Validation Aspects of Present and Future Operational Metop ATOVS/AVHRR Products

Jörg Ackermann, Rüdiger Lang, Thomas Heinemann, François Montagner

17th ITSG, Monterey, CA, 14-20 April 2010

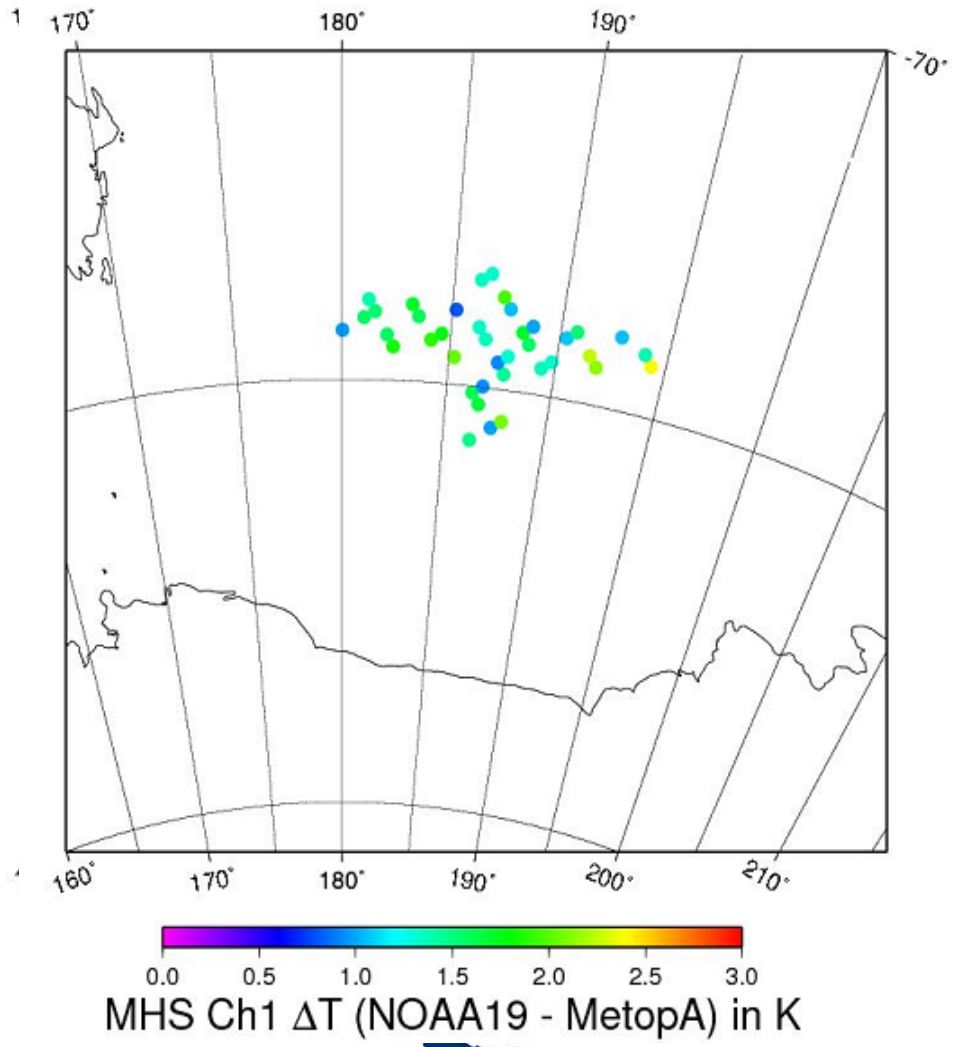
EPS METOP

EUMETSAT

Validation Aspects of Metop ATOVS/AVHRR

- MHS Validation using Simultaneous Nadir Overpasses with N-19
- AVHRR/VIS Calibration using GOME-2
- Metop-A AMSU Channel 7
- AVHRR/3 Polar Cap Winds
- Two Metops in the Same Orbit

