Assessment of AMV Quality Using Cloud Information and Tracking Parameters

16th International Winds Workshop

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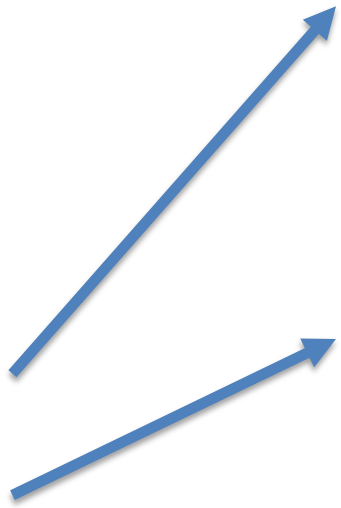
ECMWF

Cloud Phase and Type in NOAA AMVs: Types available and distribution

New Parameters in AMV BUFR Sequence:
Optimal Estimation Cost
Cloud Optical Thickness
Ice/Liquid Water Path
Cloud Particle Size
Cloud Type
Cloud Phase
Tracking Correlation of Vector
Coefficient of Variation



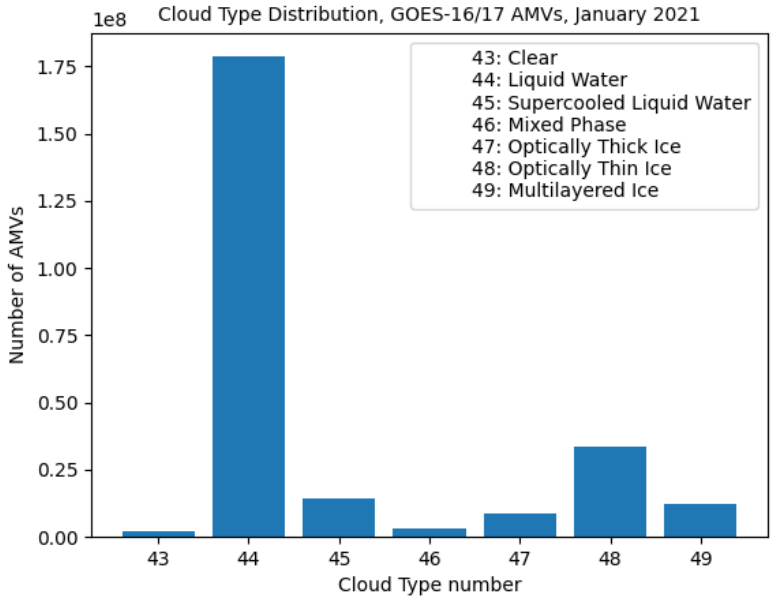
43	CLEAR
44	LIQUID WATER
45	SUPERCOOLED LIQUID WATER
46	MIXED PHASE
47	OPTICALLY THICK ICE
48	OPTICALLY THIN ICE
49	MULTILAYERED ICE

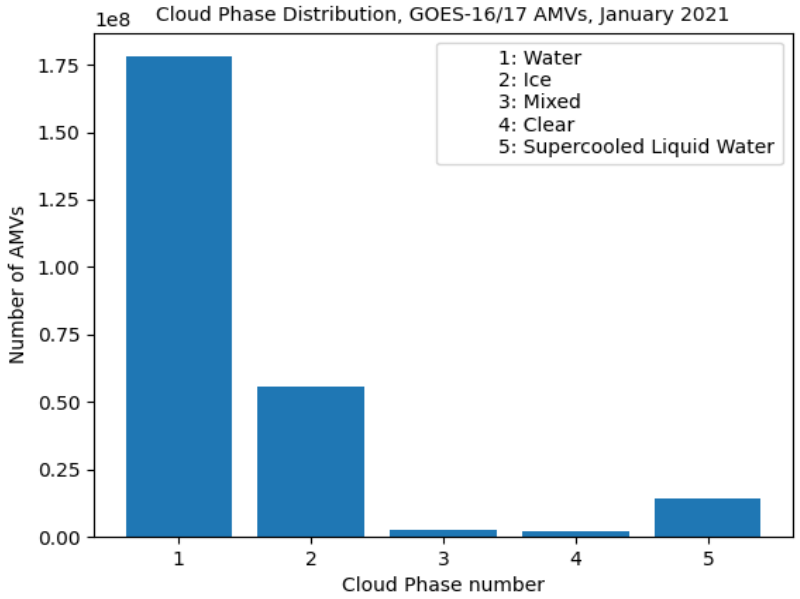
1	WATER
2	ICE
3	MIXED
4	CLEAR
5	SUPERCOOLED LIQUID WATER

Frequency of the Cloud Types and Phases

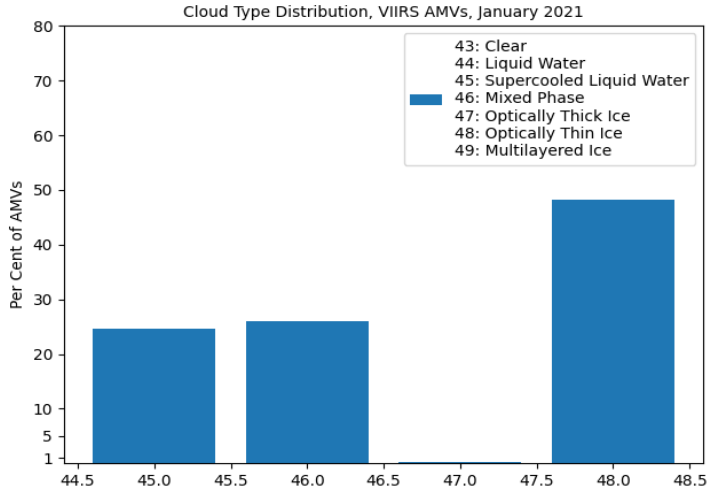
Most common type / phase in tracking scene

