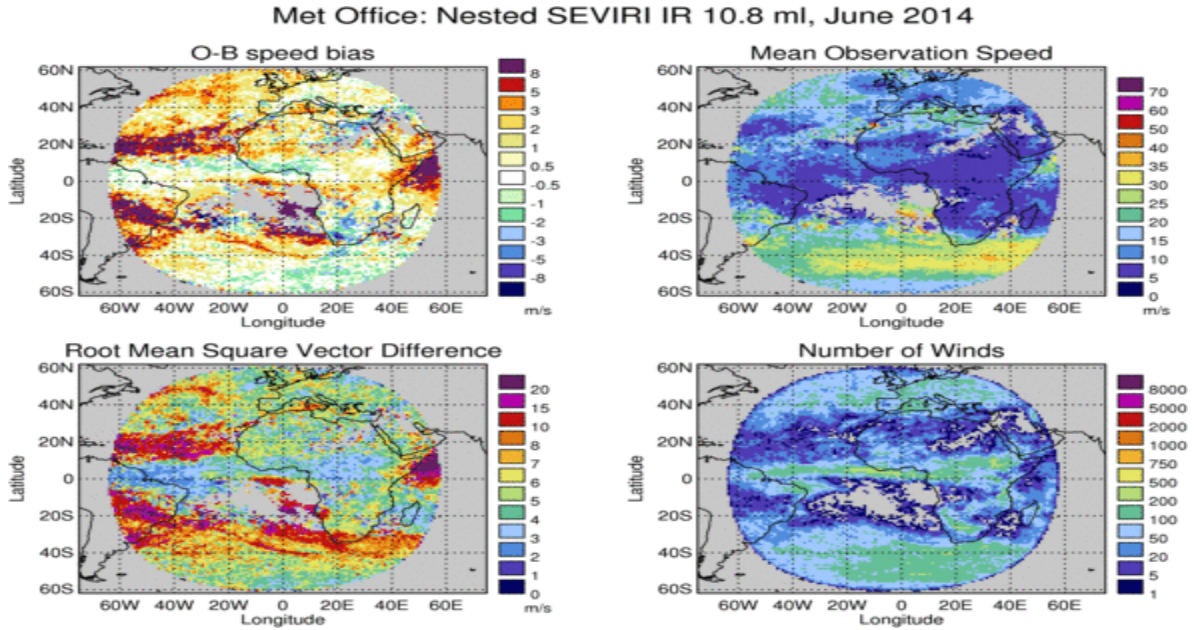
Optical Depth : >1.5

IR
Above 400 hPa



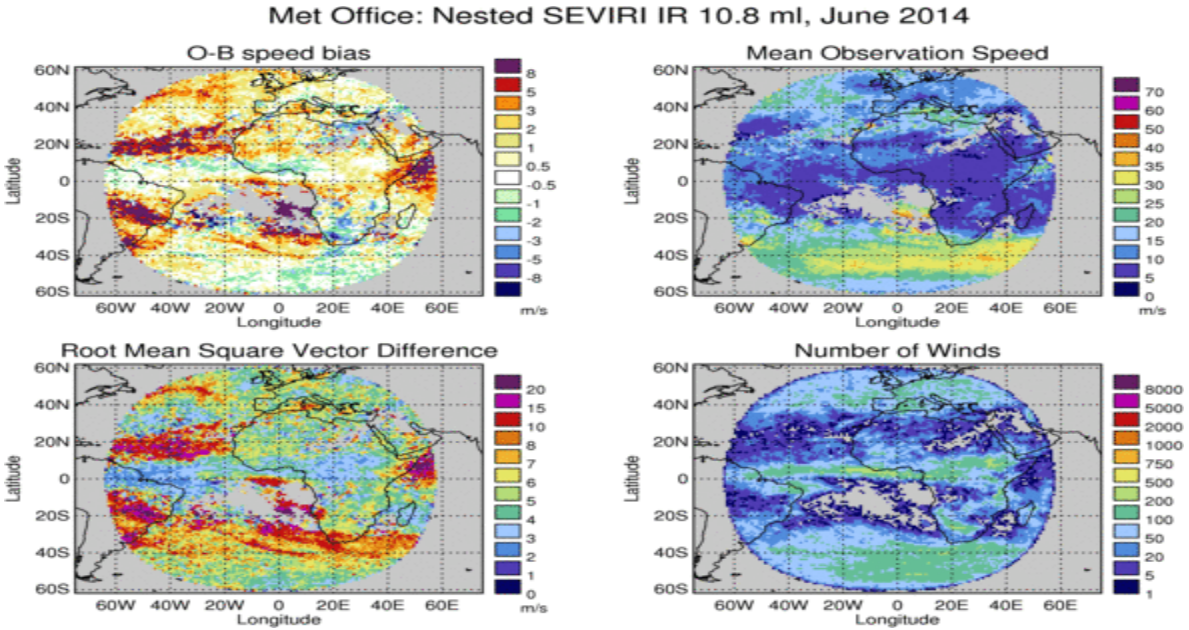
Optical Depth : All Data

IR
400-700 hPa



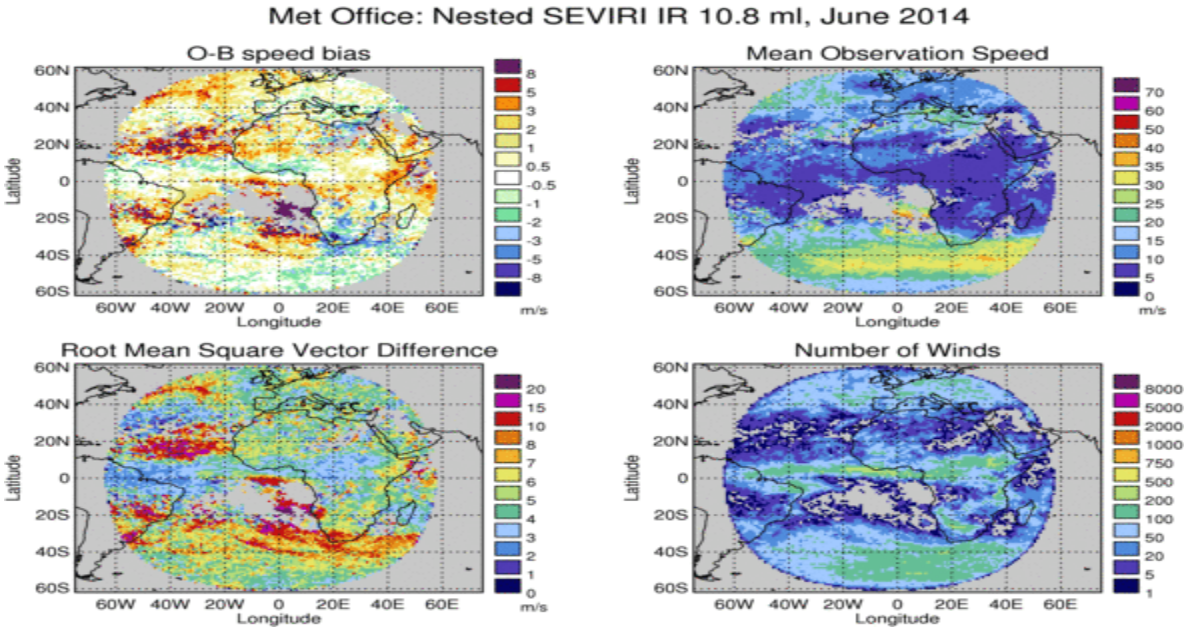
Optical Depth : >0.5

IR
400-700 hPa



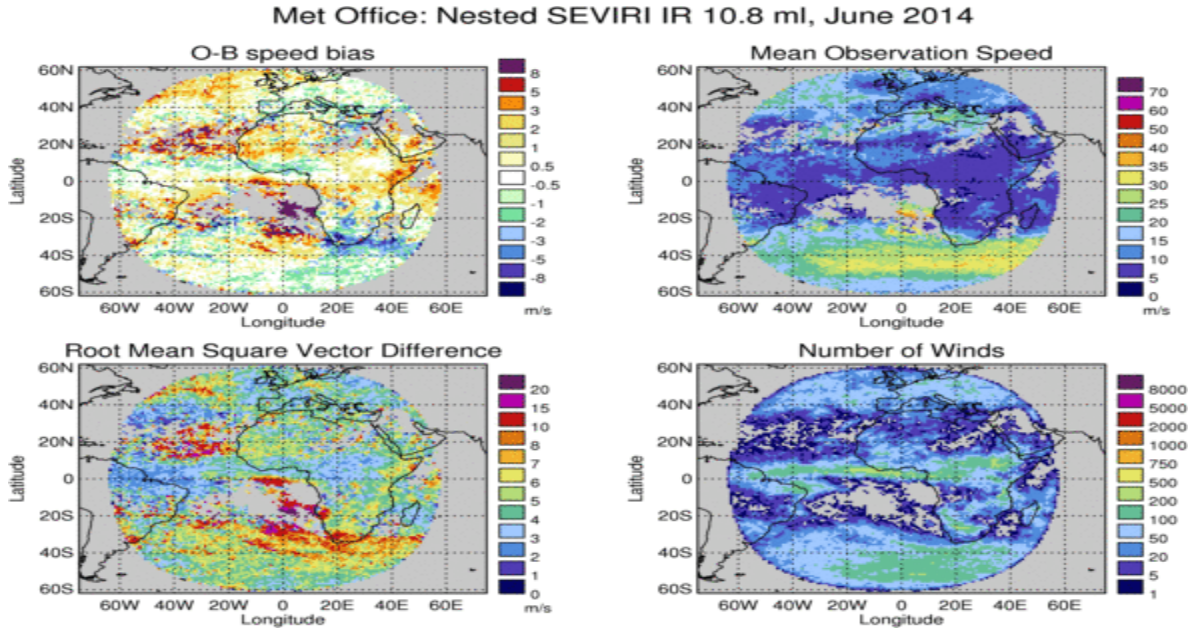
Optical Depth : >0.75

IR
400-700 hPa



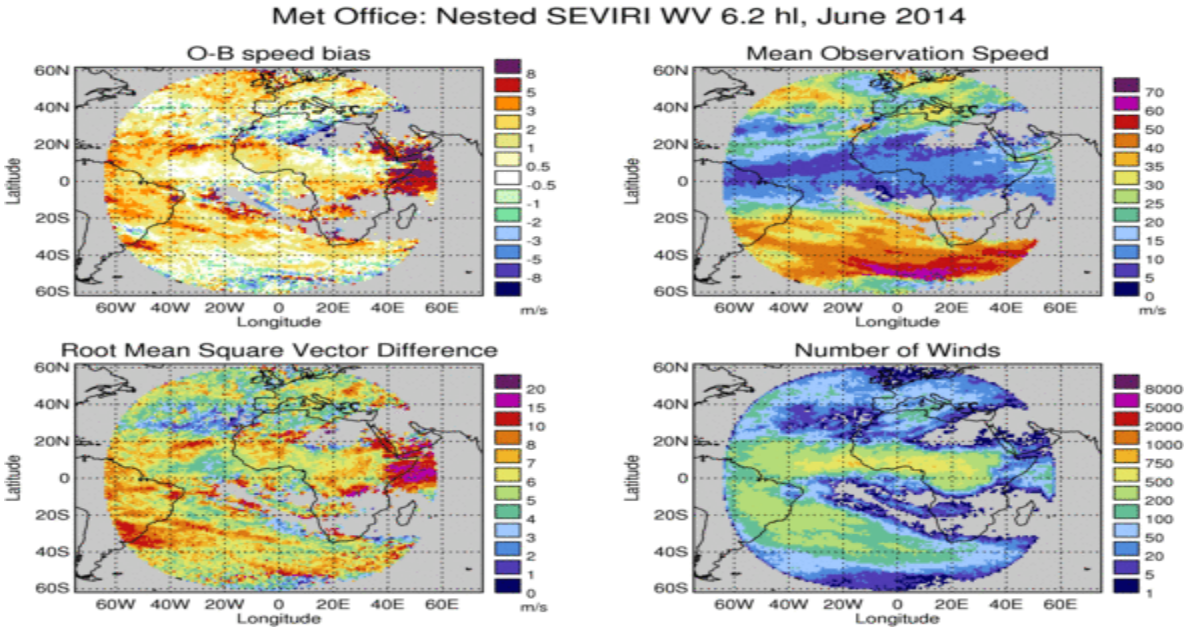
