

Recent data assimilation updates to the ECCC Global and Regional Prediction Systems

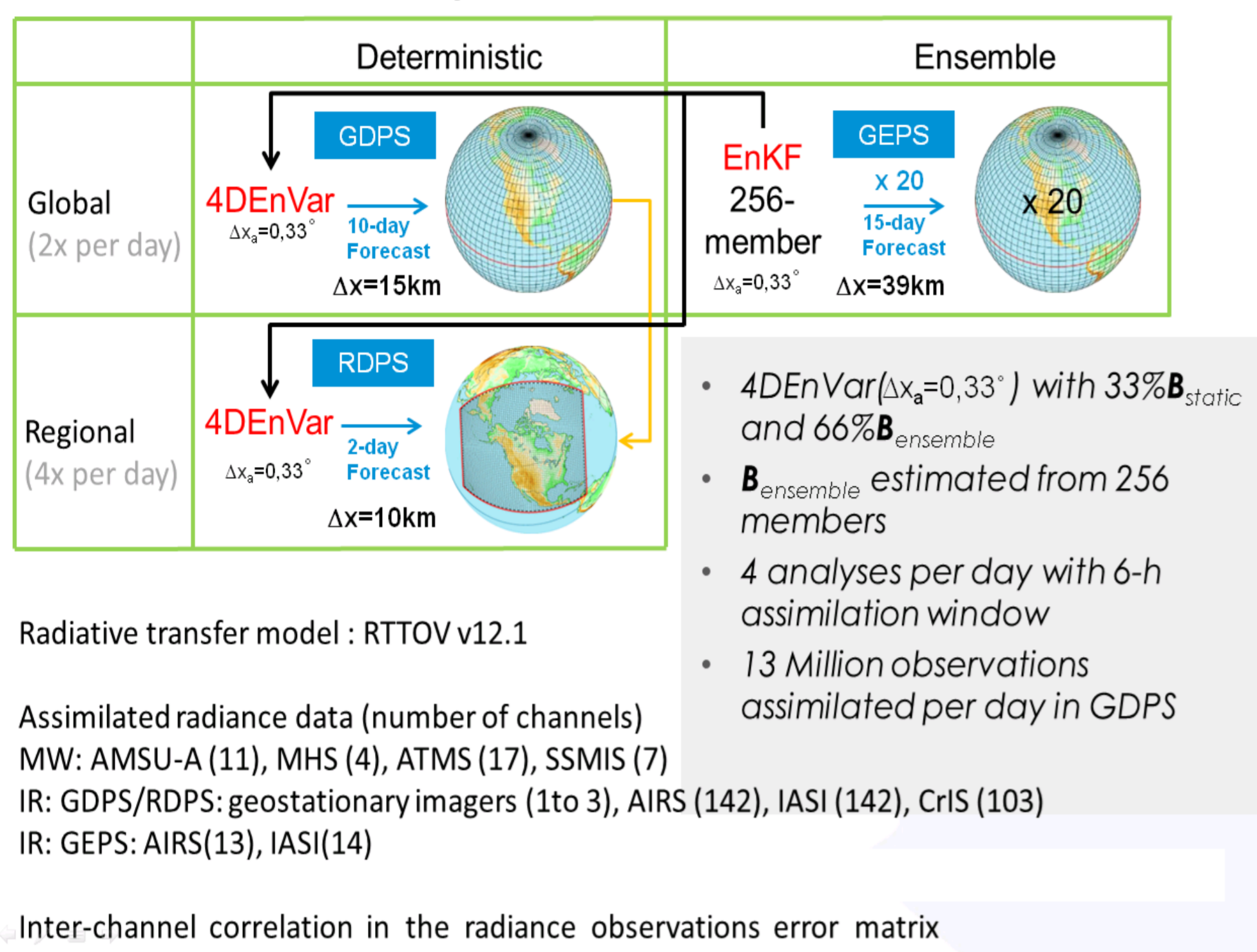
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ECCC NWP Systems



July 23rd, 2019

Updated/Added Observations

Types of observations

- GB-GPS (UCAR*)
- GPS-RO (MetOp-C, FY-3D)
- ASCAT (MetOp-C)
- AMV (GOES17*, NOAA20)
- ATMS (NOAA20)
- CSR (GOES16*)
- CrIS FSR** (NPP, NOAA20)

Prediction Systems

- GDPS RDPS
- GDPS RDPS GEPS
- GDPS RDPS GEPS
- GDPS RDPS GEPS
- GDPS RDPS GEPS
- GDPS RDPS
- GDPS RDPS

* Replaces missing or discontinued source of data
** CrIS FSR from NOAA20 replaces CrIS NSR from NPP. CrIS FSR from NPP planned to be integrated in all three systems next year (in addition to both satellites in GEPS).

Average increase of the number of observations in the GDPS (RDPS) for a 24 hour period

Data averaged over period: 10-16 July 2019

Type of observations	OPS	NEW	Increase
GB-GPS	11 500 (3370)	17 400 (7600)	+ 51% (+125%)
GPS-RO	64 000 (15 970)	97 800 (24 600)	+ 53% (+54%)
ASCAT	114 000 (17 500)	175 000 (27 200)	+ 54% (+55%)
AMV	321 000 (65 500)	368 000 (74 000)	+ 15% (+13%)
ATMS	692 000 (192 000)	1 392 000 (388 900)	+ 101% (+102%)
CSR	273 000 (27 000)	424 000 (72 000)	+ 55% (+166%)
CrIS*	0	1 567 000 (435 500)	--
Total of all Obs Assimilated	11 716 000 (3 720 000)	14 293 000 (4 436 000)	+ 22% (+19%)