GOES



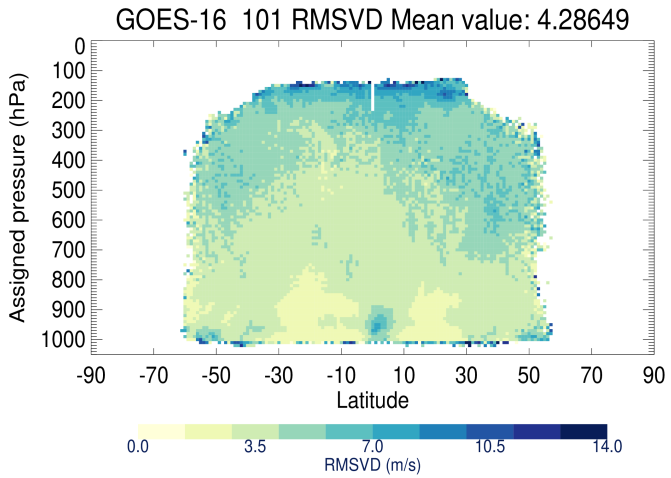


VIIRS

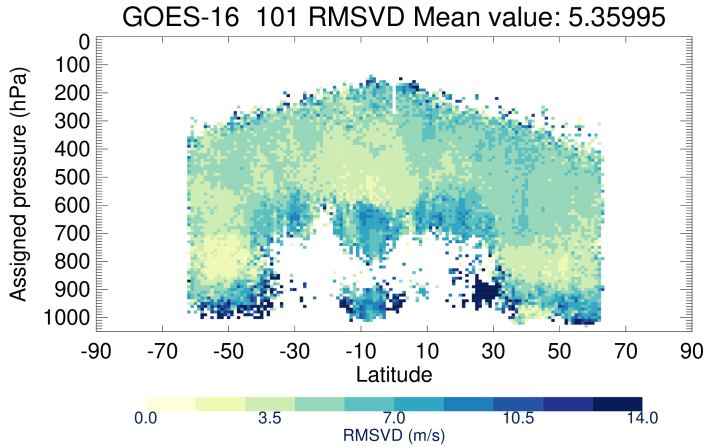


GOES background departures for selected cloud types

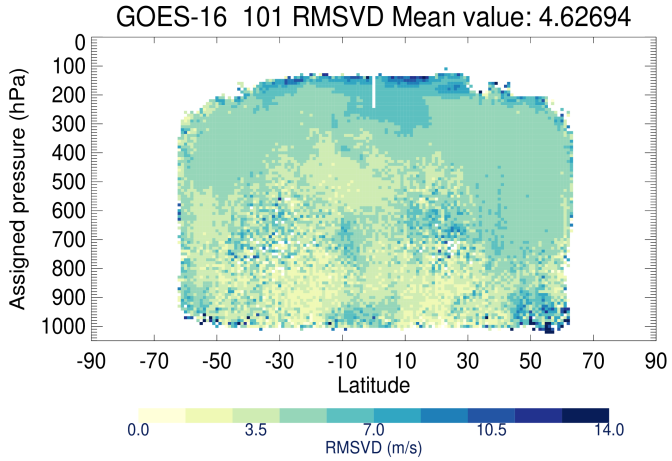
Liquid Water



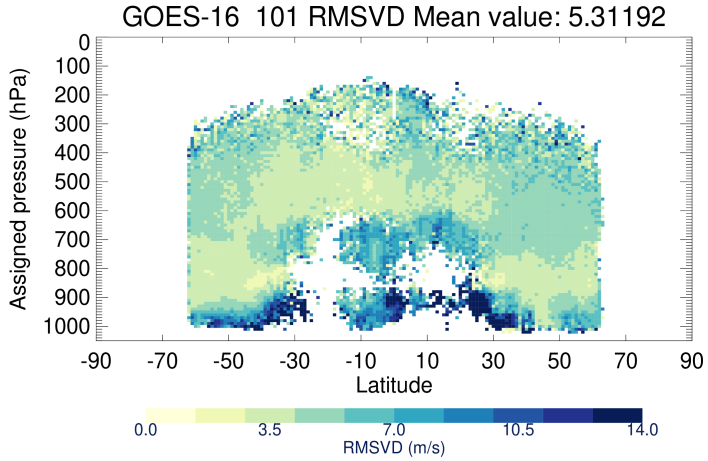
Mixed Phase



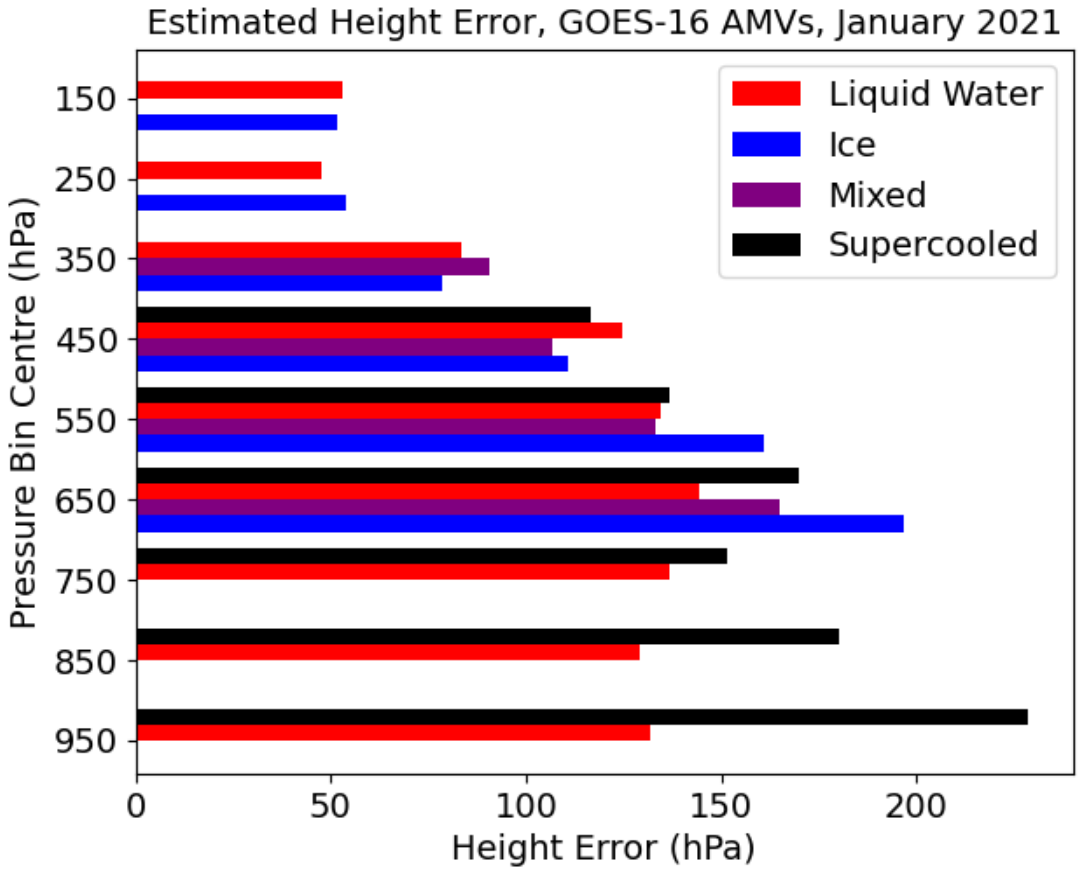
Thin Ice

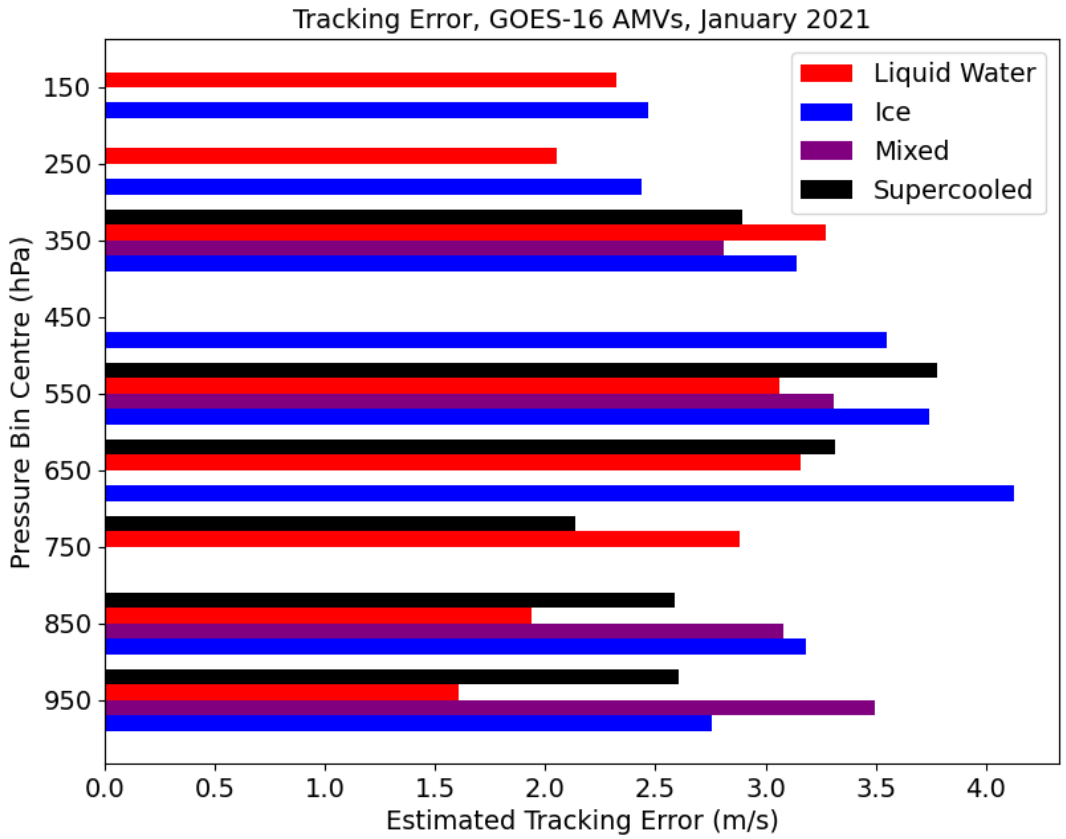


Supercooled Liquid Water



Could we derive separate observation errors for each cloud type?