Optical Depth : >1.00

IR
400-700 hPa



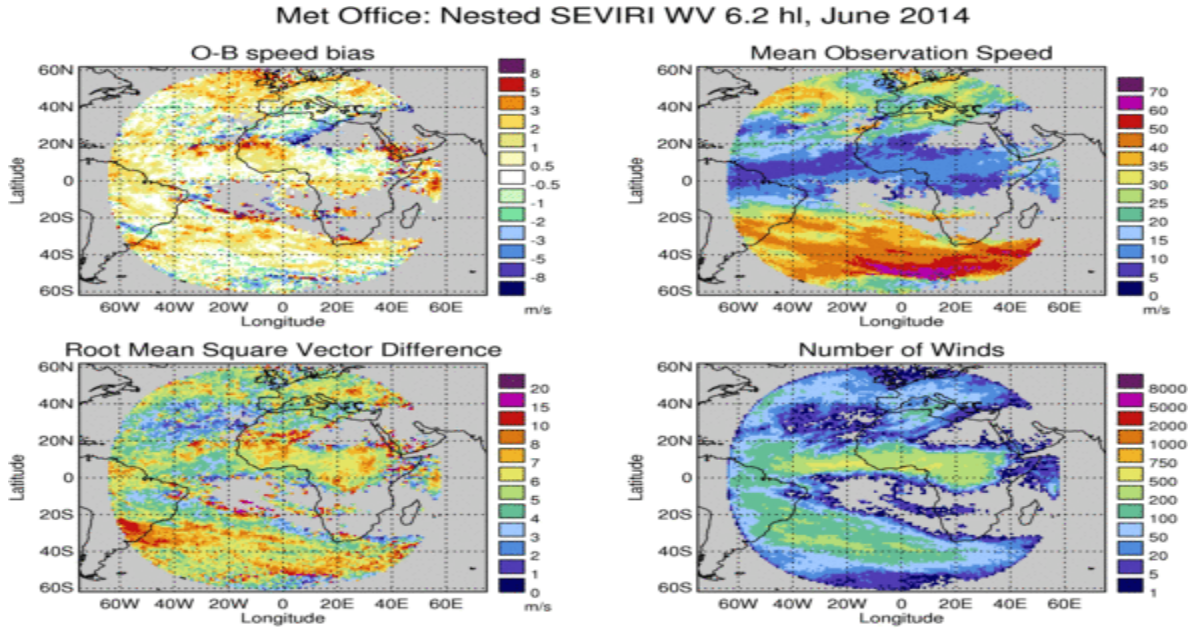
Optical Depth : All Data

WV
Above 400 hPa



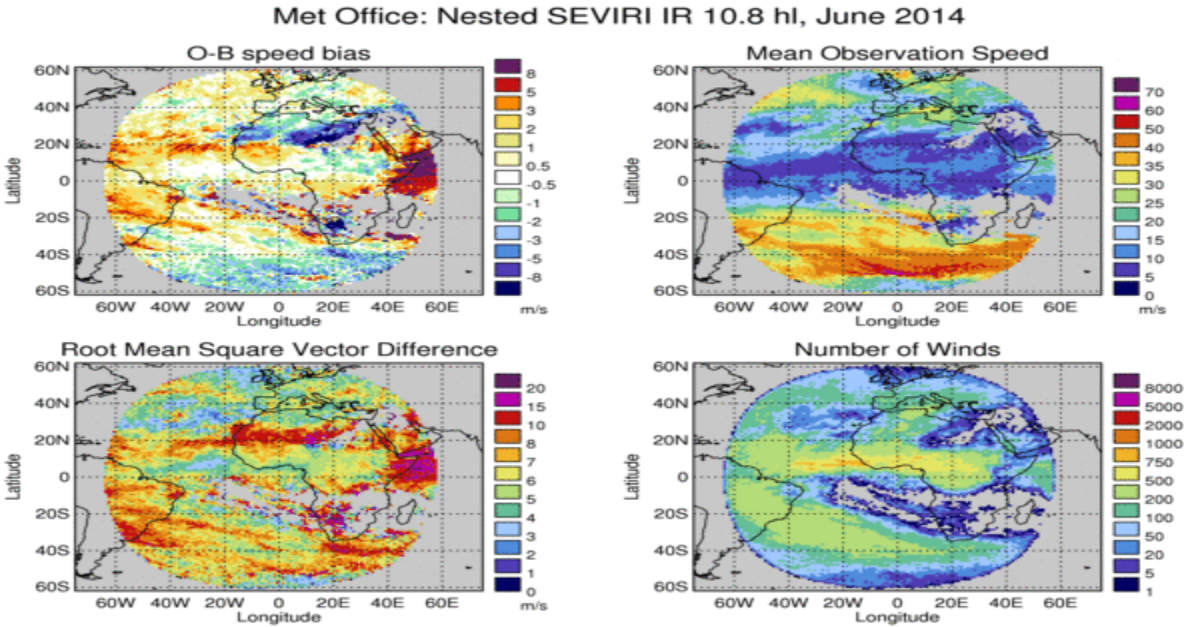
Optical Depth : >0.75

WV
Above 400 hPa



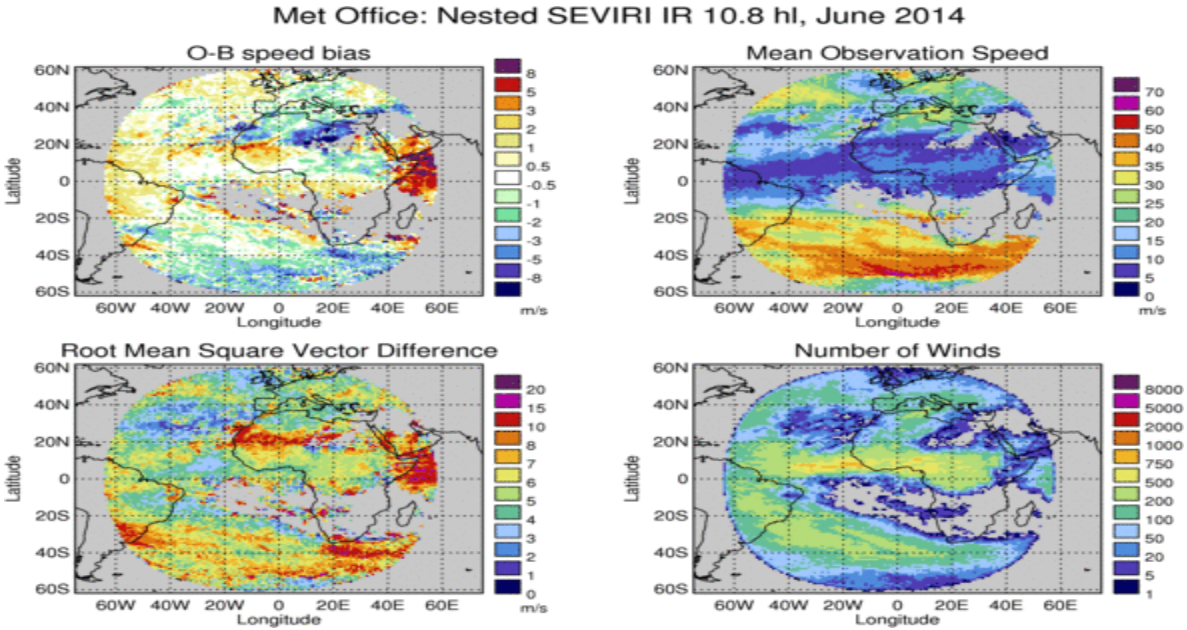
Pressure Error: All Data

IR
Above 400 hPa



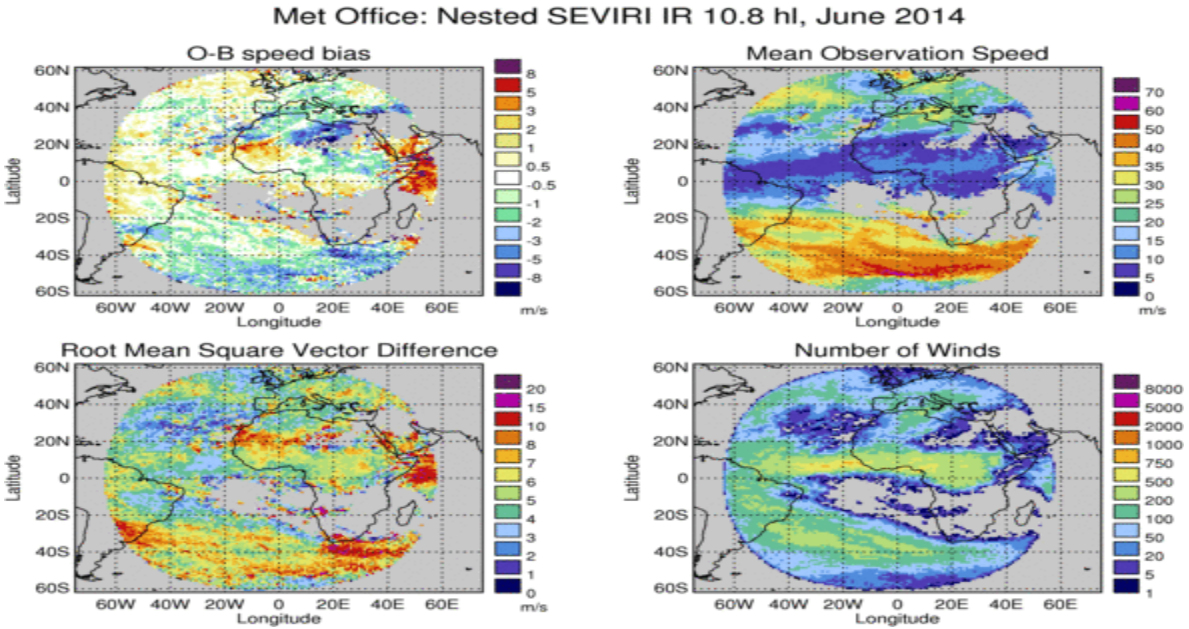
Pressure Error: < 140 hPa

IR
Above 400 hPa