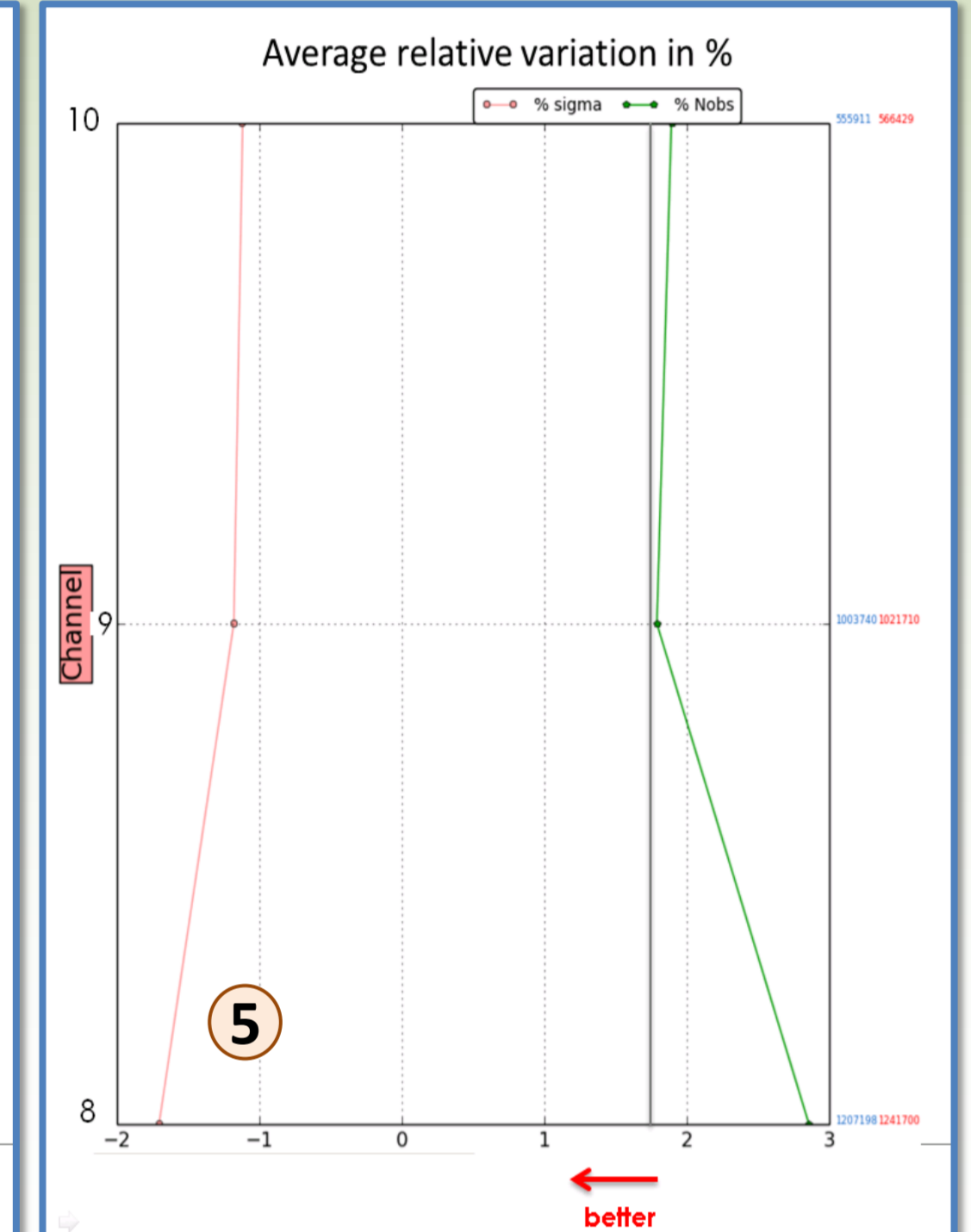
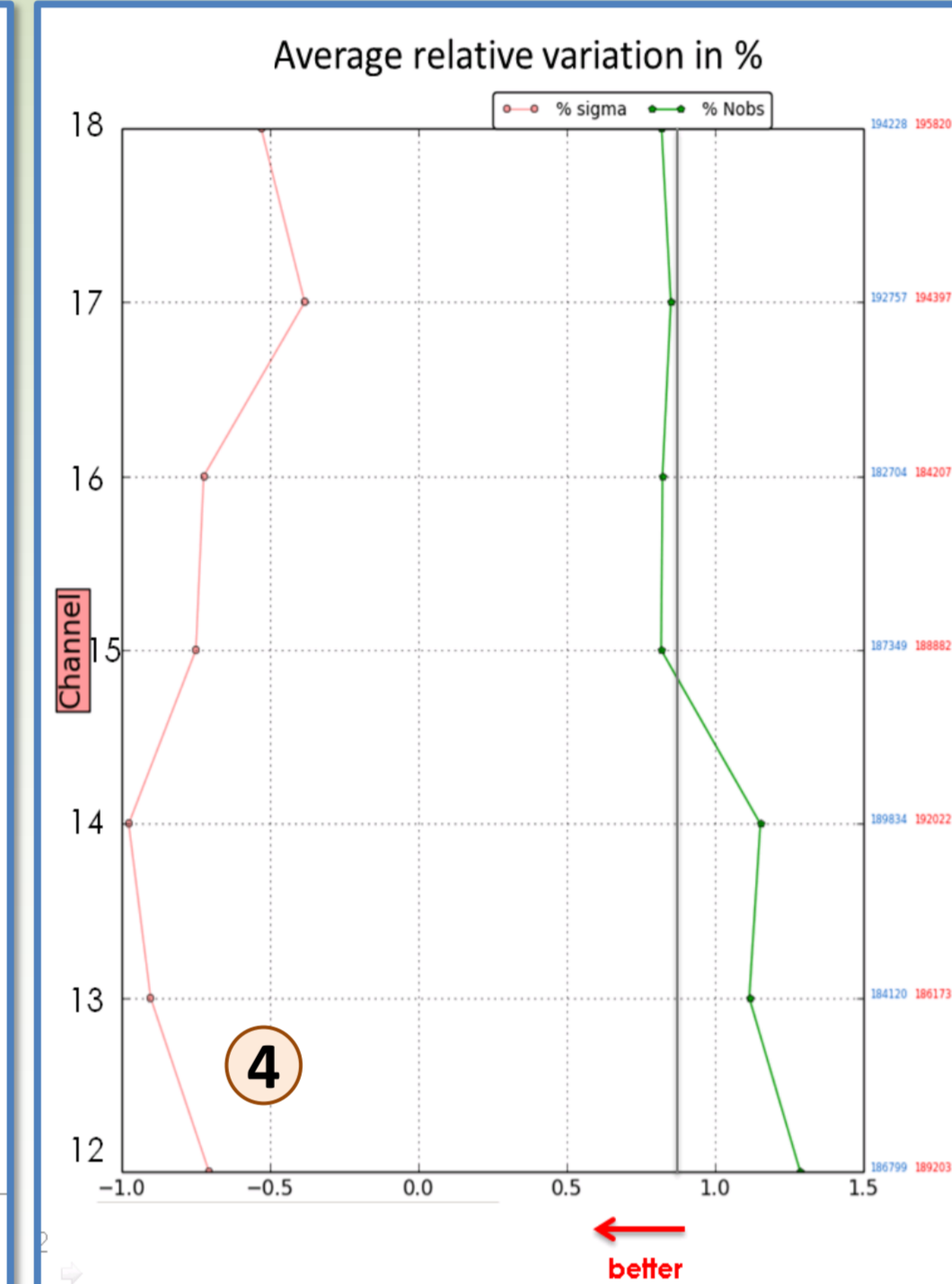