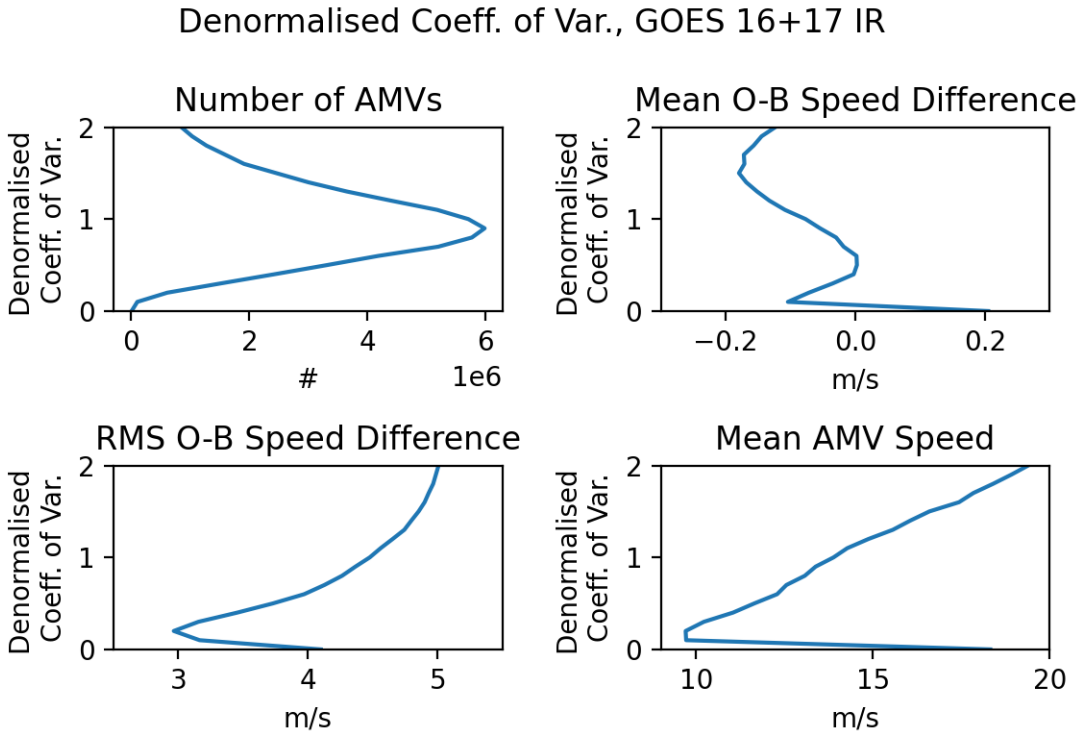
‘Coefficient of Variation’ in NOAA AMVs

Defined in BUFR standard deviation / displacement

Presented here multiplied by speed to denormalise

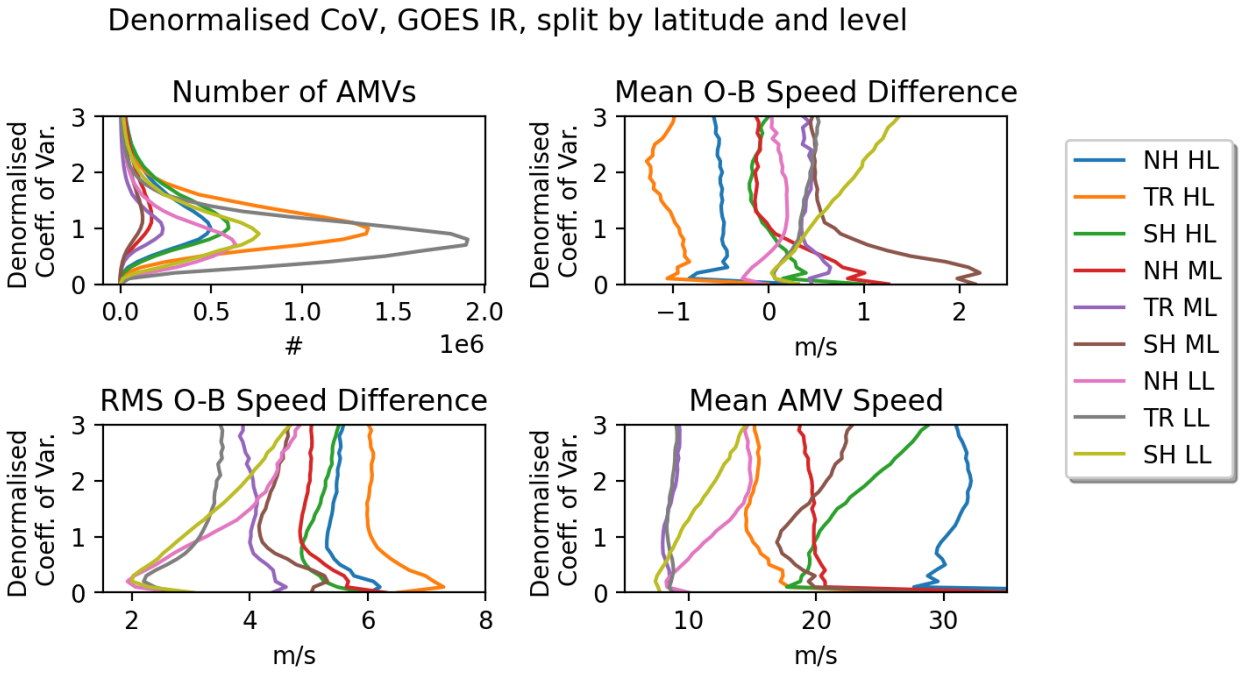
Vector from main cluster
Vector from tracking entire scene