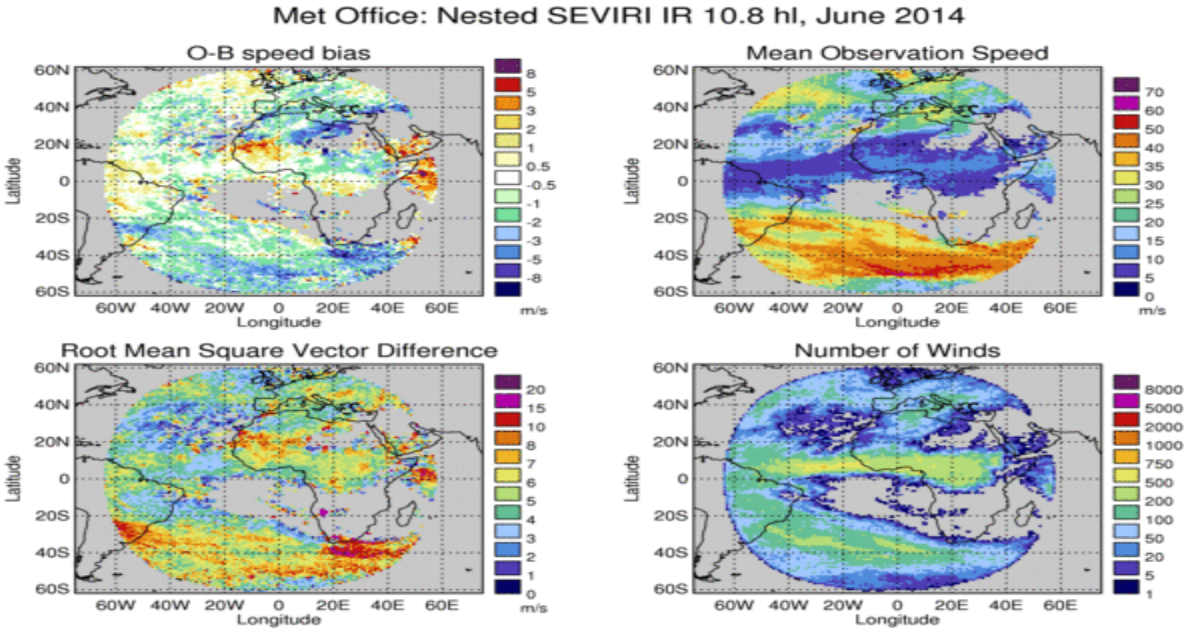
Pressure Error: < 120 hPa

IR
Above 400 hPa



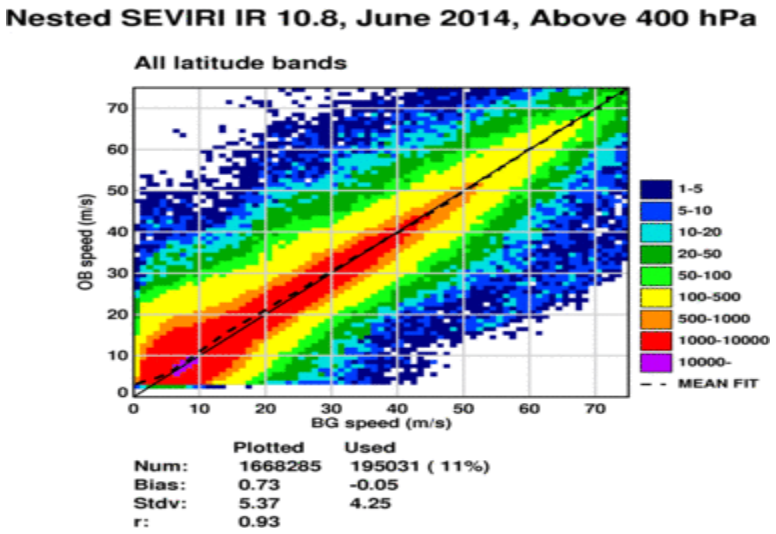
Pressure Error: < 100 hPa

IR
Above 400 hPa



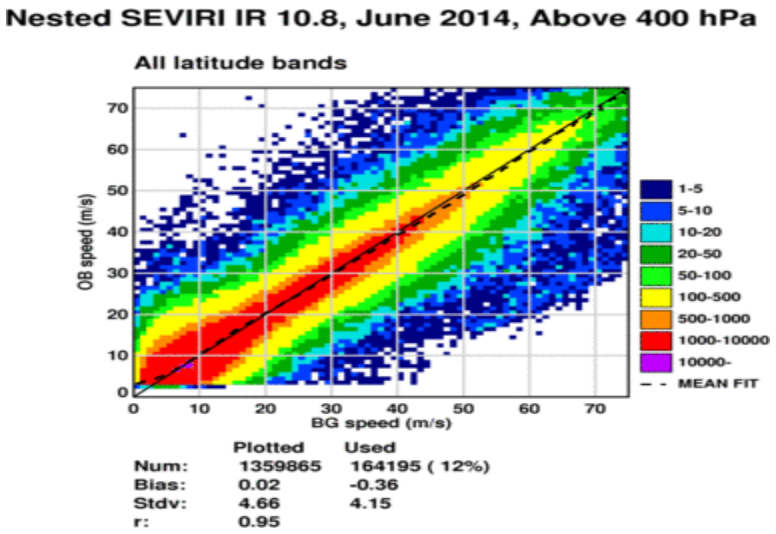
Pressure Error: All Data

IR
Above 400 hPa



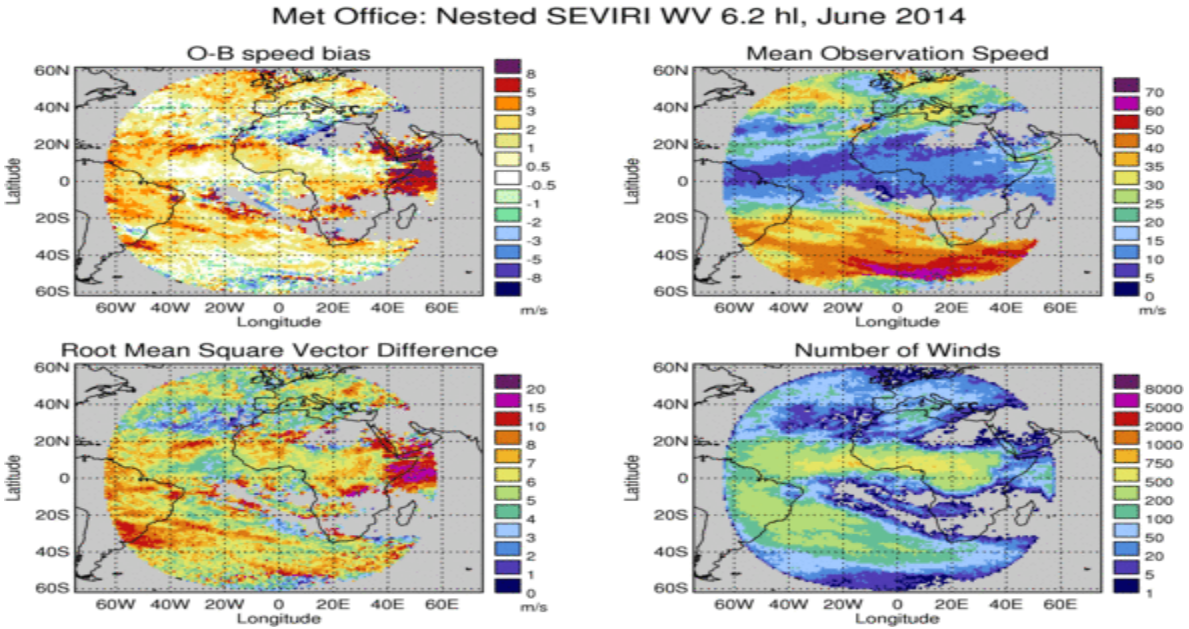
Pressure Error: < 140 hPa

IR
Above 400 hPa



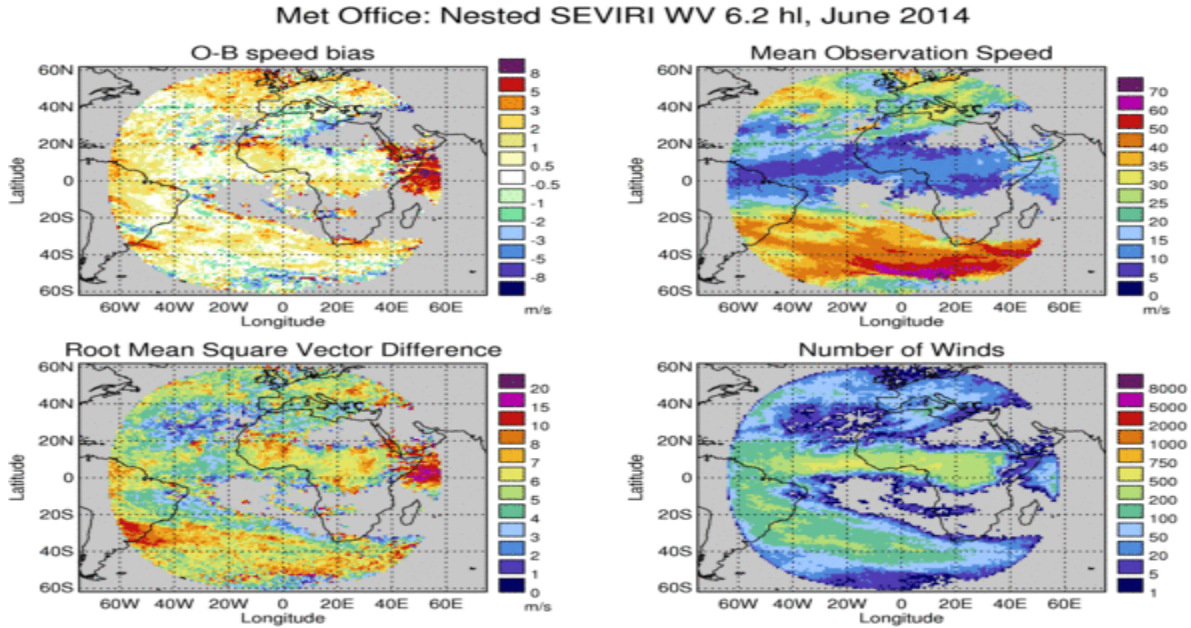