MHS Validation using SNO's with N-19



SNO on 4. April 2009, 11:16:04 UTC

1. Restriction to co-located pixels (less than 5km distance)

=> 2260 pixels left

2. Restriction to similar viewing angles (less than 3 pixels with the same scanning angles)

=>245 pixels left

3. Restriction to co-located near nadir views (pixels 35 to 56 only)

=> 62 pixels left

4. Restriction to coincident near nadir views (maximum time difference of 30 seconds)

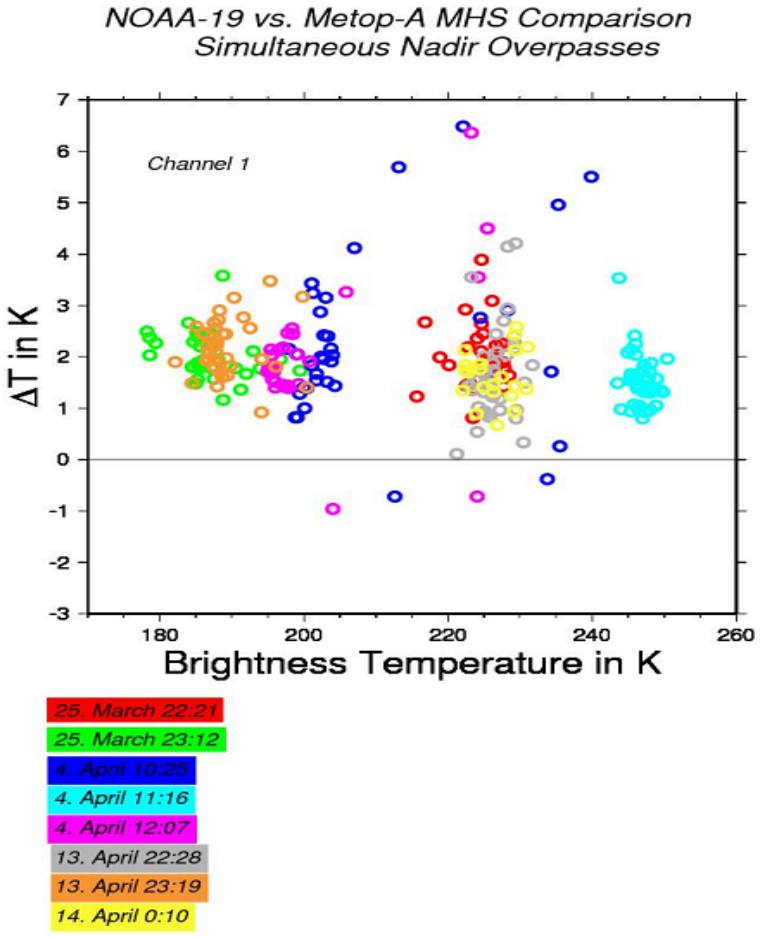
⇒40 pixels left

Computation of BT Differences

EPS METOP

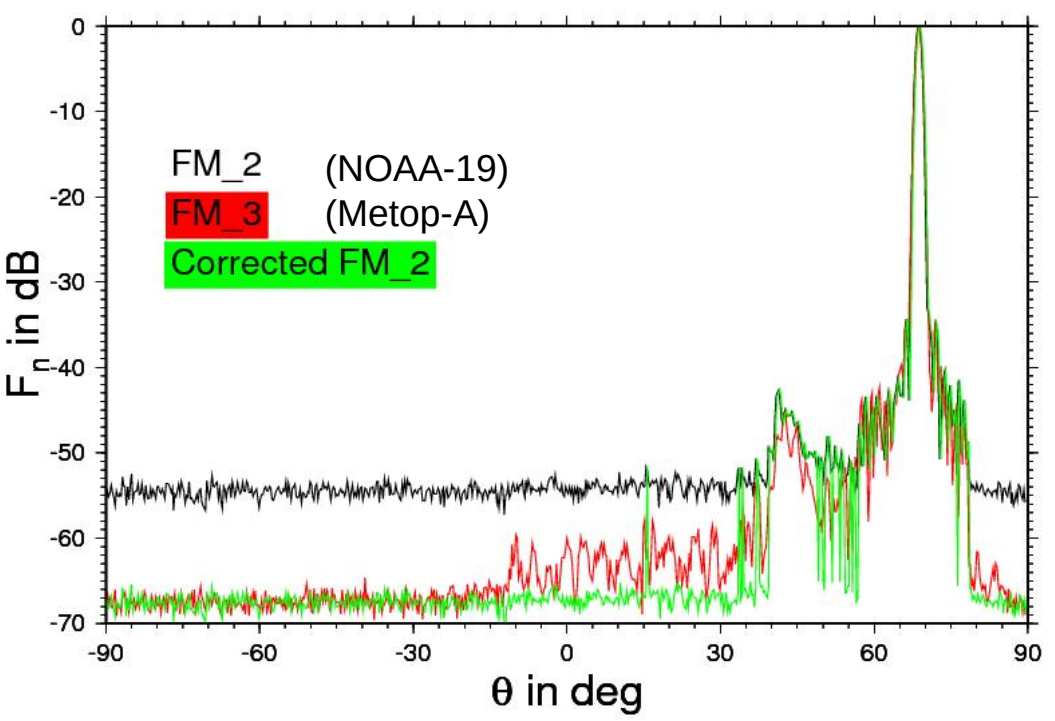
EUMETSAT

MHS Validation using SNO's with NOAA-19



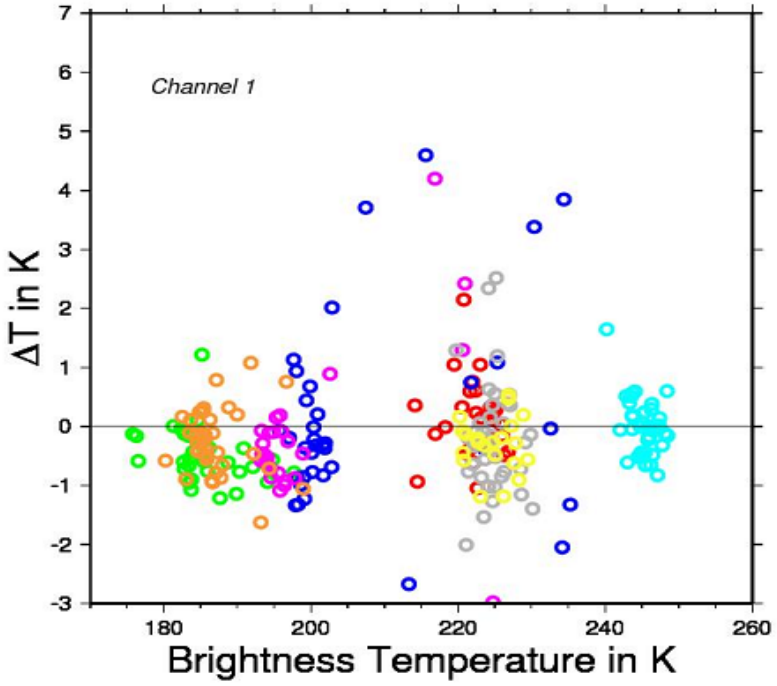
=> Significant Bias due to high space view correction factors for NOAA-19

=> High space view correction factors due to wrong noise floor of antenna pattern