Plot from Bresky et al 2012

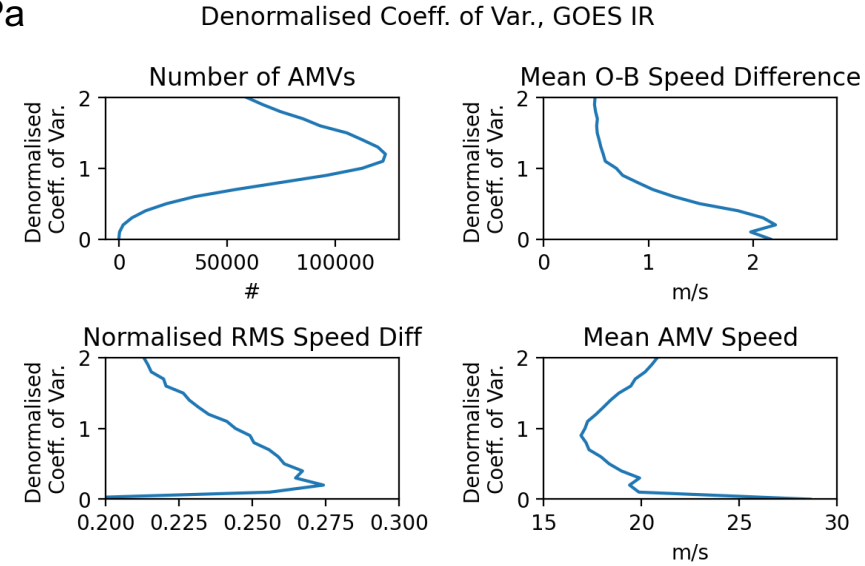


‘Coefficient of Variation’ : look at particular latitudes

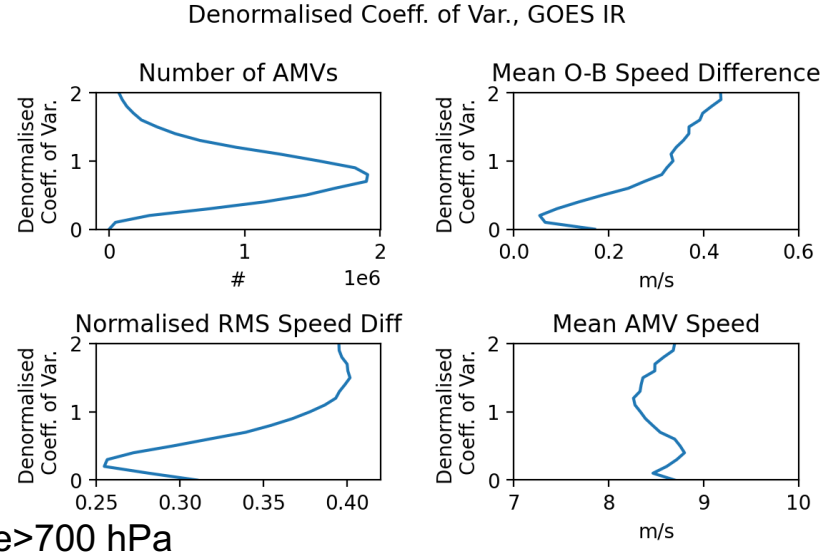
All QI values



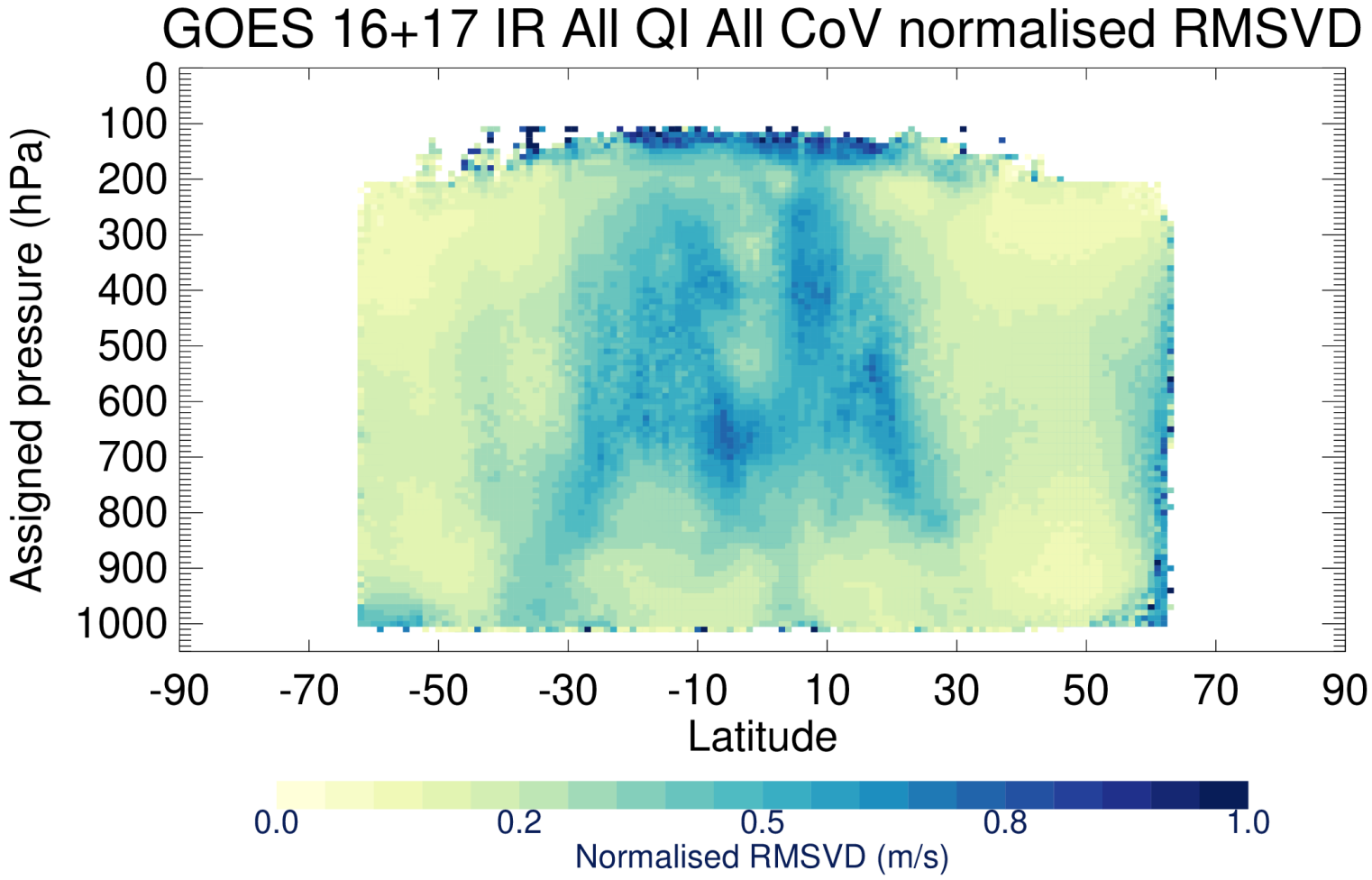
Southern Hemisphere
400-700 hPa



Tropics
Pressure>700 hPa



Change in background departures when filtering by Coefficient of Variation



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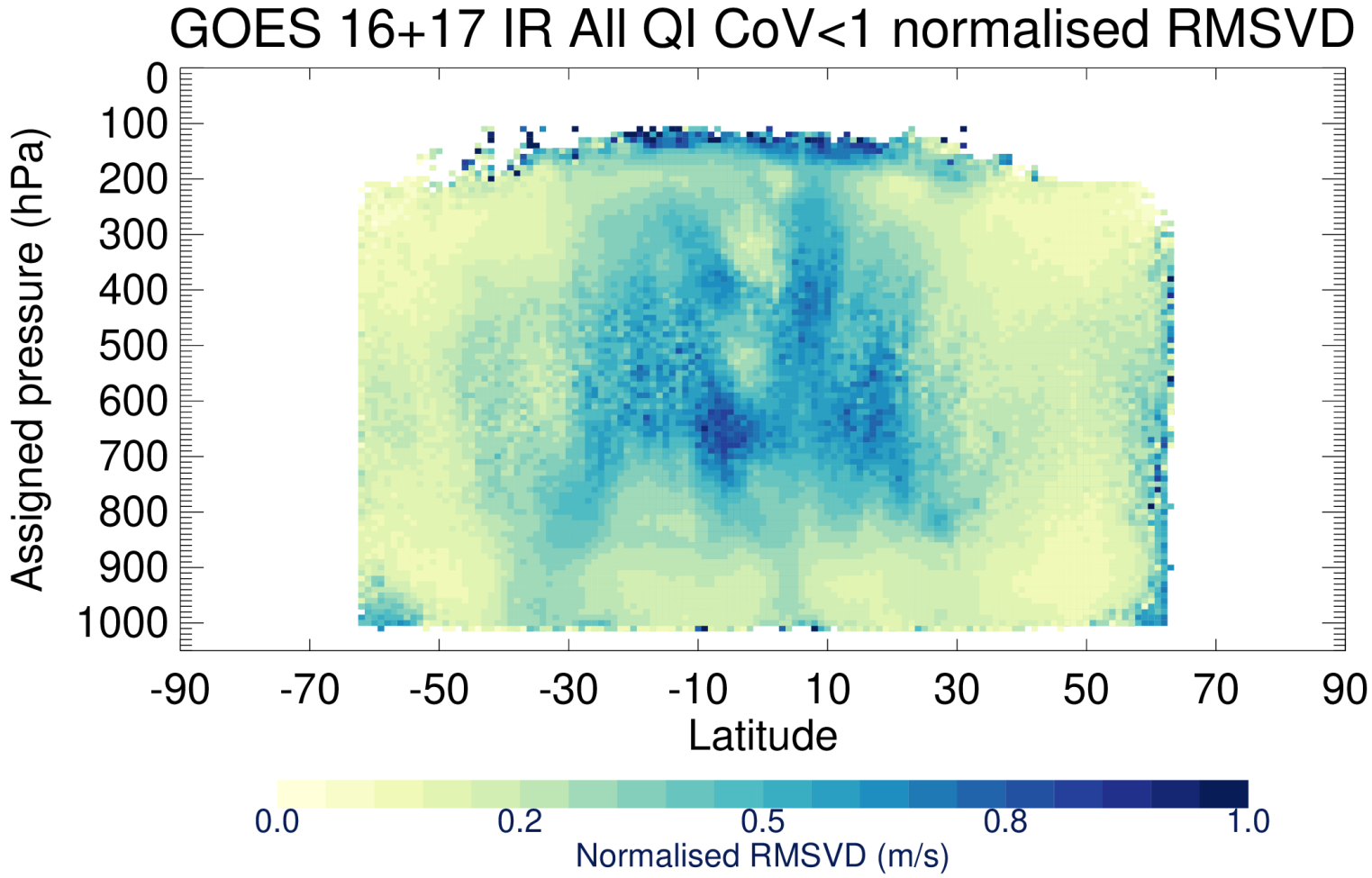