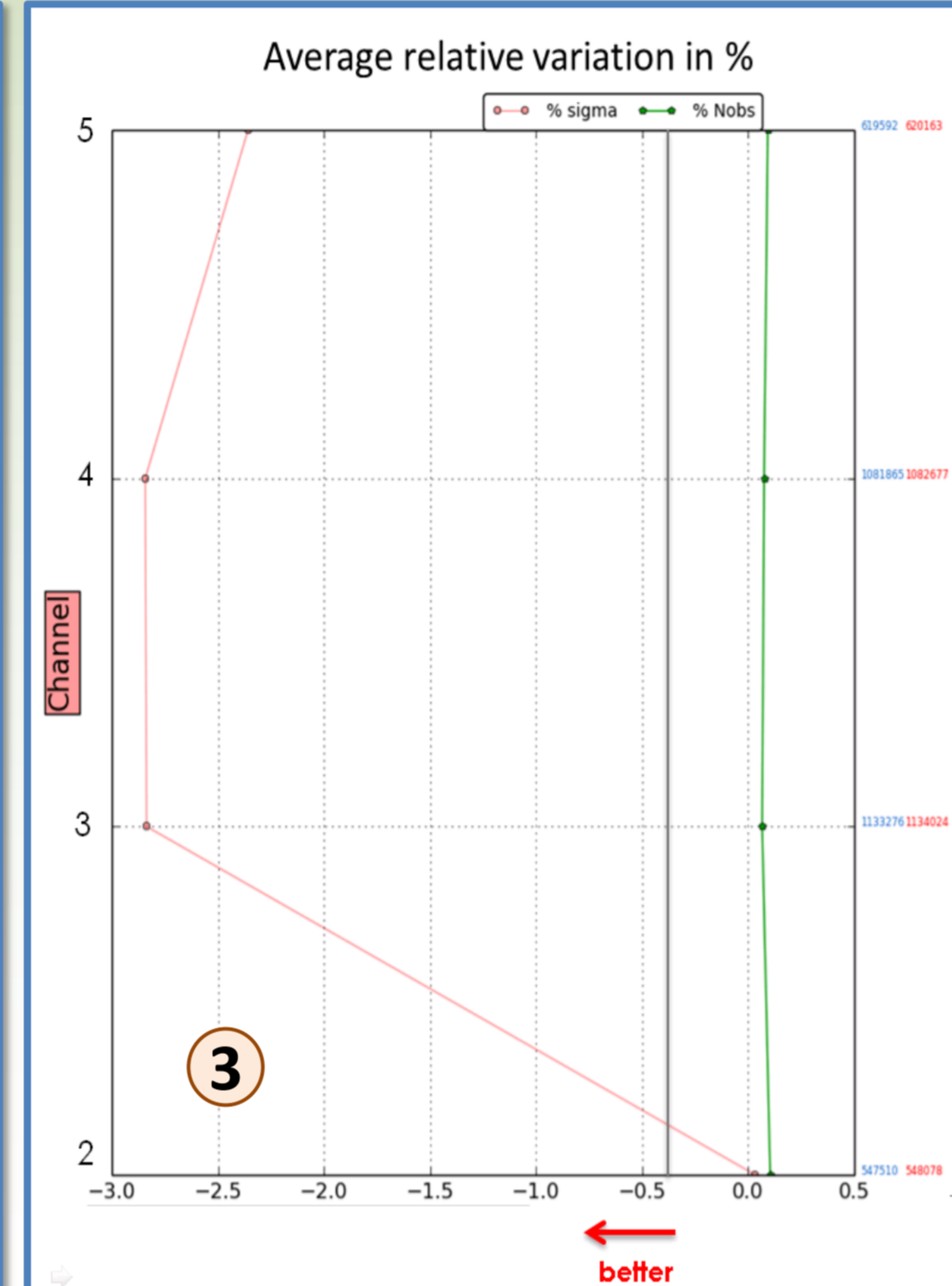
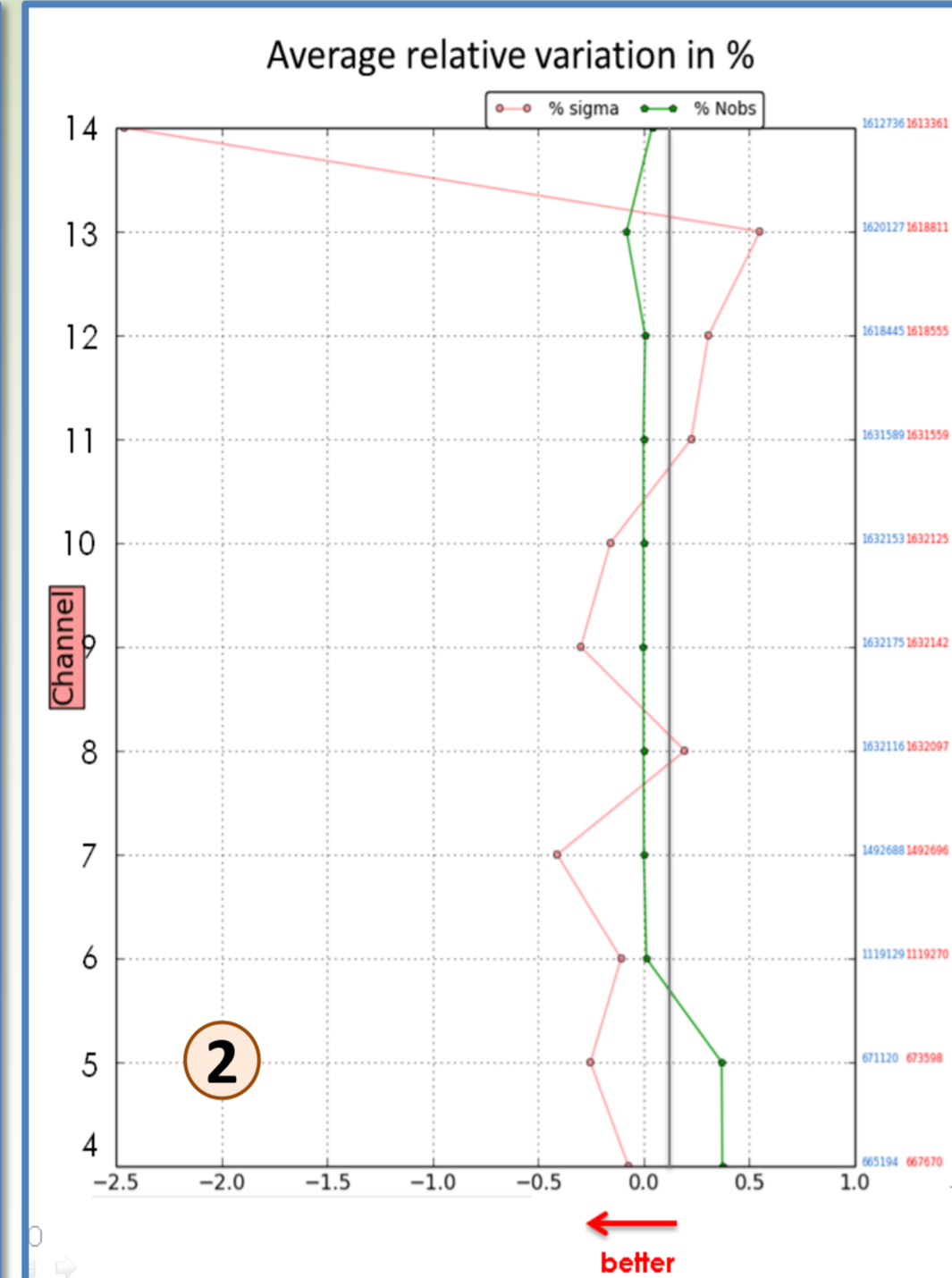
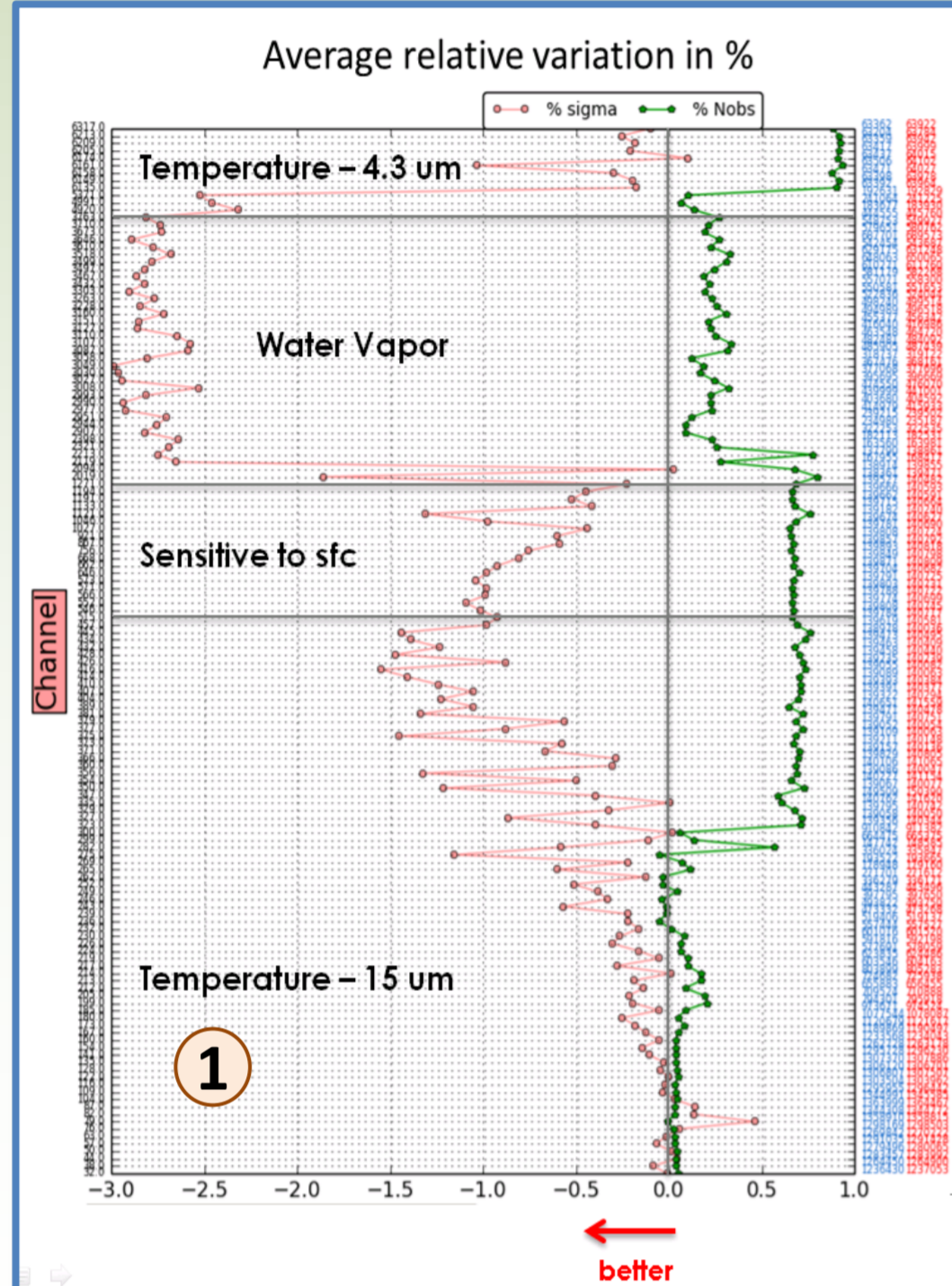
*CrIS-NSR from NPP ceased on 2019062918 and only CrIS-FSR has been / will be integrated.