Pressure Error: All Data

WV
Above 400 hPa



Pressure Error: < 120 hPa

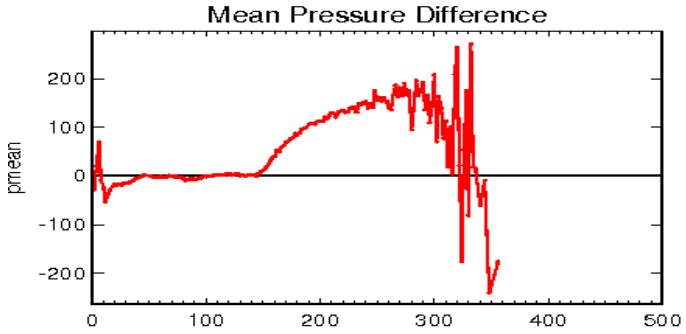
WV
Above 400 hPa



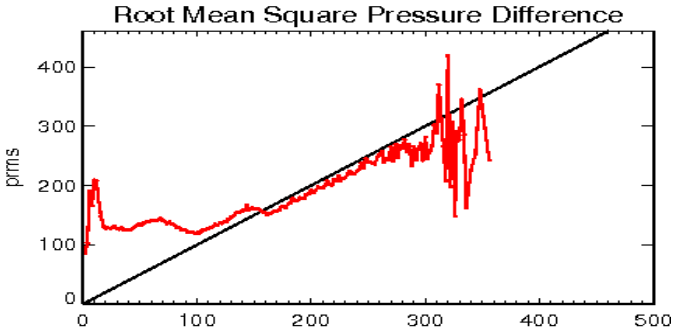
Median cloud top pressure error

Comparison to model best-fit pressure stats

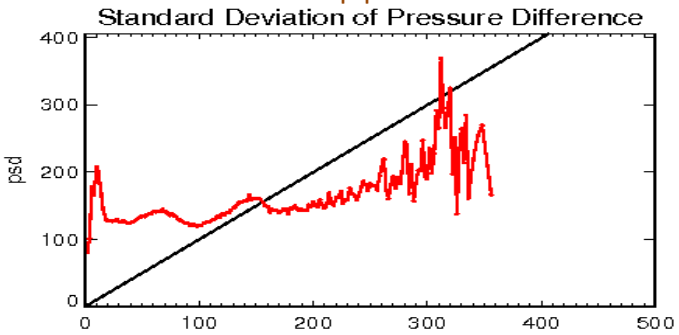
Nested SEVIRI IR 10.8
June 2014
All levels All latitude bands