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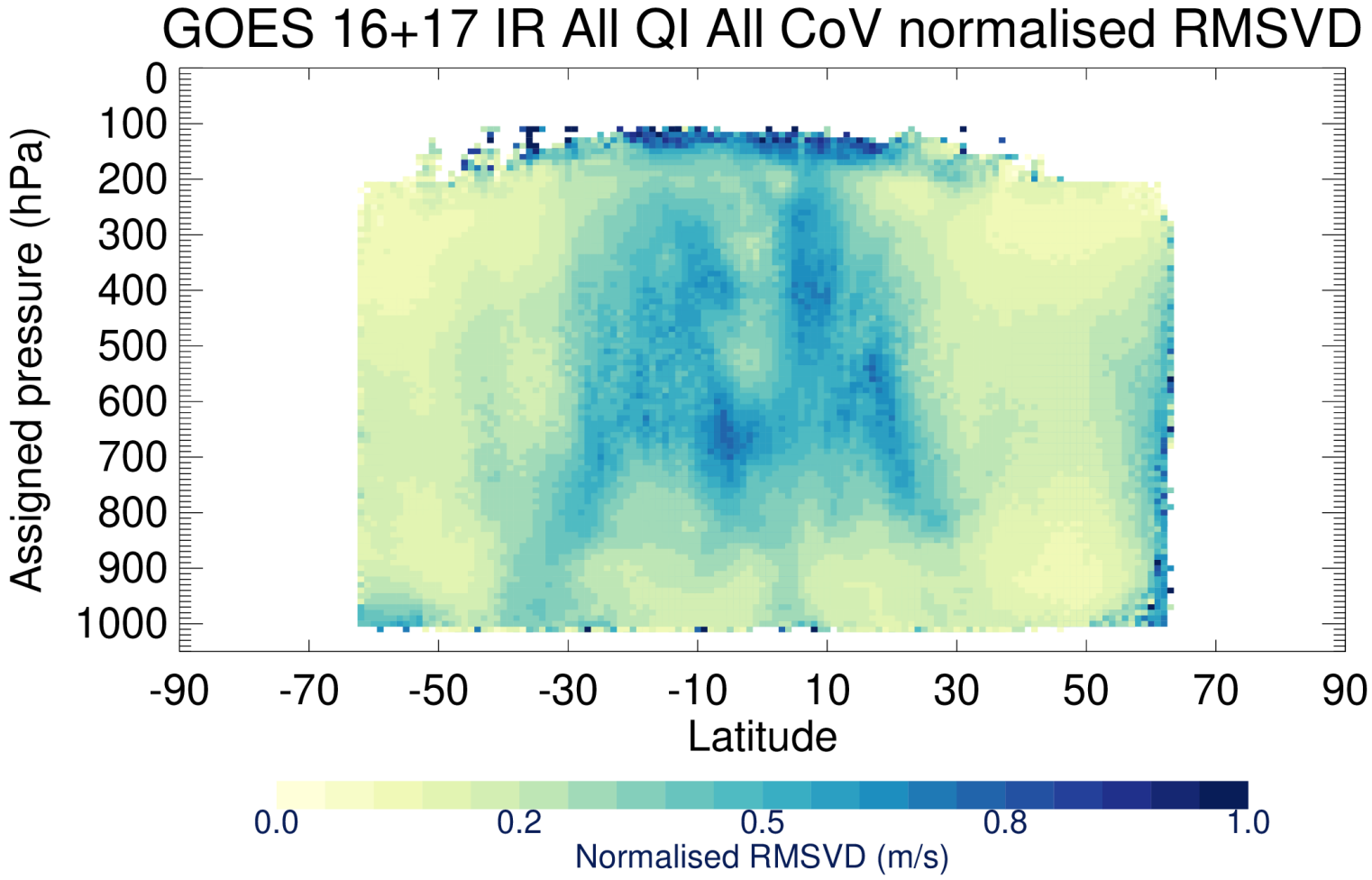

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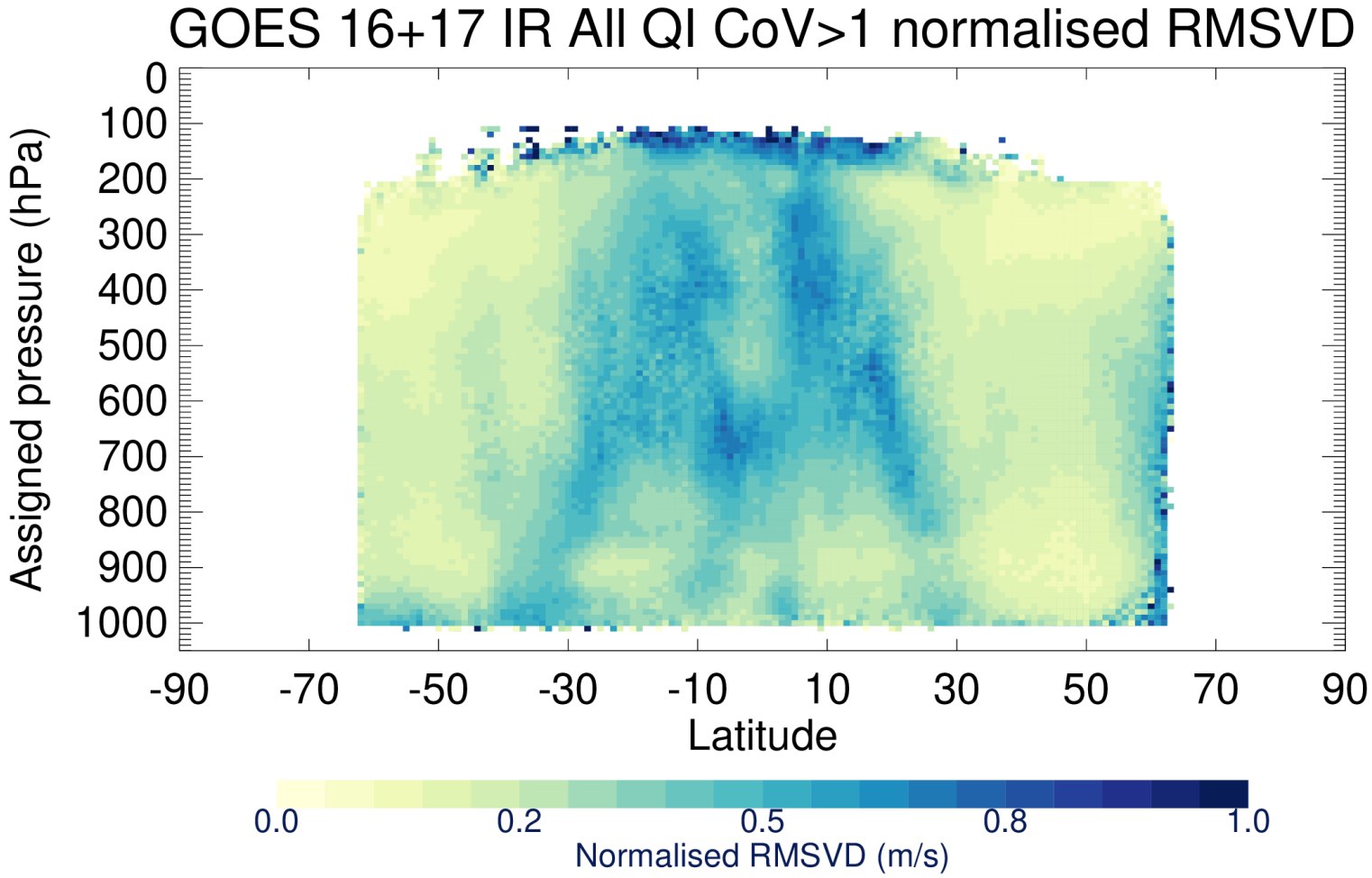