Fit of short-range forecasts (STDO-B: red curve) to other observations when Updated/Added Observations are included

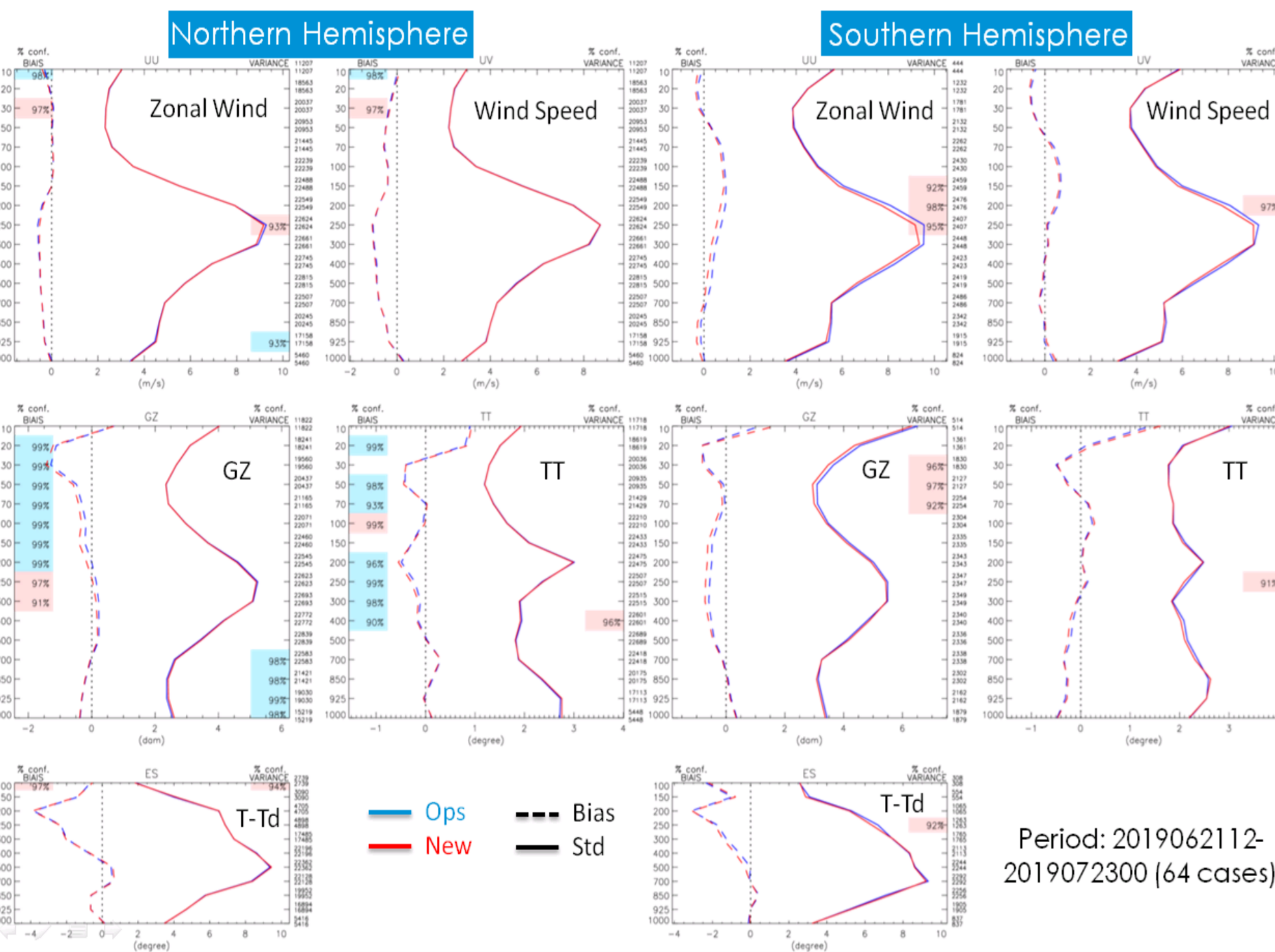
Period: 21 June - 23 July 2019

Region: World

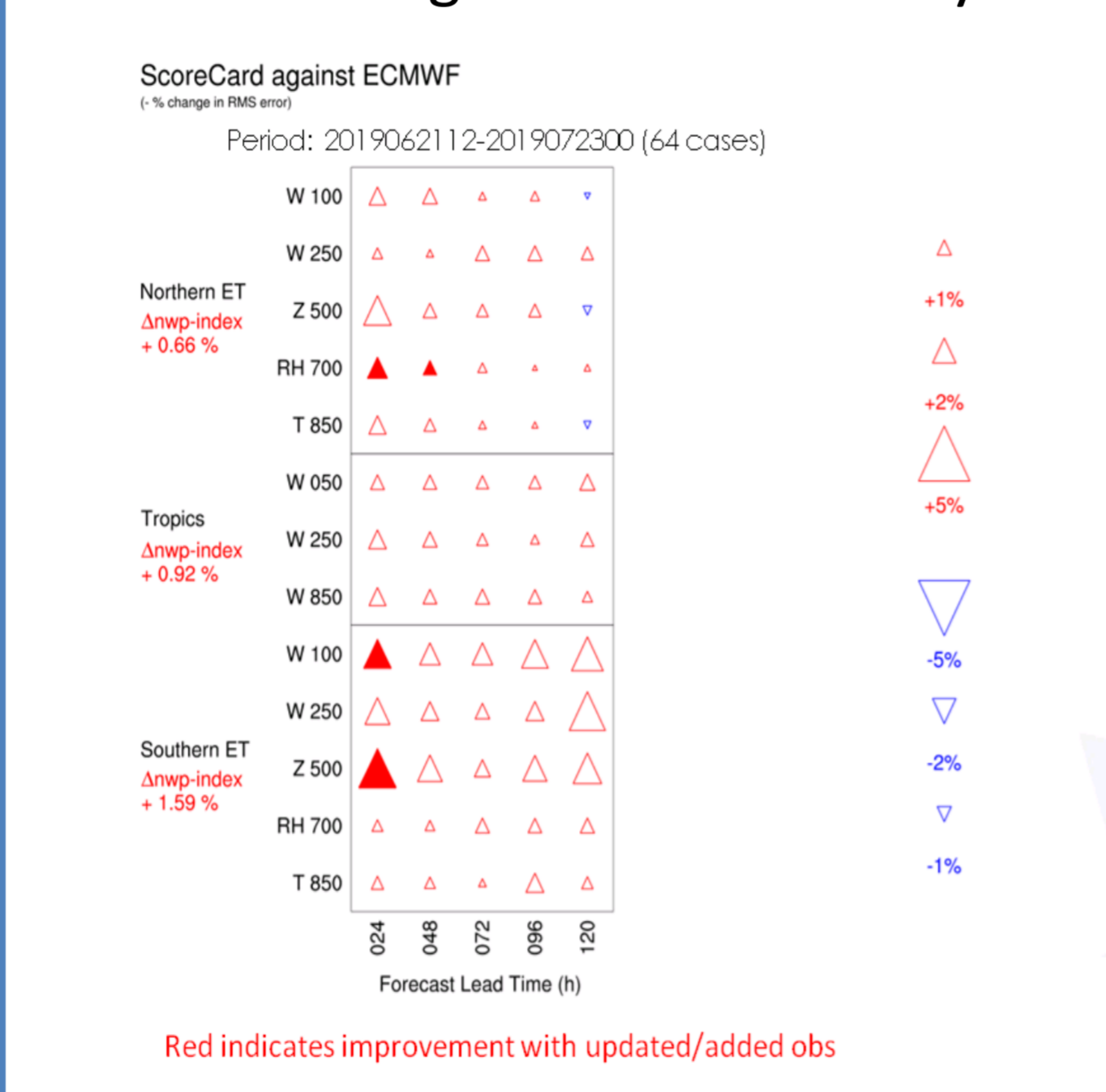
- Metop-B IASI
- Metop-B AMSU-A
- Metop-B MHS
- DMSP-18 SSMIS
- Himawari-8 AHI (CSR)