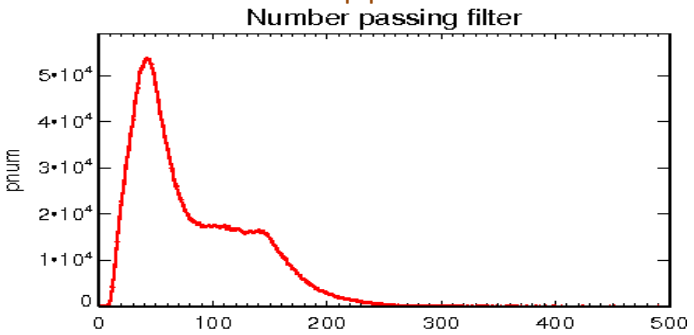
Median cloud top pressure error



Median cloud top pressure error



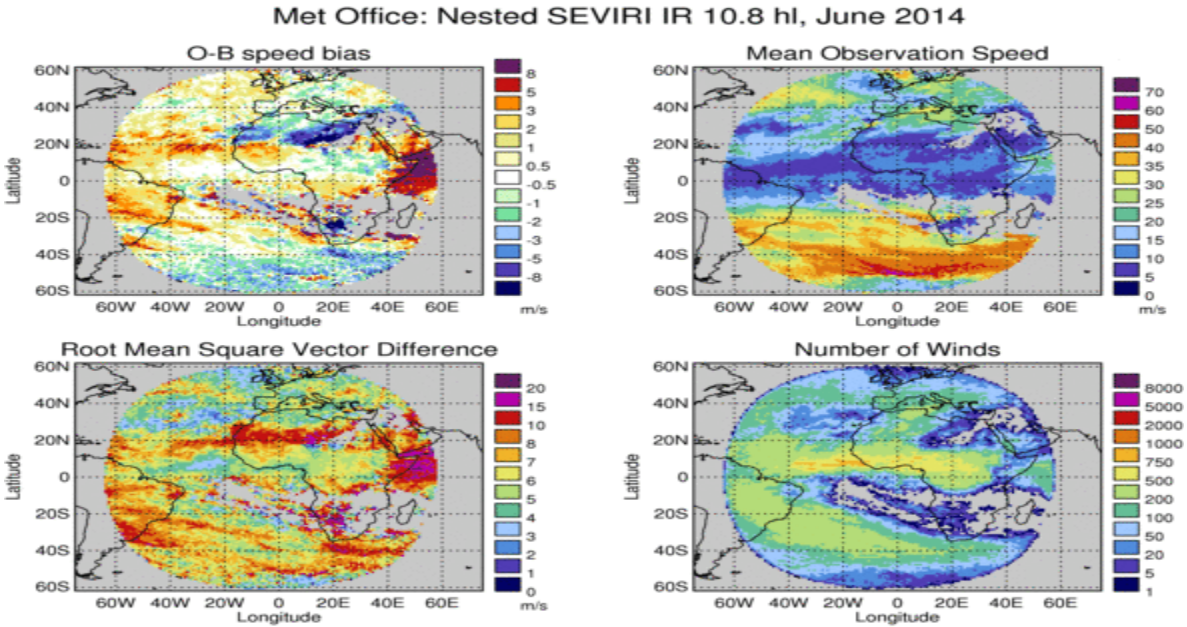
Median cloud top pressure error



Median cloud top pressure error

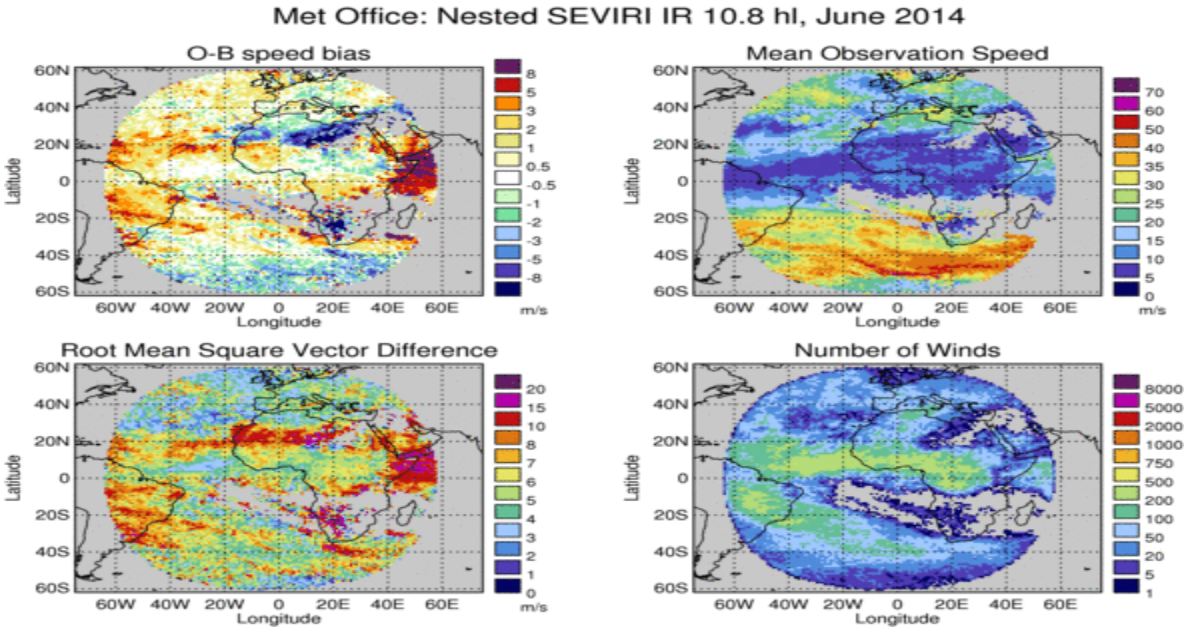
Number of Clusters: All Data

IR
Above 400 hPa



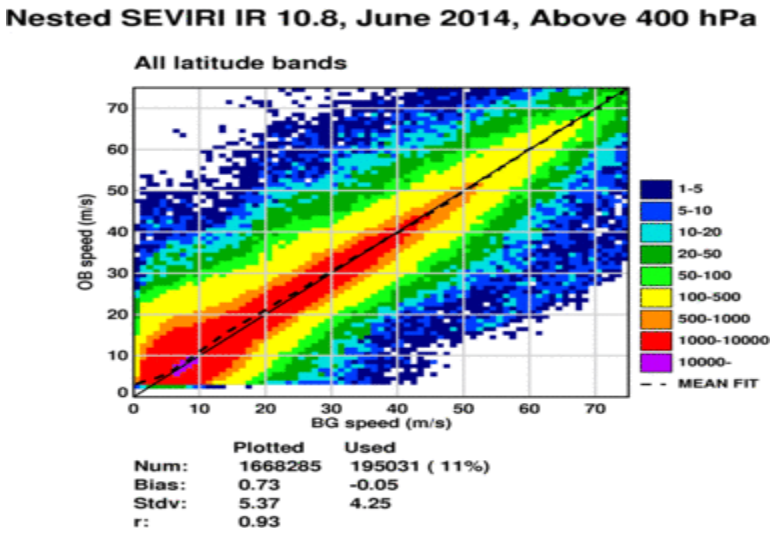
Number of Clusters < 3

IR
Above 400 hPa



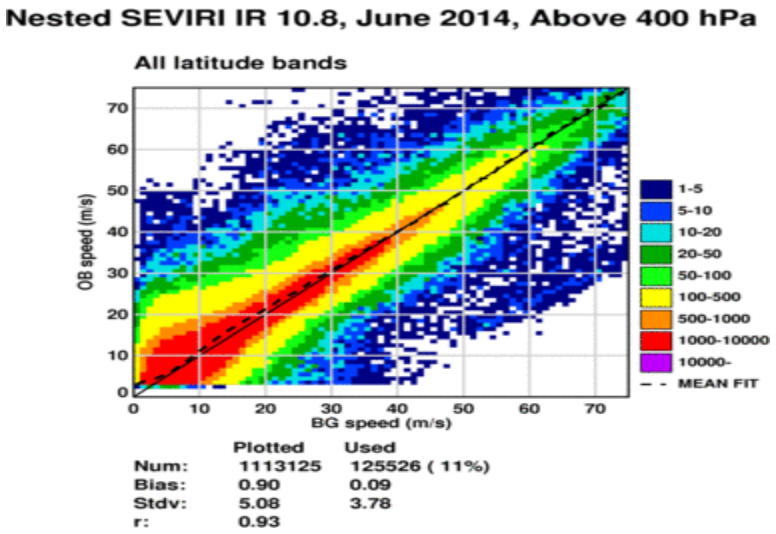
Number of Clusters: All Data

IR
Above 400 hPa



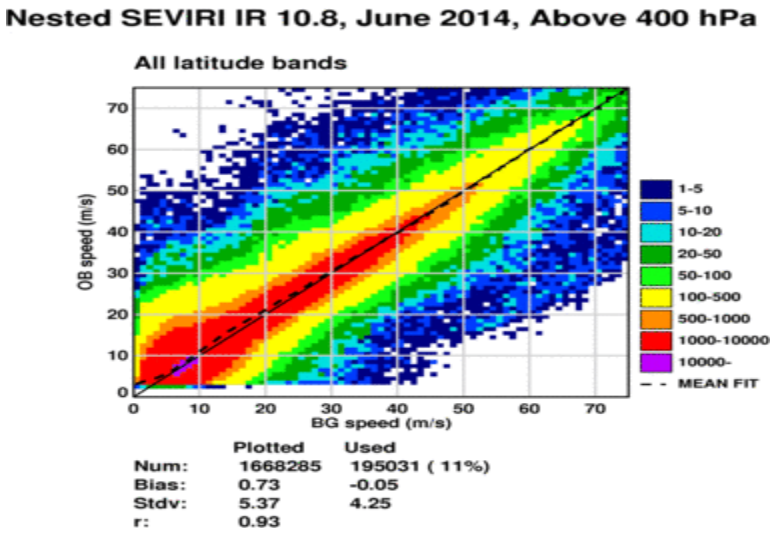
Number of Clusters < 3

IR
Above 400 hPa



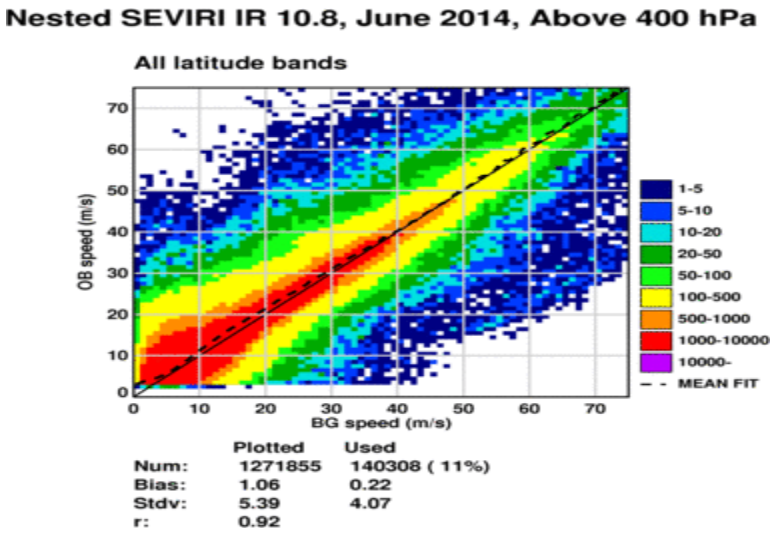
Standard Deviation of Local Vectors: All Data