Filtering with EUMETSAT OCA product

With thanks to: Philip Watts, Alessio Bozzo, Marie Doutriaux Boucher, Alessio Lattanzio of EUMETSAT providing the test dataset

Data from Meteosat-11, IR 10.8 micron channel

July 2019

EUMETSAT Climate Data Record derivation used with OCA heights

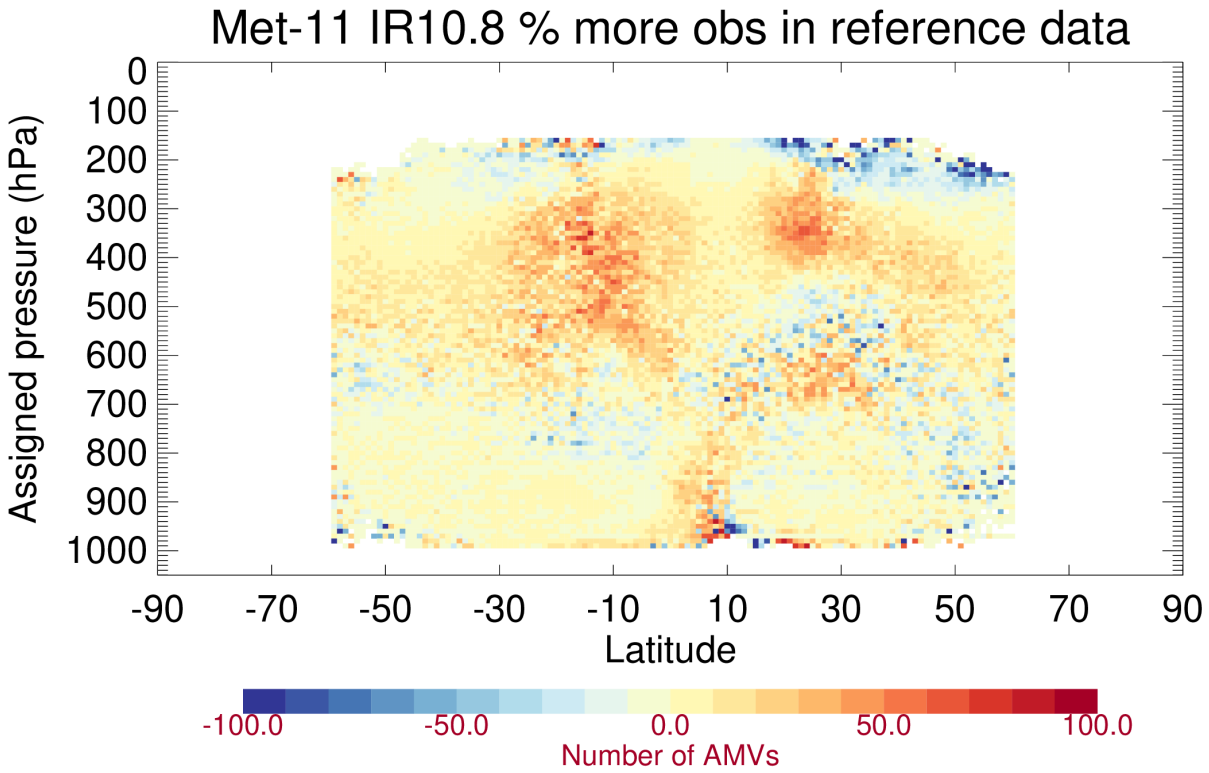
Pixels excluded from the AMV derivation if they breach the following values in the Optimal Cloud Analysis product:

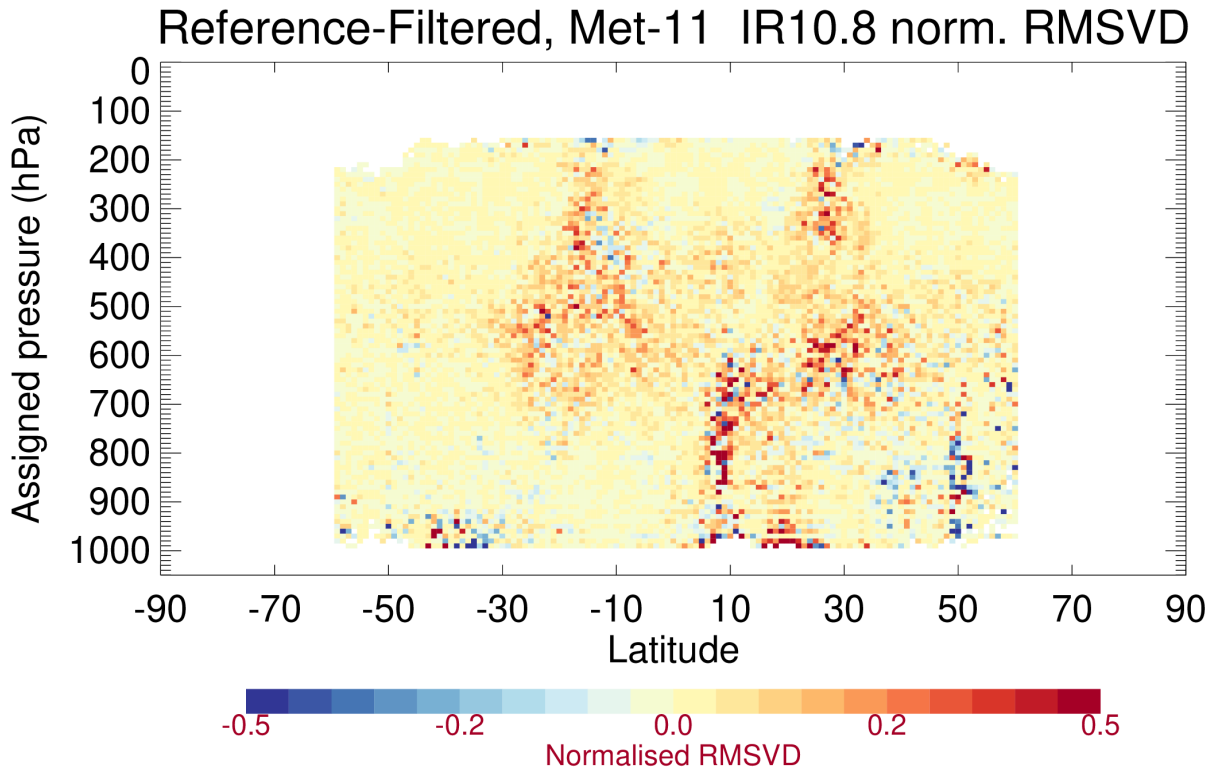
- Cloud-top pressure error levels:
- Single layer water – 40 hPa
- Single layer ice – 30 hPa
- 2 layers – 70 hPa

Final cost levels:

- Single layer water – 200
- Single layer ice – 110
- 2 layers – 150

Change in background departures from applying the filtering





Forecast Independent QI > 85
(same as operational use)

Conclusions and Next Steps

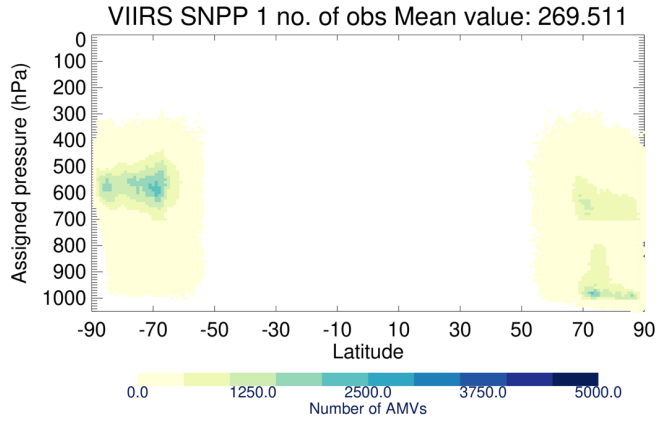
- Some skill at reducing background departures shown by the use of information about the tracked clouds and AMV derivation.
- Plan to continue assessment of this and any other available information, with, and hopefully test the use of the extra information in assimilation experiments.
- Long-term goal is to increase the proportion of received AMVs assimilated in NWP, reducing the amount of data automatically rejected.