EPS METOP

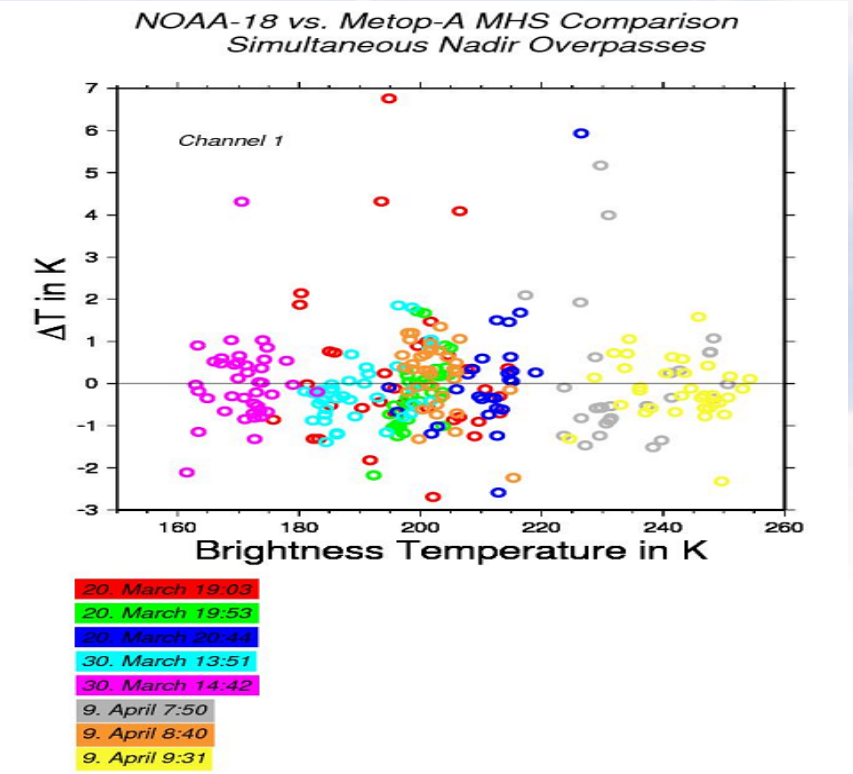
MHS Validation using SNO's with NOAA-19



=> Correction of the antenna pattern

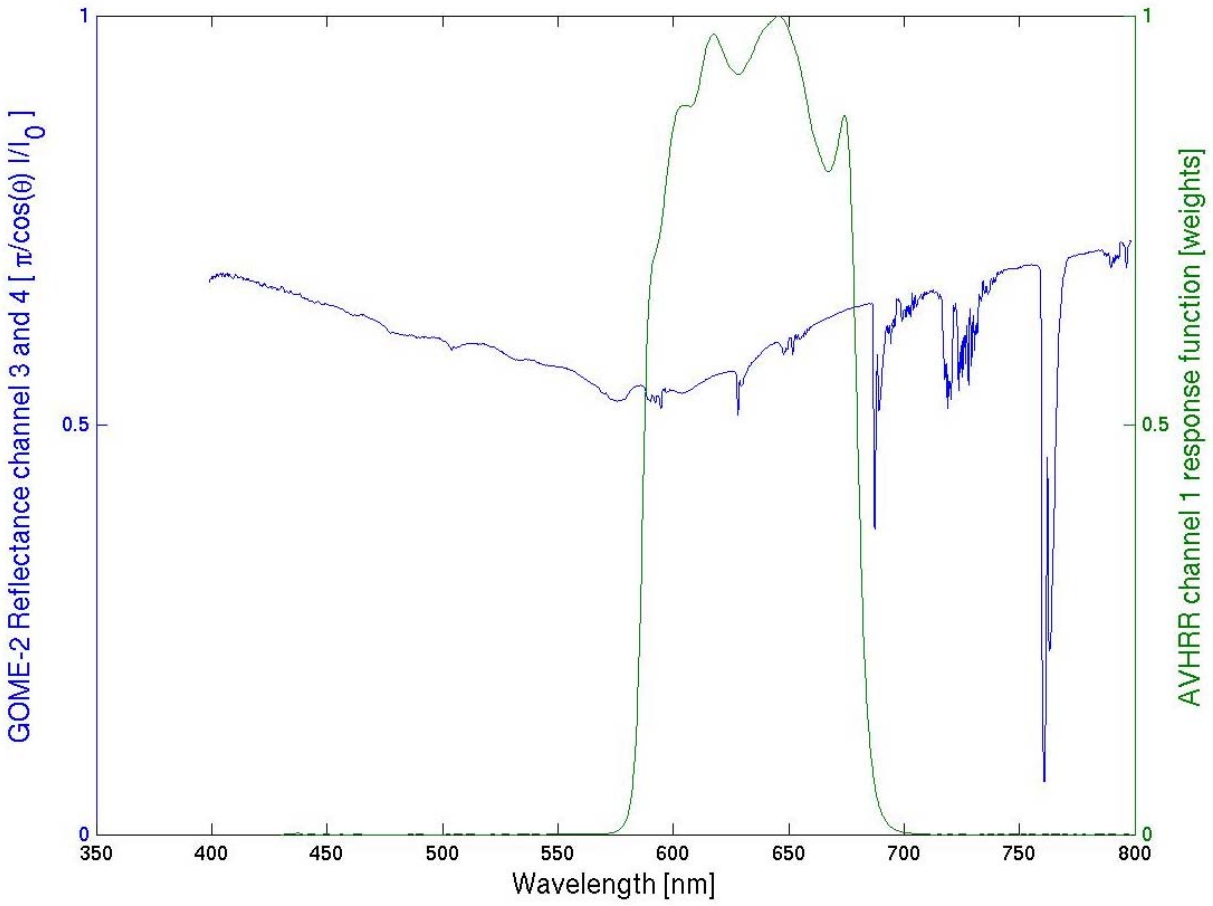
=> Re-calculation of the space view correction for NOAA-19