IR
Above 400 hPa



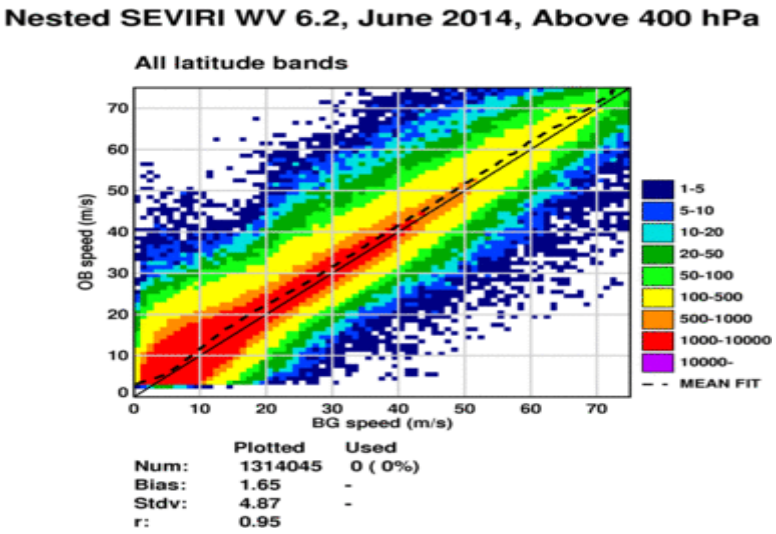
IR
Above 400 hPa

Standard Deviation of Local Vectors: < 0.4



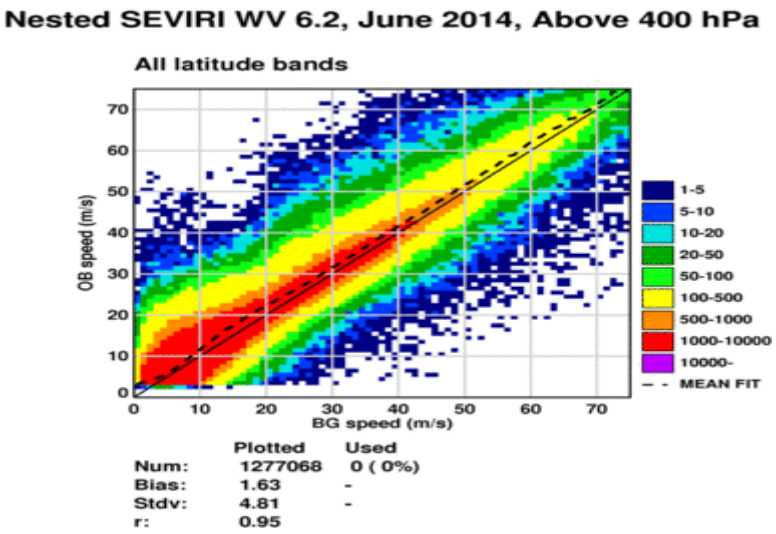
Number of Local Vectors in Cluster: All Data

WV
Above 400 hPa



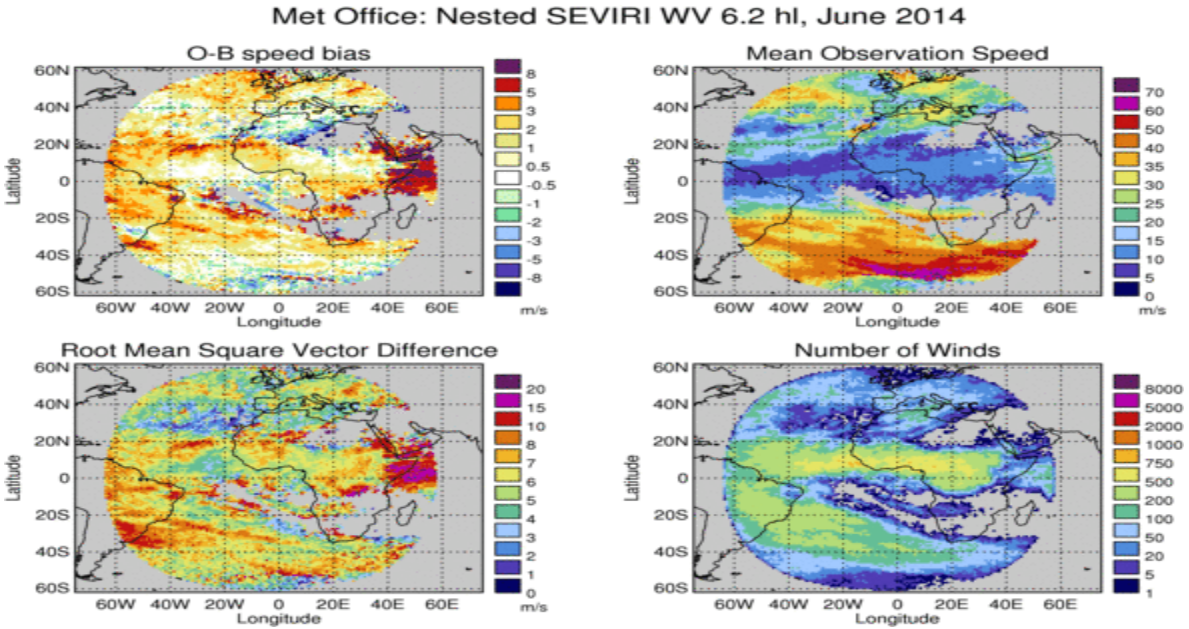
Number of Local Vectors in Cluster > 15

WV
Above 400 hPa



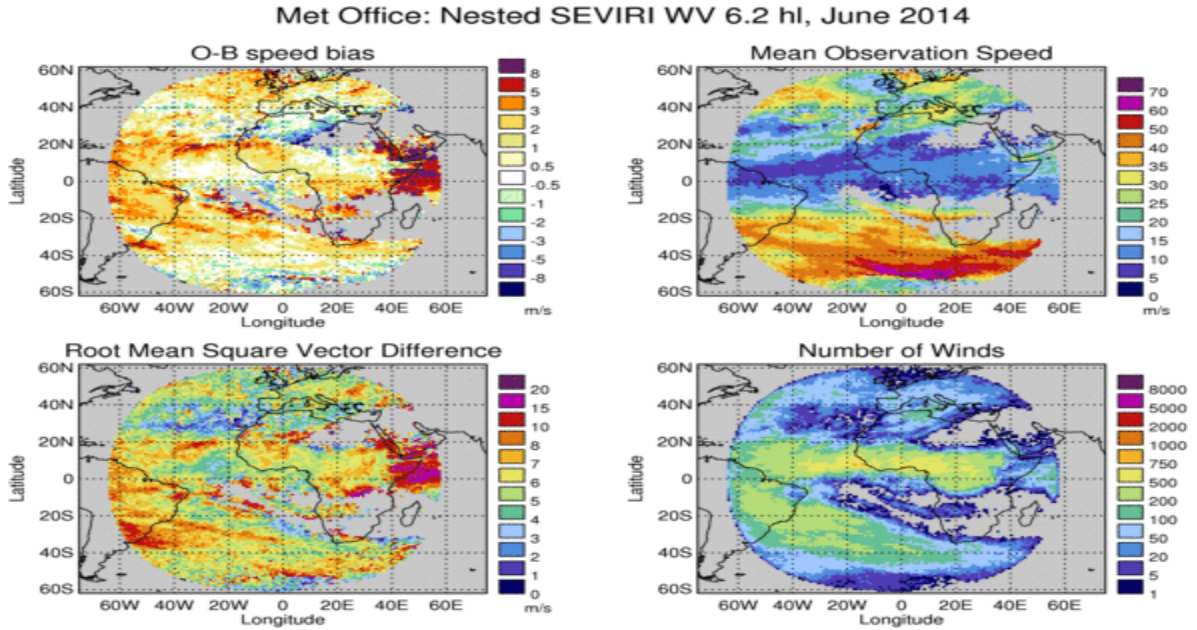
Number of Local Vectors in Cluster: All Data