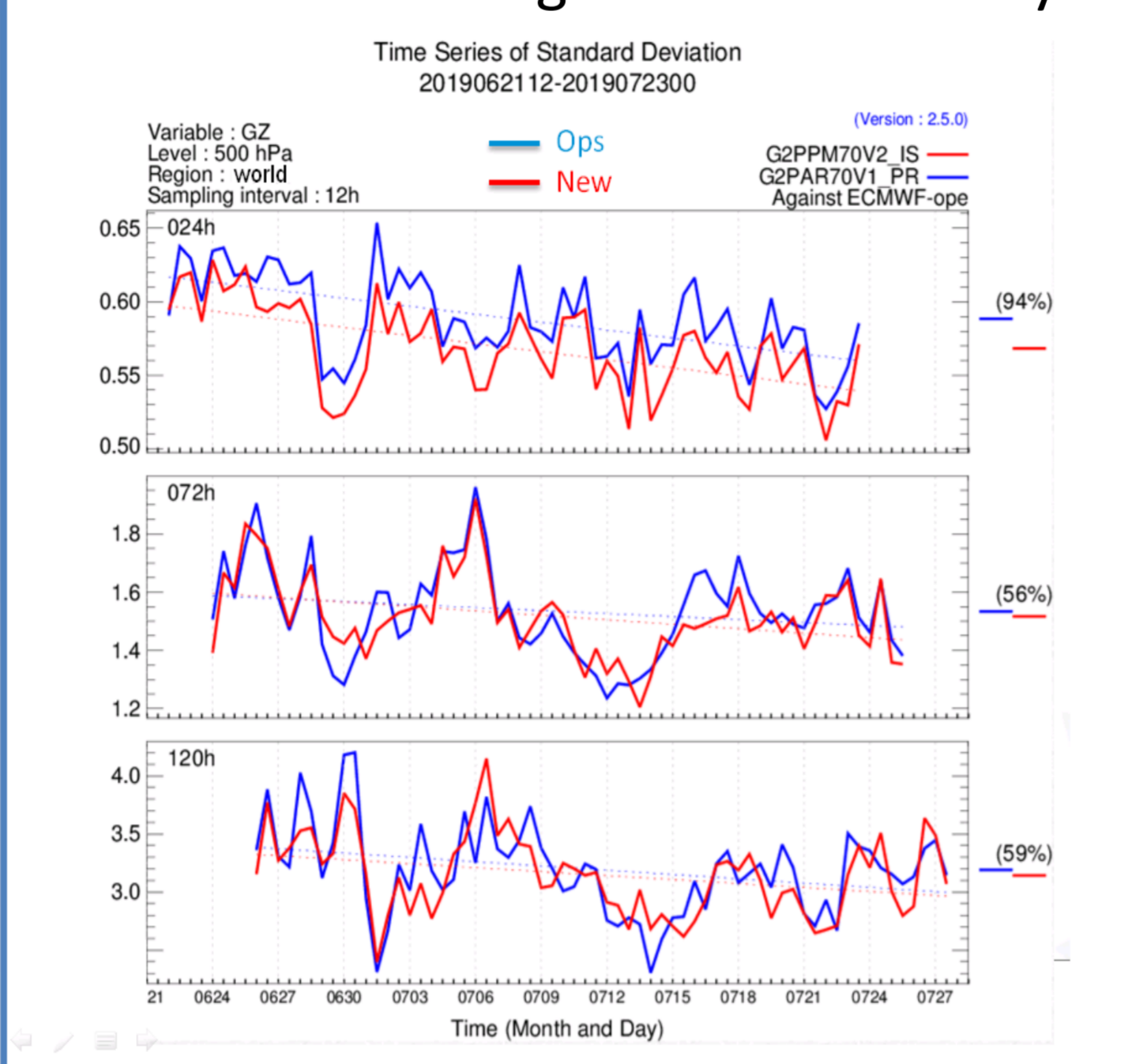
Impact of Updated/Added Observations on the 120 hour Global Forecast: Verification against Radiosondes



