Progress and plans for the use of radiance data in the NCEP global and regional data assimilation systems

John Derber[1], Russ Treadon[1], David Groff[2], Daryl Kleist[1],
Emily Liu[3], Haixia Liu[2], Quanhua (Mark) Liu[4], Edward Safford[2],
Paul van Delst[2], Yanqiu Zhu[2] and Andrew Collard[2]

[1] NOAA/NCEP/EMC   [2] IMSG @ NOAA/NCEP/EMC   [3] SRG @ NOAA/NCEP/EMC   [4] NOAA/NESDIS/STAR

SSMIS bias correction and assimilation

Bias correction predictors used are:

Air-mass					SSMIS specific		Scan angle (θ)			
const offset	zenith angle	cloud liquid water	lapse rate	lapse rate square	$node^* \times \cos(lat)$	$\sin(lat)$	θ^4	θ^3	θ^2	θ

*node is +1 if ascending, -1 if descending

Current use of satellite radiance data
Monitoring web site - http://www.emc.ncep.noaa.gov/gmb/gdas/

Global
all thinned to 145km

. GOES-15 Sounder
   Channels 1-15
. SEVIRI
   Meteosat-10 Channels 5-6
. AMSU-A
   NOAA-15   Channels 1-10, 12-13, 15
   NOAA-18   Channels 1-8, 10-13, 15
   NOAA-19   Channels 1-7, 9-13, 15
   METOP-A   Channels 1-6, 8-13, 15
   METOP-B   Channels 1-13, 15
   AQUA   Channels 6, 8-13
. AMSU-B/MHS
   NOAA-18   Channels 1-5
   NOAA-19   Channels 1-5
   METOP-A   Channels 1-5
   METOP-B   Channels 1-5
. HIRS
   METOP-A   Channels 2-15
. AIRS
   AQUA   120 Channels
. IASI
   METOP-A   165 Channels
. CrIS
   SNPP   84 Channels

Added in August 2013 Upgrade

Regional

. AMSU-A
   NOAA-15   Channels 1-10, 12-13, 15
   NOAA-18   Channels 1-8, 10-13, 15
   NOAA-19   Channels 1-7, 9-13, 15
   METOP-A   Channels1-6, 8-13, 15
   Aqua   Channels 6,8-13
                Thinned to 60km
. AMSU-B/MHS
   NOAA-18   Channels 1-5
   METOP-A   Channels 1-5
                Thinned to 60km
. HIRS
   METOP-A   Channels 2-15
                Thinned to 120km
. AIRS
   AQUA   148 Channels
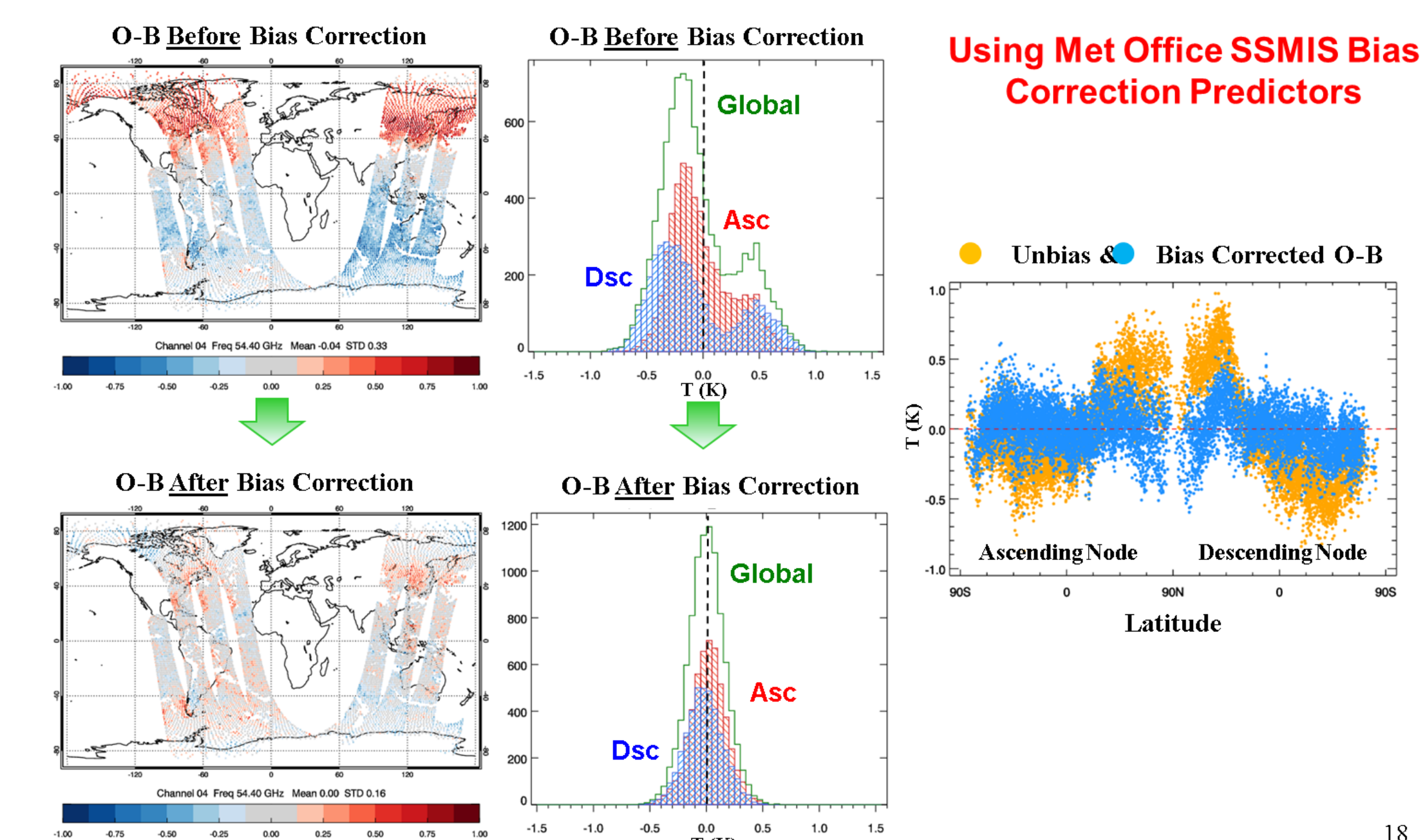   Thinned to 120km