=> Repetition of the SNO analysis



EPS METOP

AVHRR/3 Validation using GOME-2



~ 500 GOME-2 measurements within the AVHRR/3 Ch.1 window response function

Read-out period (sucessive reading of the 500 detector pixels): 0.02 seconds

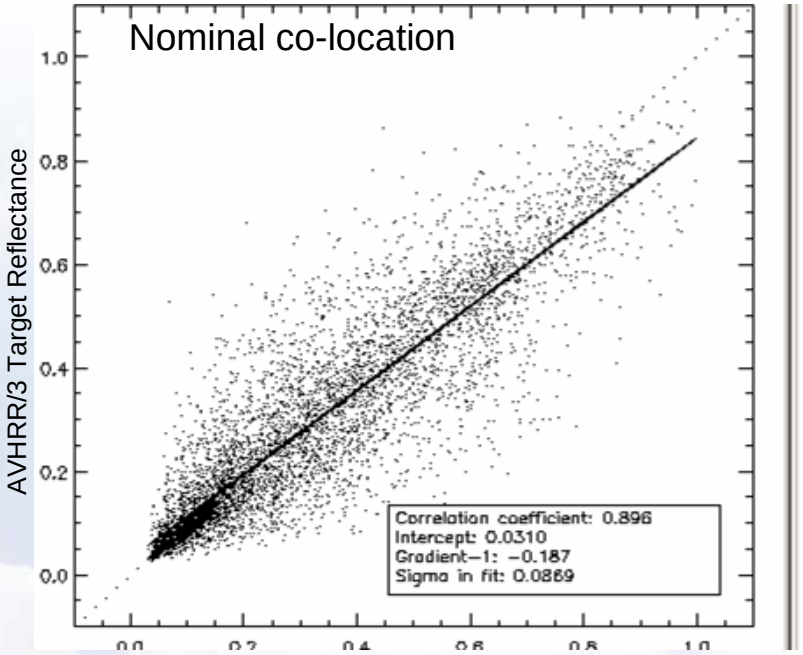
EPS METOP

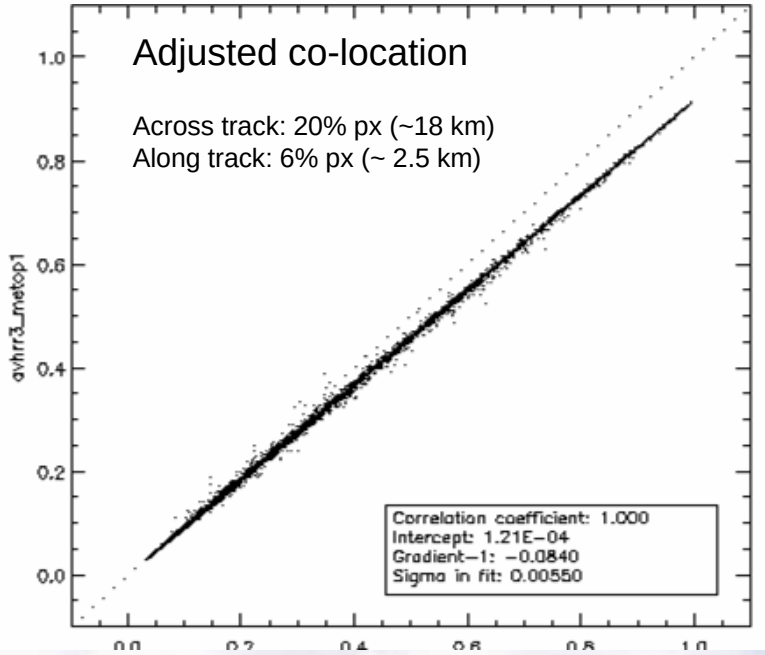
EUMETSAT

AVHRR/3 Validation using GOME-2

National Centre for Earth Observation
NATURAL ENVIRONMENT RESEARCH COUNCIL

Science & Technology Facilities Council
Rutherford Appleton Laboratory





Courtesy of Barry Latter et al. (2009)

- **Across Track shift is explained by GOME-2 read-out period (geolocation refers to start of the spectrum)**
- **Along Track shift is very likely a real geolocation difference (investigations ongoing)**
- **GOME-2 convoluted target reflectances are higher by about 8 % (relative value)**

EPS METOP

EUMETSAT

Elimination of Metop-A AMSU Ch. 7

Objective: Remove AMSU channel 7 from the ATOVS Level 2 (temperature) retrieval

Problem: Temperature Biases of the FRTM are expressed by a polynomial which depends on:

- **Satellite zenith angle**
- **HIRS channels 1,2,3**
- **AMSU channels 6,7,8,9**

=> Generation of an 'artificial' AMSU channel 7 brightness temperature using the neighbouring channels 6 and 8