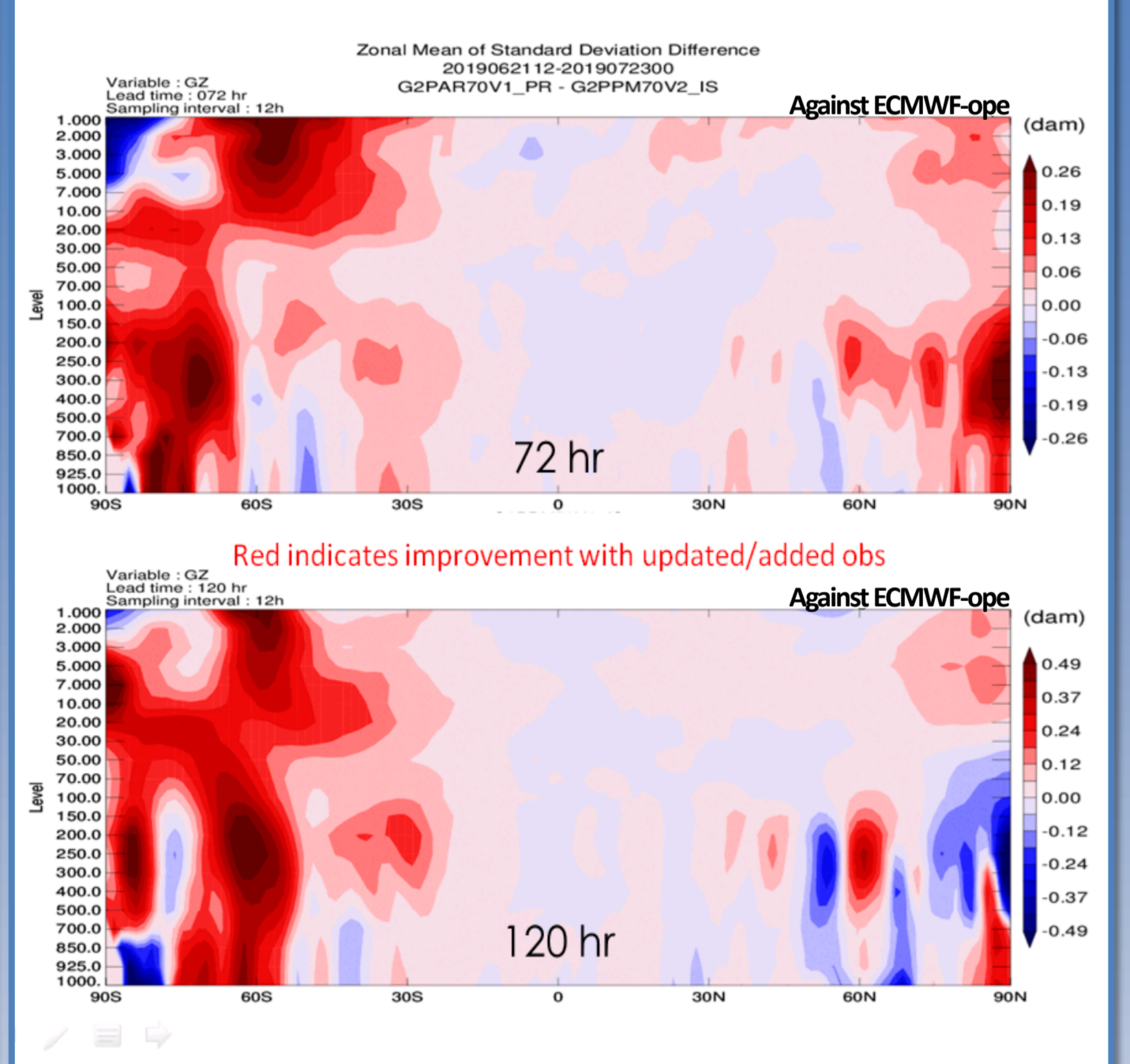
Impact of Updated/Added Observations on the Global Deterministic Model: Verification against ECMWF Analyses



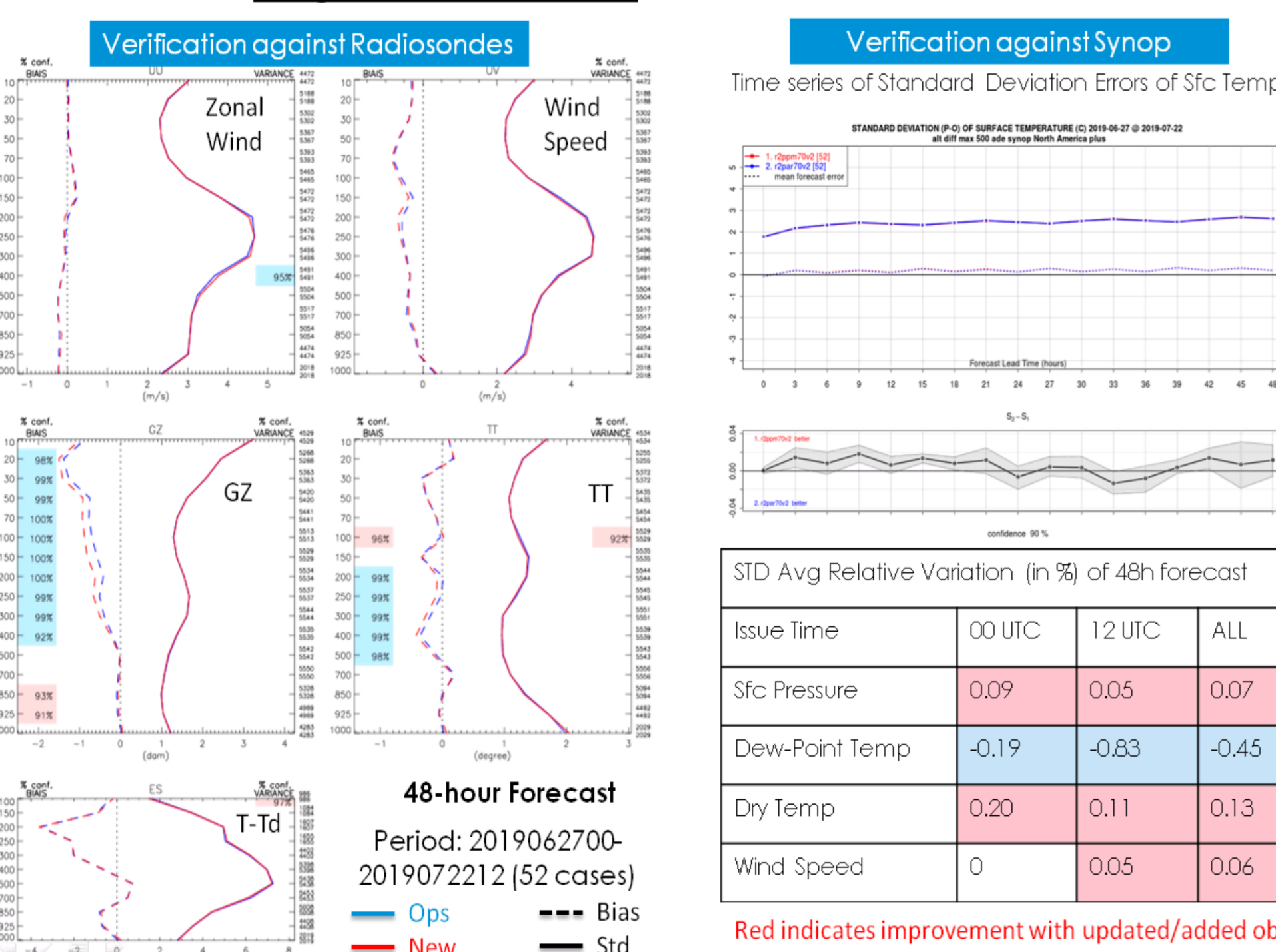
Impact of Updated/Added Observations on the Global Deterministic Model: GZ STD time series against ECMWF Analyses