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Global Model Summer 2014 Upgrade

. IASI
   MetOp-B   165 Channels
. SSMIS
   F17   1-3, 5-7, 24
   F18   1-7, 24
Enhanced bias correction (talk 10.02 by Y. Zhu)
CRTM Upgrade to v2.1.3 (FASTEM-5).
QC Improvements to AMSU-A

Ongoing NCEP/JCSDA satellite data assimilation developments

. Assimilation of cloudy radiances
   . Various IR and MW approaches
   . (e.g. Cloud Cleared Radiances poster 9p.02 by H. Liu)
. Improved use of IASI /AIRS/CrIS moisture channels
. Radiance based SST analysis (includes diurnal cycle)
. 4D-Ensemble-Var

Application of NWP Bias Correction for SSMIS F18

O-B Before Bias Correction

O-B Before Bias Correction

Using Met Office SSMIS Bias Correction Predictors

Global
Asc
Dsc

O-B After Bias Correction

O-B After Bias Correction

Global
Asc
Dsc

Unbias   Bias Corrected O-B

Ascending Node   Descending Node

Latitude

18

15 Jan to 30 Mar 2012 (00Z cycles only)
Northern Hemisphere 500 hPa Geopotential Height Anomaly Correlation
Southern Hemisphere 500 hPa Geopotential Height Anomaly Correlation

Control
Enhance

Difference w.r.t. PRHY

Forecast Hour

Tropical (20°N-20°S) 0 to 5 Day Wind Forecast RMS Errors
15 Jan to 30 Mar 2012 (00Z cycles only)
850hPa
200hPa

Control
Enhance

Difference w.r.t. PRHY

Forecast Hour

CRTM Upgrade to FASTEM-5

FASTEM5: amsua channel 2
FASTEM4: amsua channel 2
FASTEM1: amsua channel 2

FASTEM-1
FASTEM-5
FASTEM-5 (with bug fix)

AC: HGT P500 G2 00Z, 20120701-20120818

PR3DVCLO   41.
PR3DVRTM3   41.
PR3DVFX2   41.

Difference w.r.t. PR3DVCLO

AC differences outside of outline bars are significant at the 95% confidence level

Forecast Hour