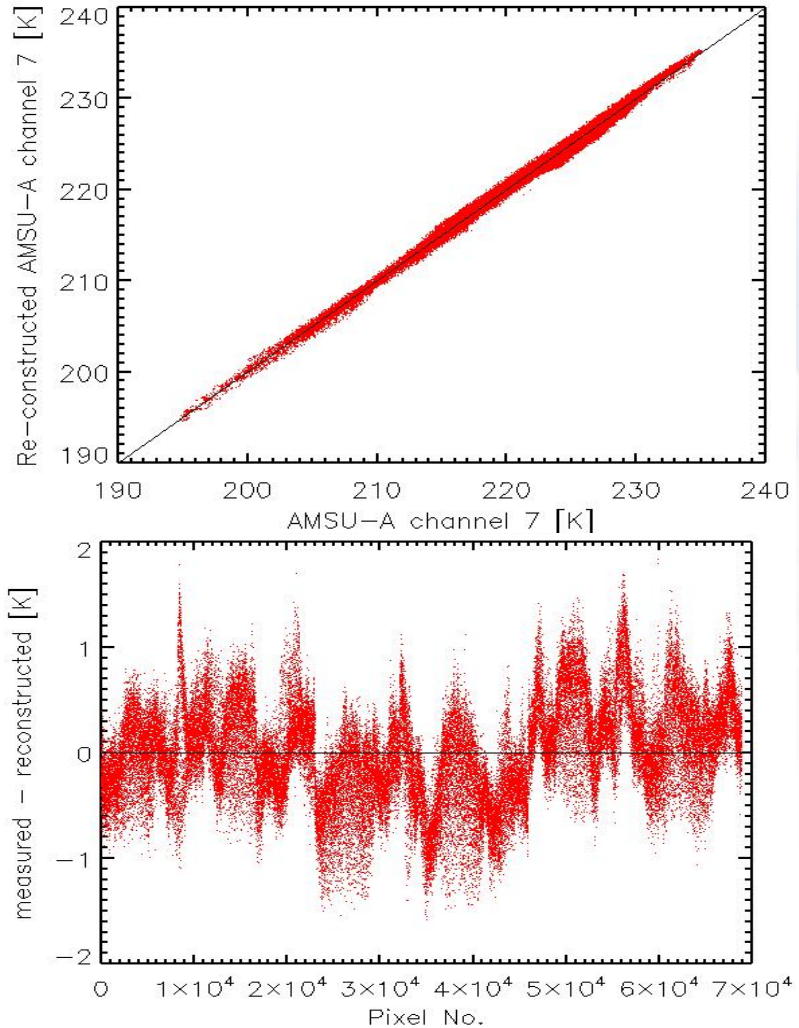
EPS METOP

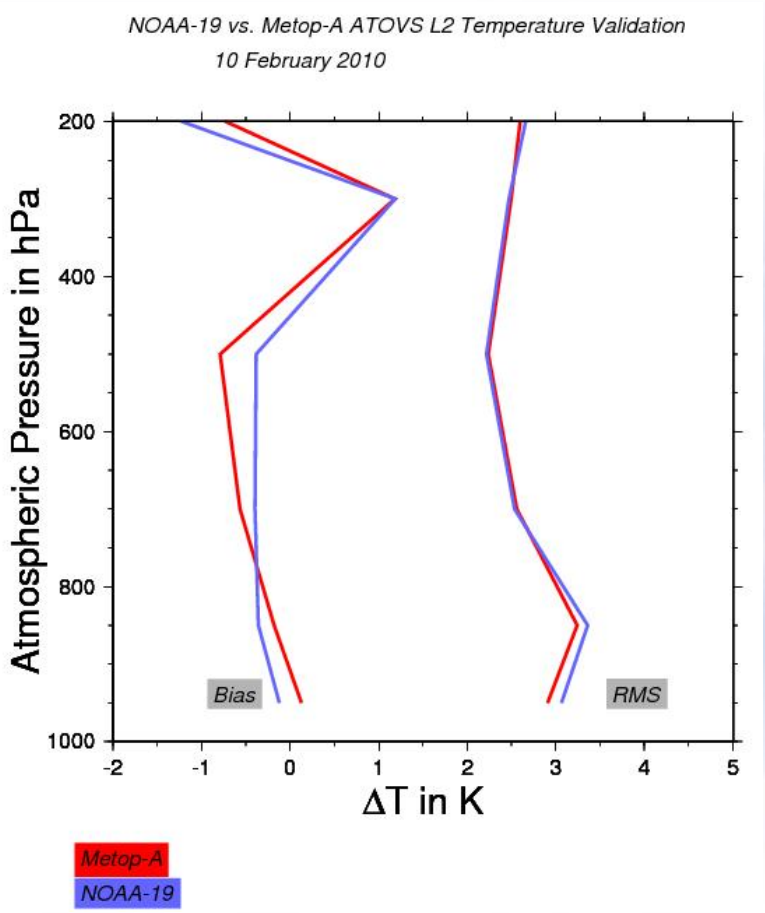
EUMETSAT

Elimination of Metop-A AMSU Ch. 7

Regression (from orbits #207, #1042, #3987):

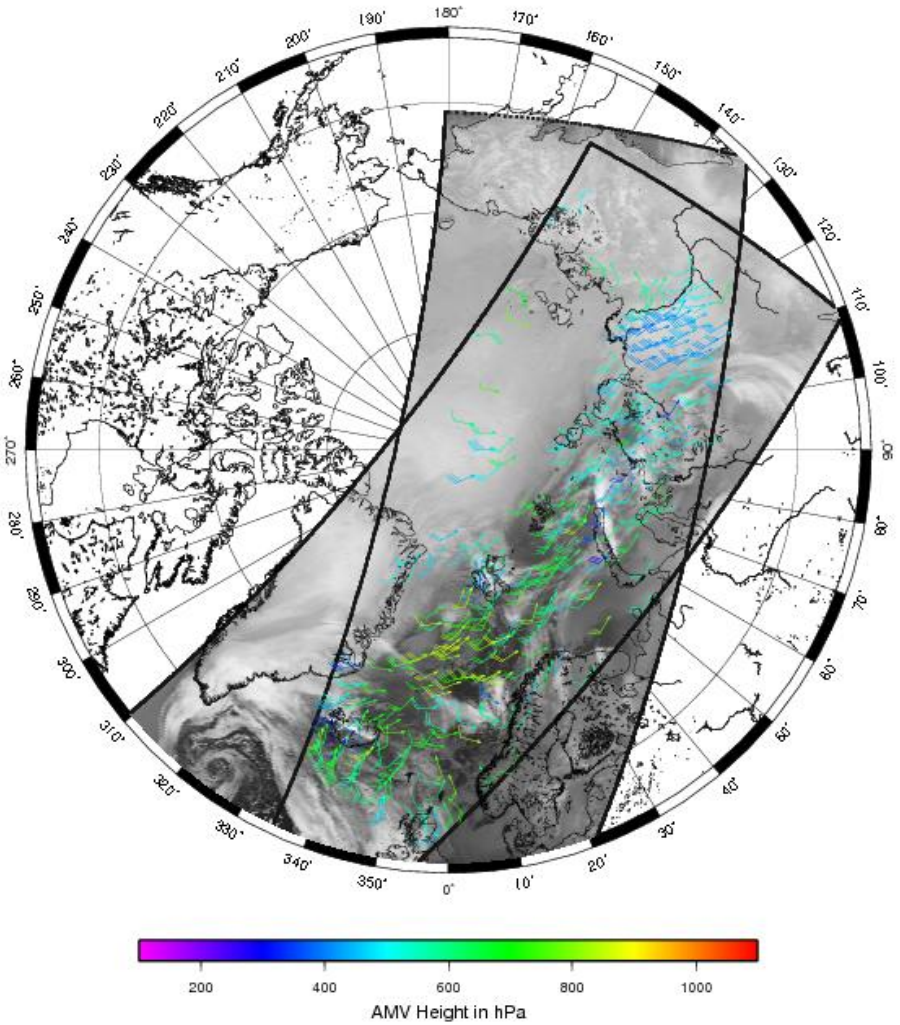
$BT_7 = 0.487\ BT_6 + 0.511\ BT_8 - 1.286$





EUMETSAT

Polar Cap Winds from Metop-A AVHRR/3



Mapping of AVHRR/3 data over the poles onto a common projection

Tracking of structures in overlap areas of mapped AVHRR/3 Ch.4 (11 µm) measurements from subsequent orbits

Determination of heights for tracked targets (AMV: Atmospheric Motion Vector)