Impact of Updated/Added Observations on the Global Deterministic Model: Zonal Mean of GZ STD differences



Impact of Updated/Added Observations on the 48 hour Regional Forecast over North America

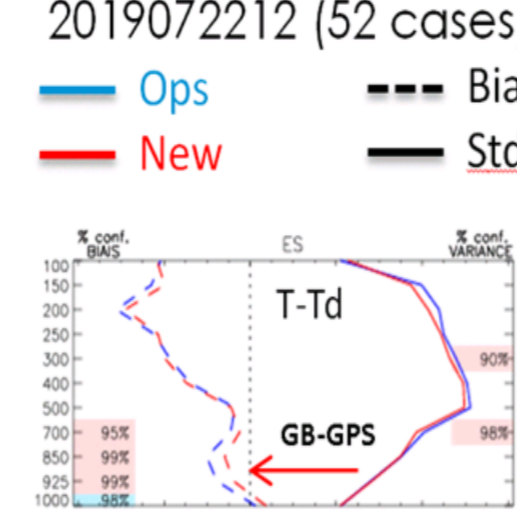


Concluding remarks

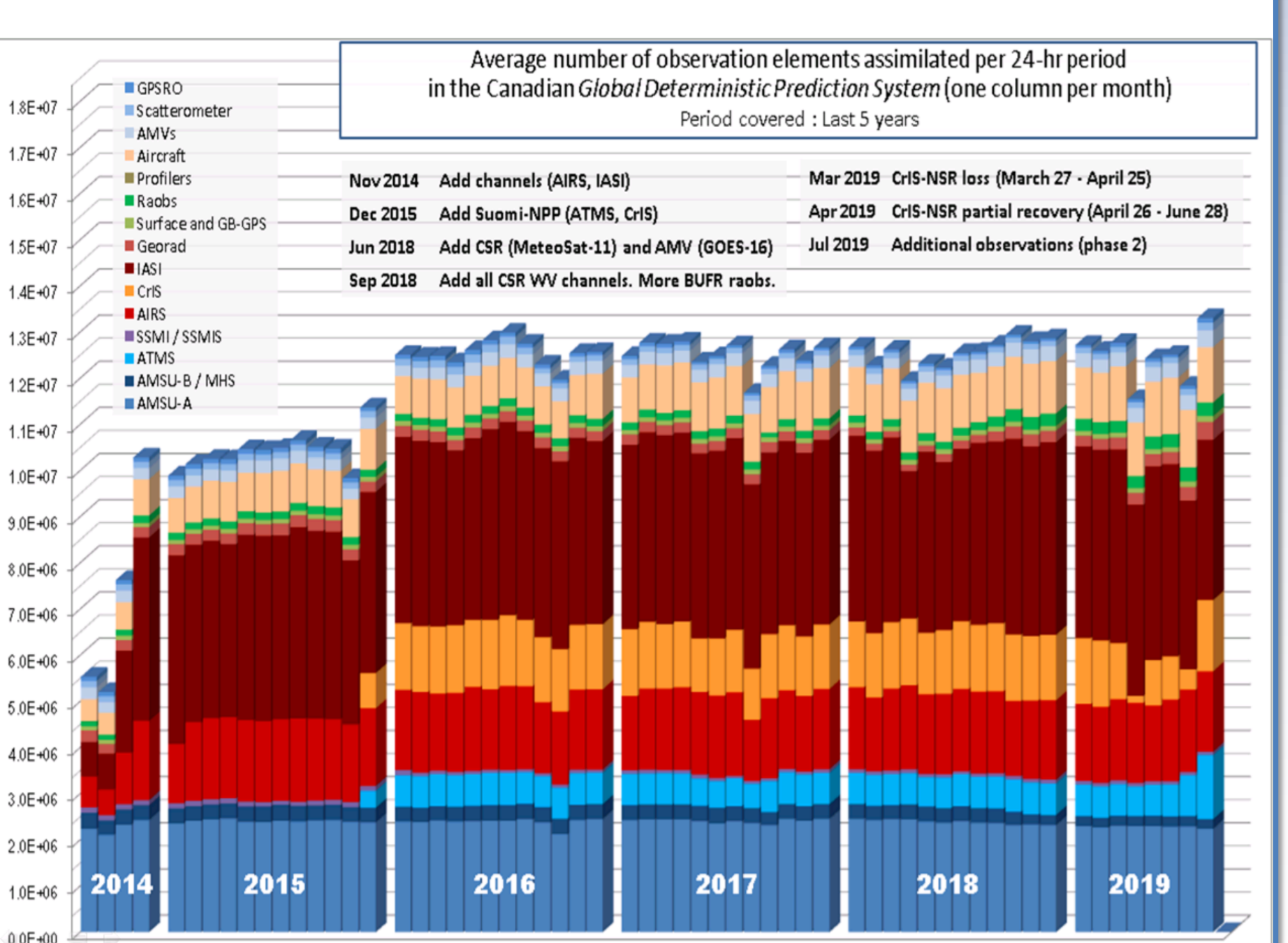
- O-B for each type of observations indicate that their quality is similar to what is/was operational
- Improved fit of short-range forecasts to water vapor sensitive channel data
- Impact on forecasts is mostly neutral. Some improvements noticed over Southern Hemisphere
- Increased GZ and TT biases seen in verifications against radiosondes seems related to a reduced B-O humidity bias (drying) in the lower troposphere which is particularly obvious over the United States (impact of GB-GPS addition)

B-O Statistics

Period: 2019062700-2019072212 (52 cases)



Observations used at ECCC



Radiance data: Current / future work and research avenues

- Maintain the system robustness: Assimilation of Metop-C (AMSU-A, MHS and IASI), FY-3C (MHS-2) and GOES-17 (CSR product).
- Increase the quantity of MW data: Assimilation of additional MW sounders / imagers (e.g. AMSR-2, MWTS-2, MWRI, SAPHIR, GMI, SSMIS humidity sounding channels).
- Better use of current data: Thinning reduction from 150km to 100km (with inflated observation errors in assimilation); all-sky satellite data assimilation of MW sounders; operational FSOI diagnostics.