WV
Above 400 hPa



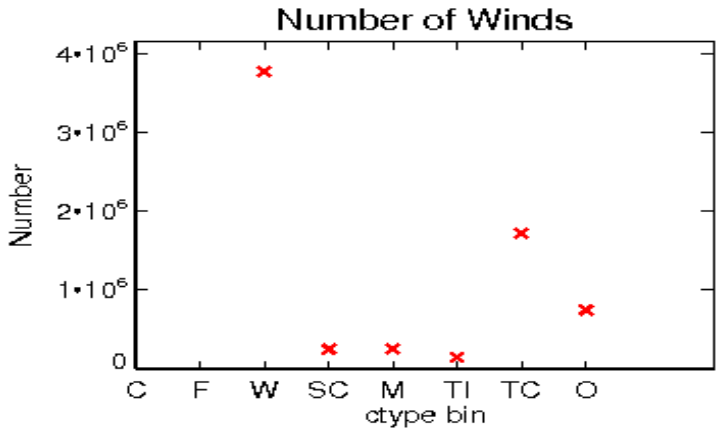
Number of Local Vectors in Cluster > 15

WV
Above 400 hPa

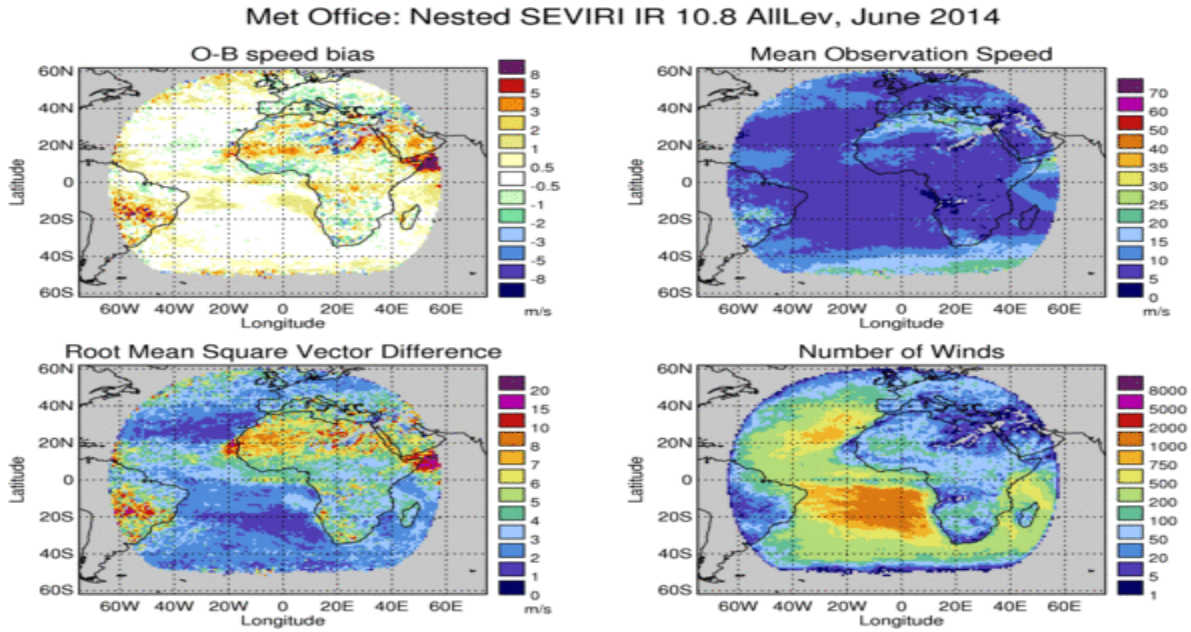


Infra-Red Cloud Type Distribution

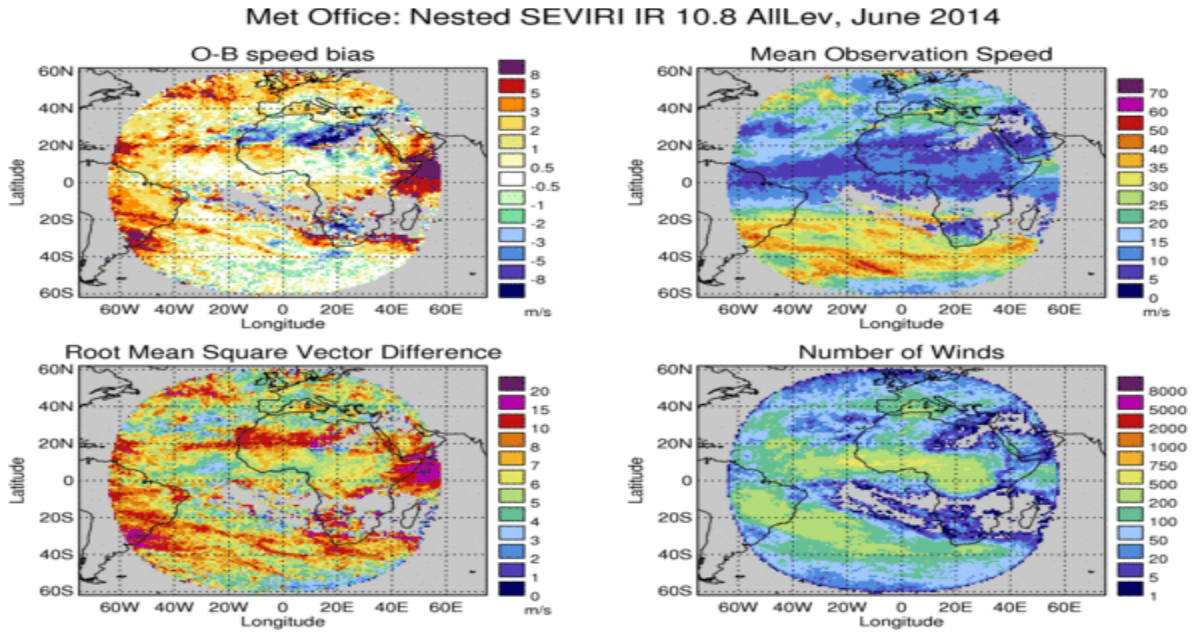
W = Water
SC = Supercooled
M = Mixed
TI = Thick Ice
TC = Thin Cirrus
O = Overlap