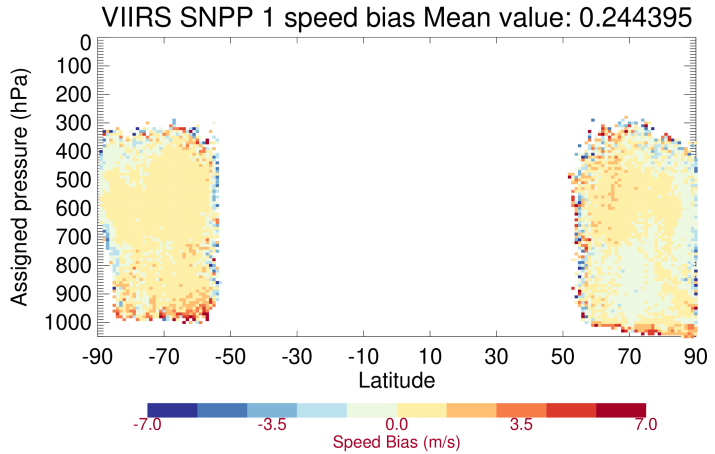
Thanks for listening, any questions?

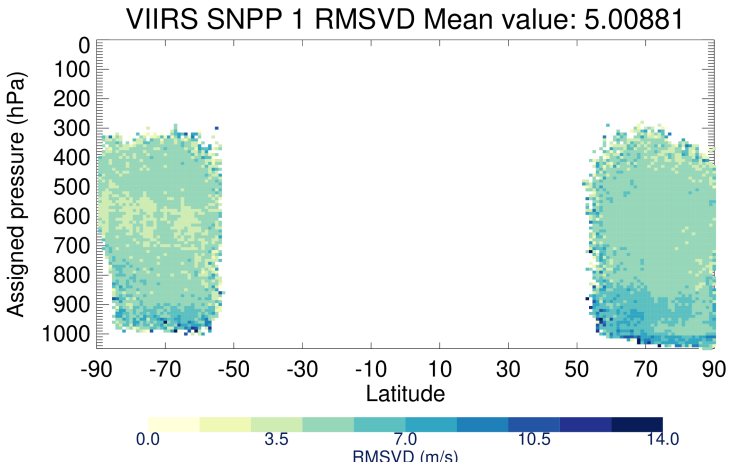
Extra Slides

VIIRS: Background Departures

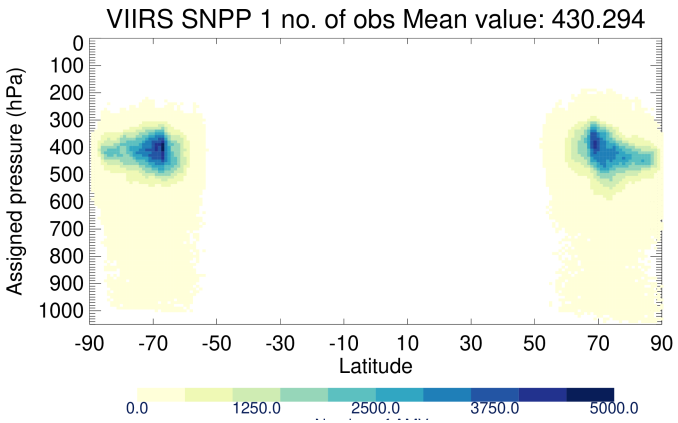
Mixed Phase

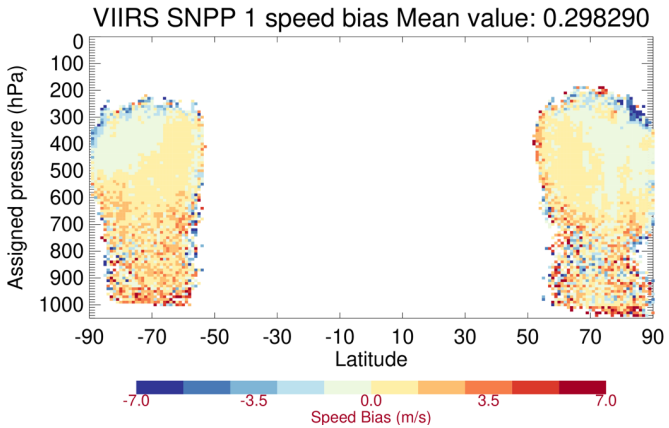


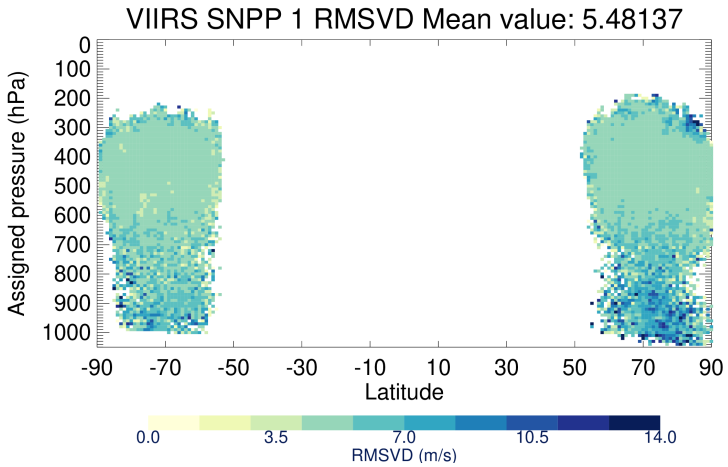




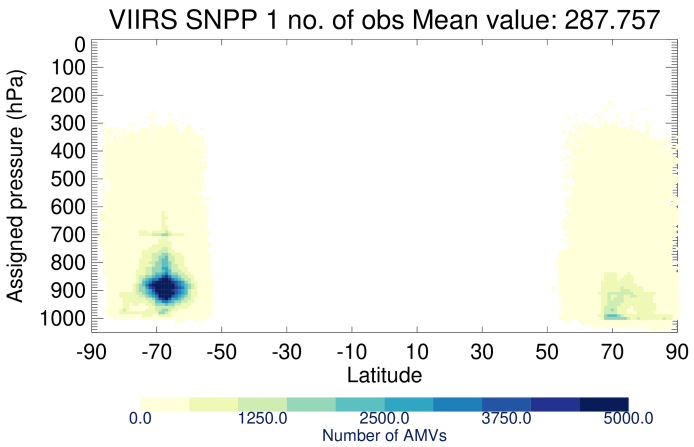
Thin Ice

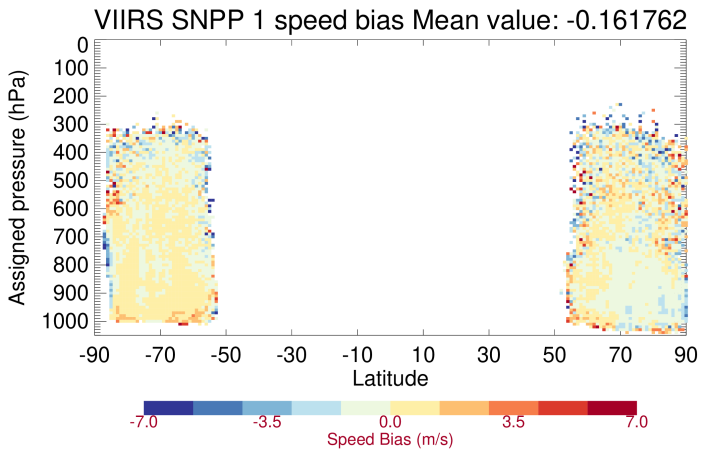


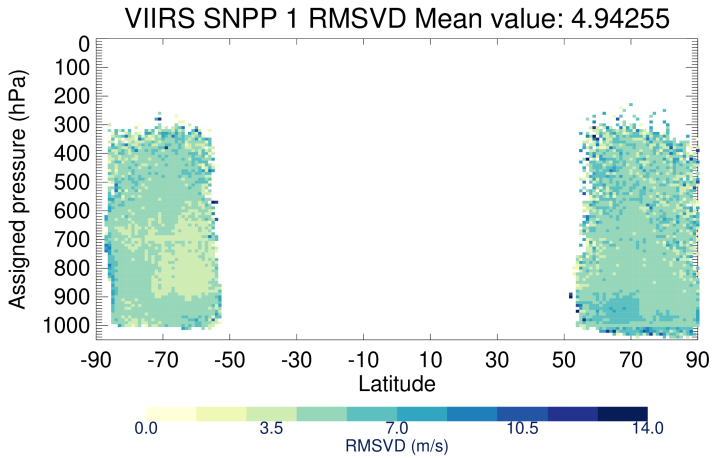




Super-cooled

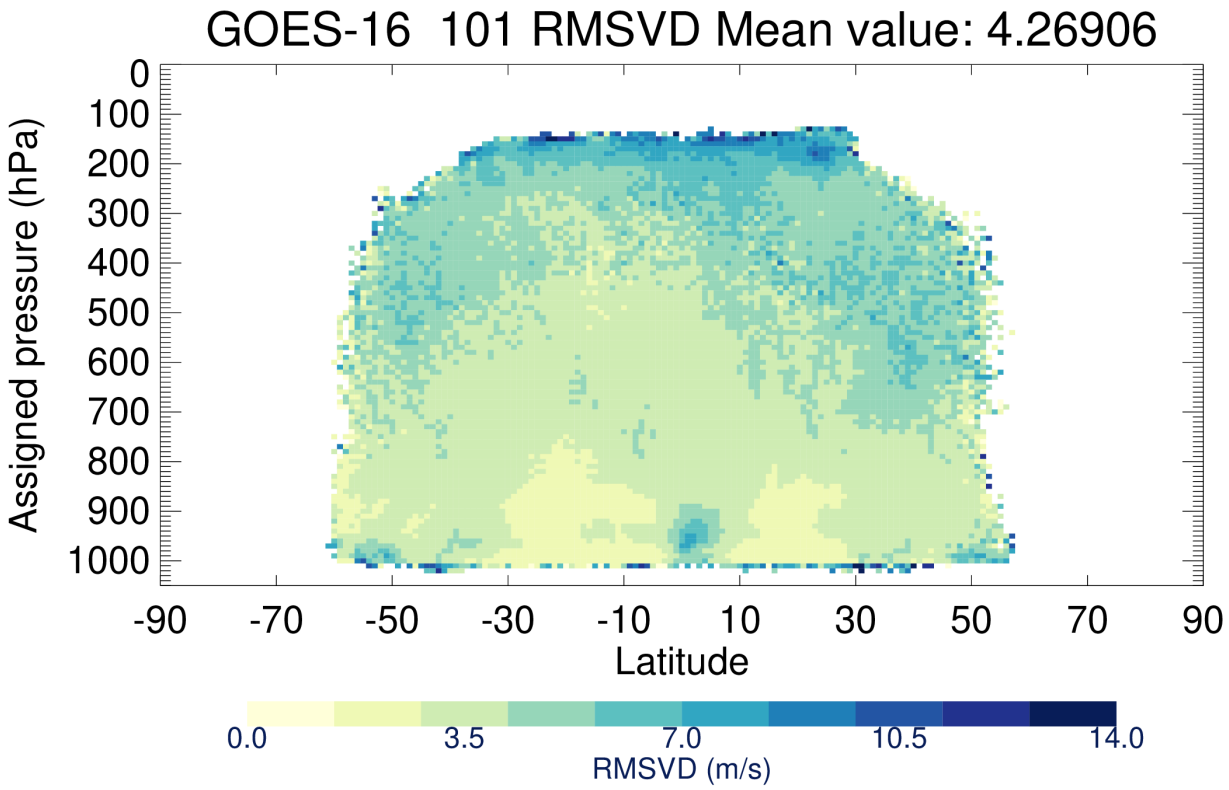




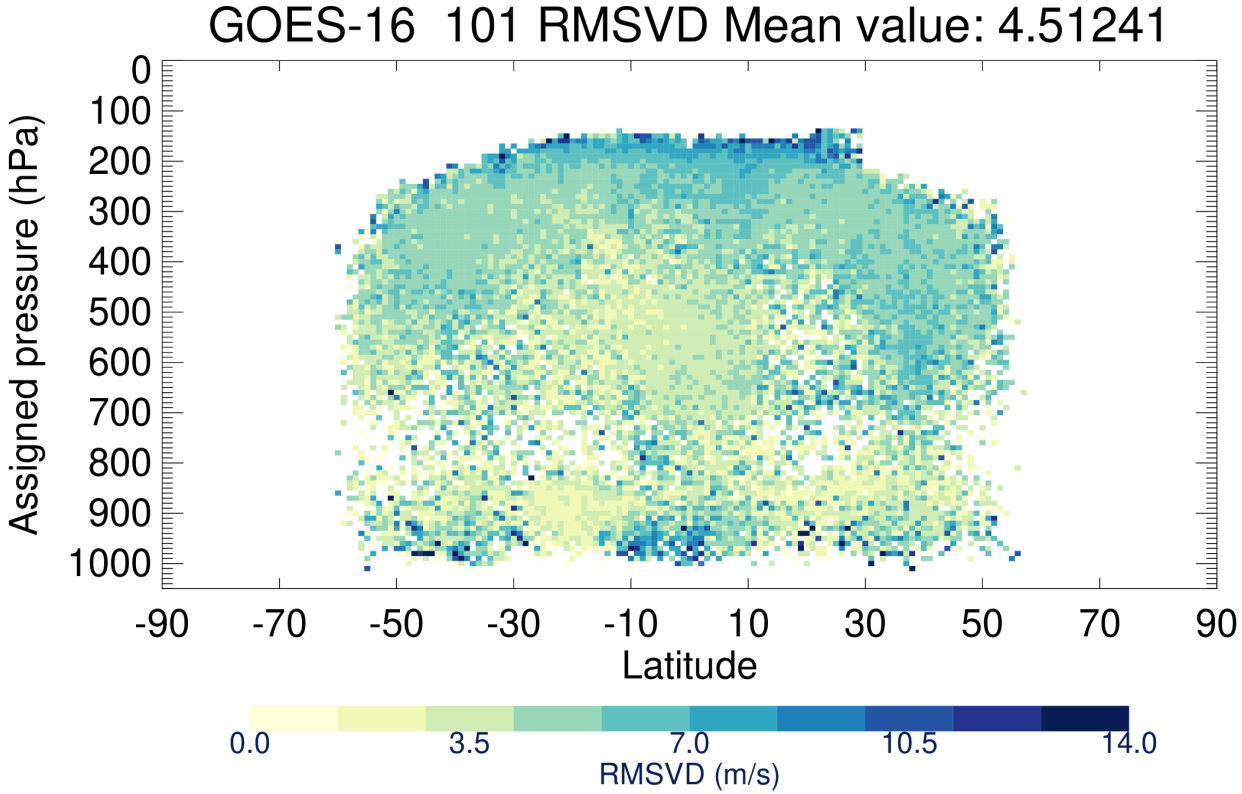


Phase/Type = Most Common in ‘Tracking Scene’

Phase = Liquid Water, Type = Liquid Water



Phase = Ice, Type = Liquid Water



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Footnote: derivation of height and tracking errors

Derive height errors the usual way, but separating by cloud phase

Height error =
Standard deviation of AMV pressure minus best-fit pressure

Only calculate using AMVs with quality indicator (no forecast) > 50

Derive tracking errors the usual way, but separating by cloud phase

Tracking error =
Standard deviation of (AMV wind – model wind)

Restricted to cases where error from height assignment is small (< 1.5 m/s)

Error from height assignment: apply height error via weighting to model wind shear

Only calculate using AMVs with QI (no forecast) >50