Infra-Red Cloud Type: Water

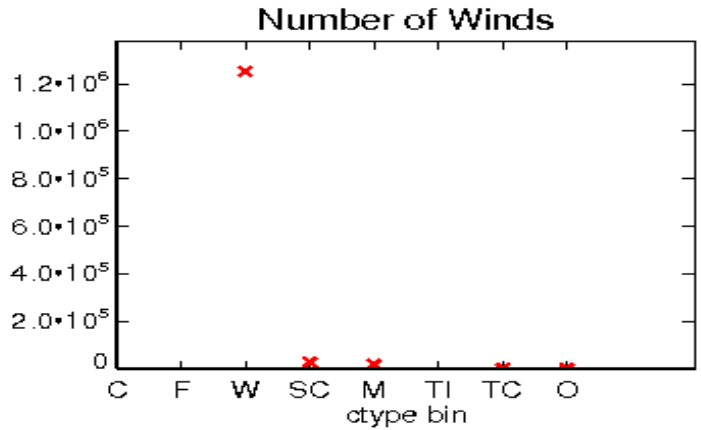


Infra-Red Cloud Type: Thin Cirrus

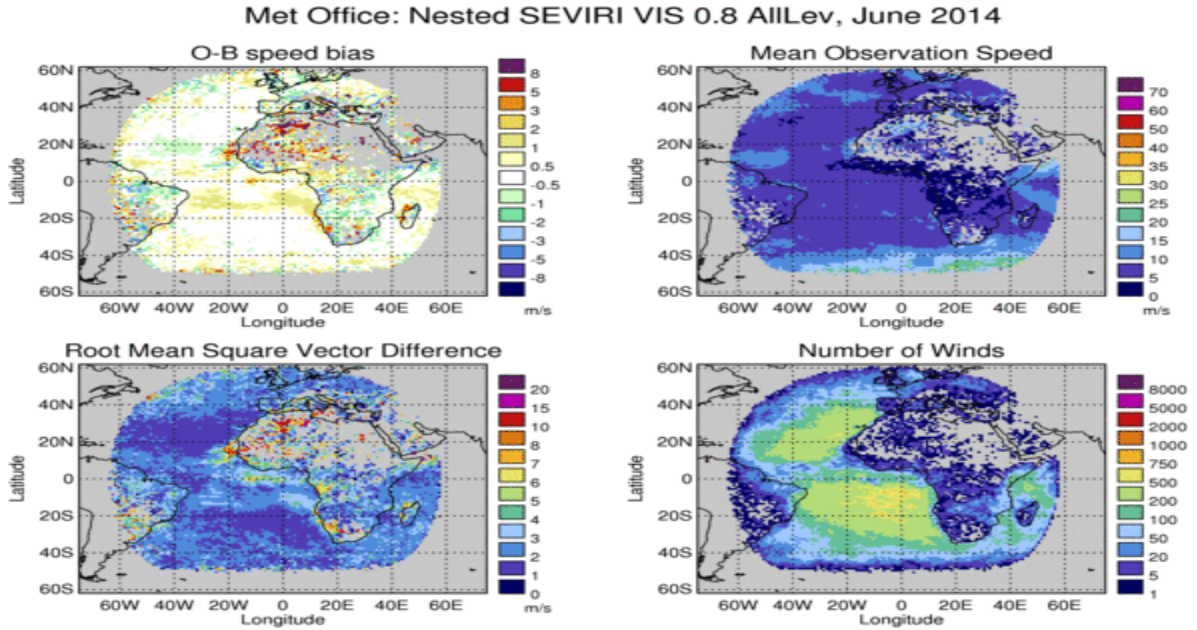


Visible Cloud Type Distribution

W = Water
SC = Supercooled
M = Mixed
TI = Thick Ice
TC = Thin Cirrus
O = Overlap

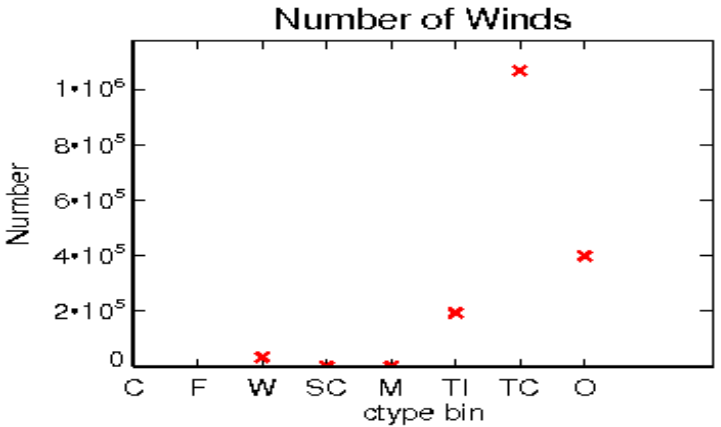


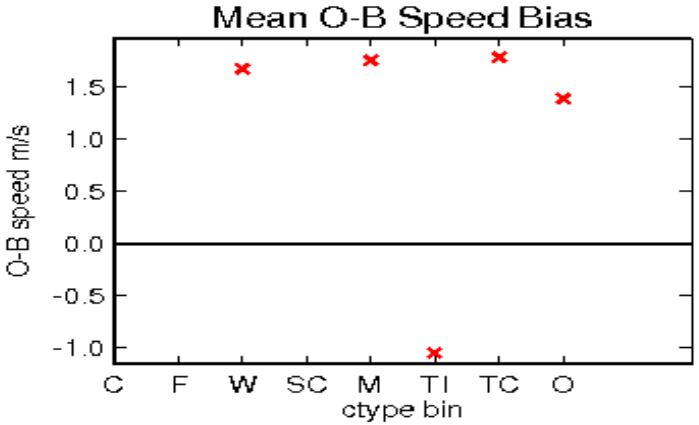
Visible Cloud Type: Water



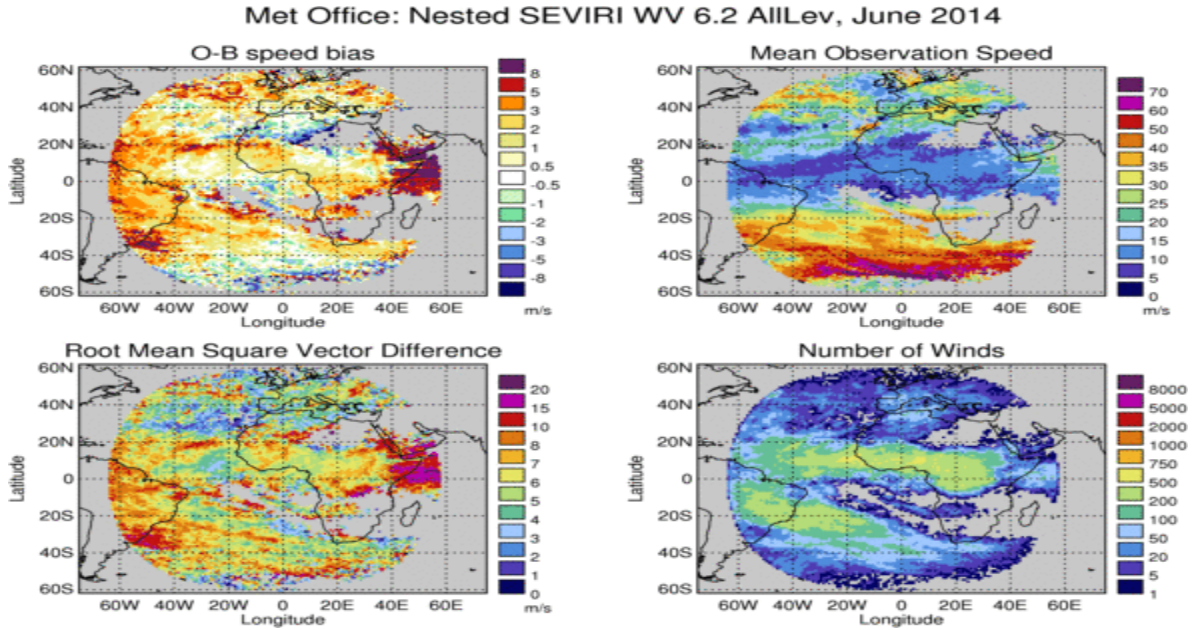
Water-Vapour Cloud Type Distribution

W = Water
SC = Supercooled
M = Mixed
TI = Thick Ice
TC = Thin Cirrus
O = Overlap

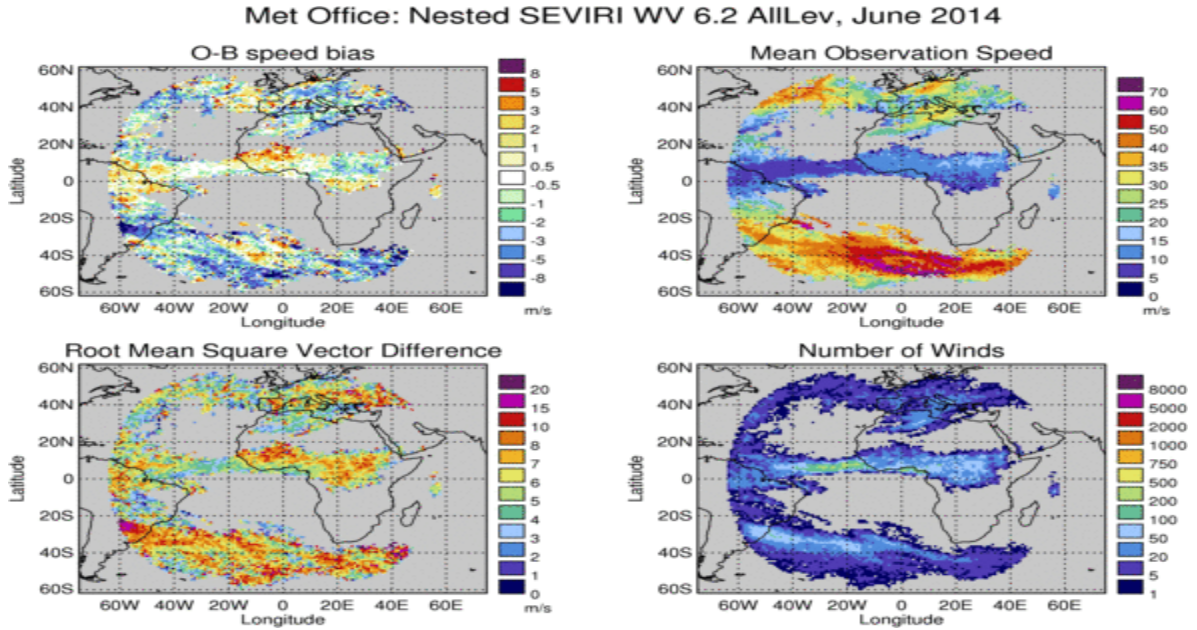




Water-Vapour Cloud Type: Thin Cirrus



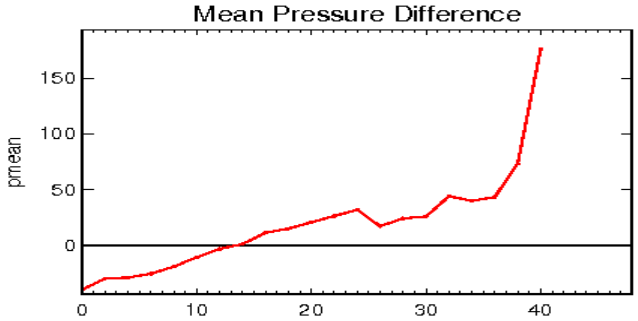
Water-Vapour Cloud Type: Thick Ice



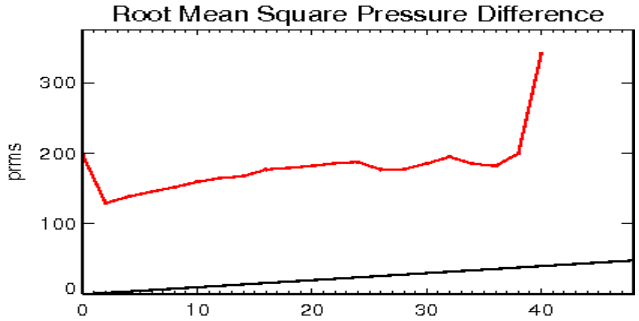
Standard deviation of OCA CTPs

Comparison to model best-fit pressure stats

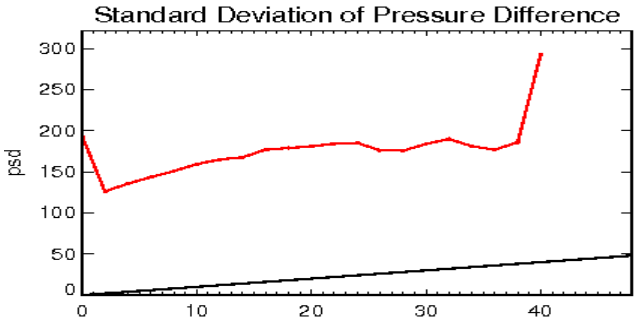
Meteosat-10 IR 10.8
May 2016
All levels All latitude bands



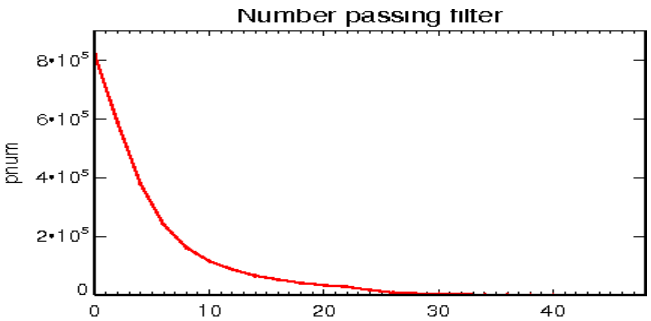
Standard deviation of OCA CTPs



Standard deviation of OCA CTPs



Standard deviation of OCA CTPs



Standard deviation of OCA CTPs

Conclusions

• Median optical depth of cluster	ODMD	✓
• Number of clusters found	NOC	✗
• Median pressure error of cluster	PERR	✓
• Standard deviation of cluster's local vectors	SD	✗
• Number of local vectors in cluster	MX	~
• Cloud type	CTYPE	?

Next Steps

- Assess further nested tracking test data with cost of optimal estimation.

- Assess further the OCA standard deviation of AMV pressures (and OCA pressures themselves)

- Try setting AMV height errors with PERR instead of (or in combination with) the static height error profiles?

Met Office

Questions?