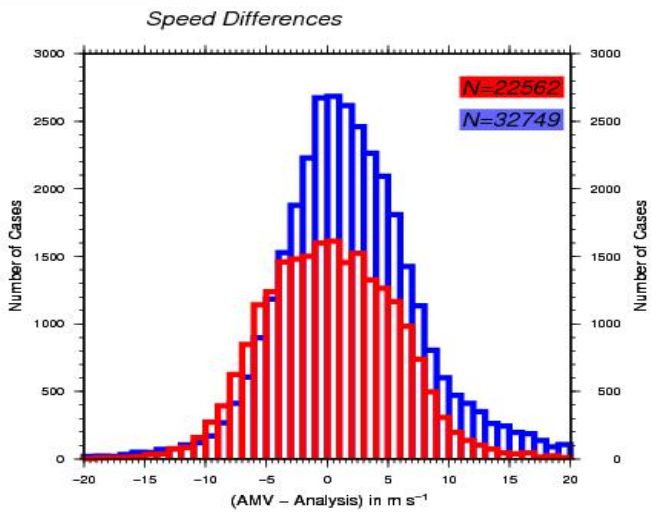
Selection of valid targets through several quality checks (spatial and temporal consistency with surrounding wind vectors)

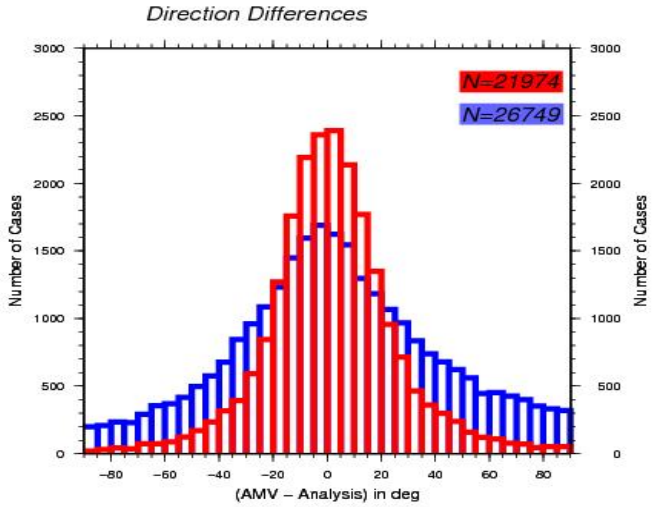
EPS METOP

EUMETSAT

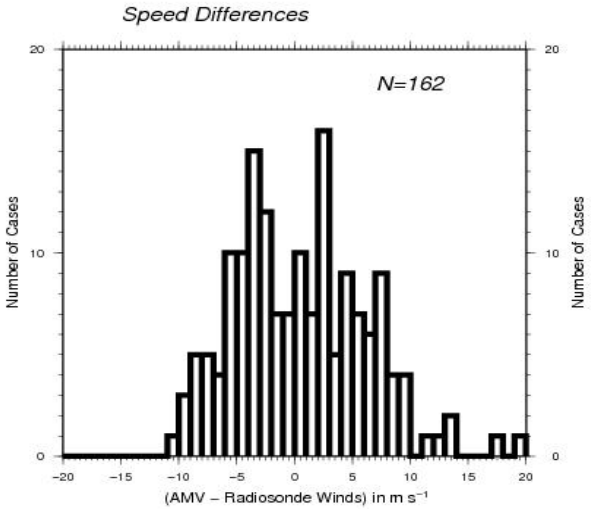
Validation of Metop-A AVHRR/3 Winds

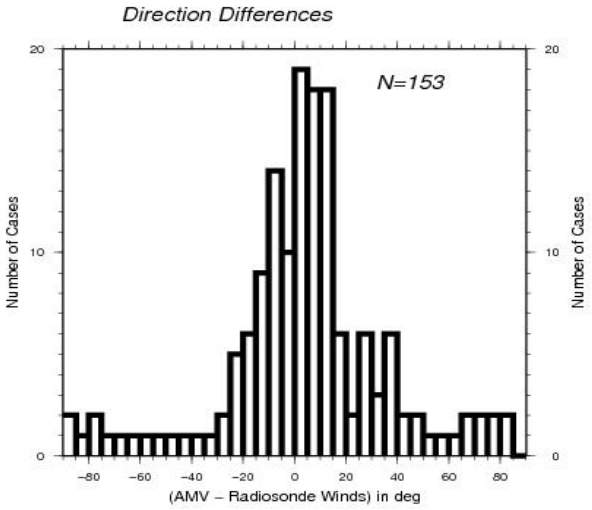
AMV vs. ECMWF Analysis





AMV vs. Radiosondes



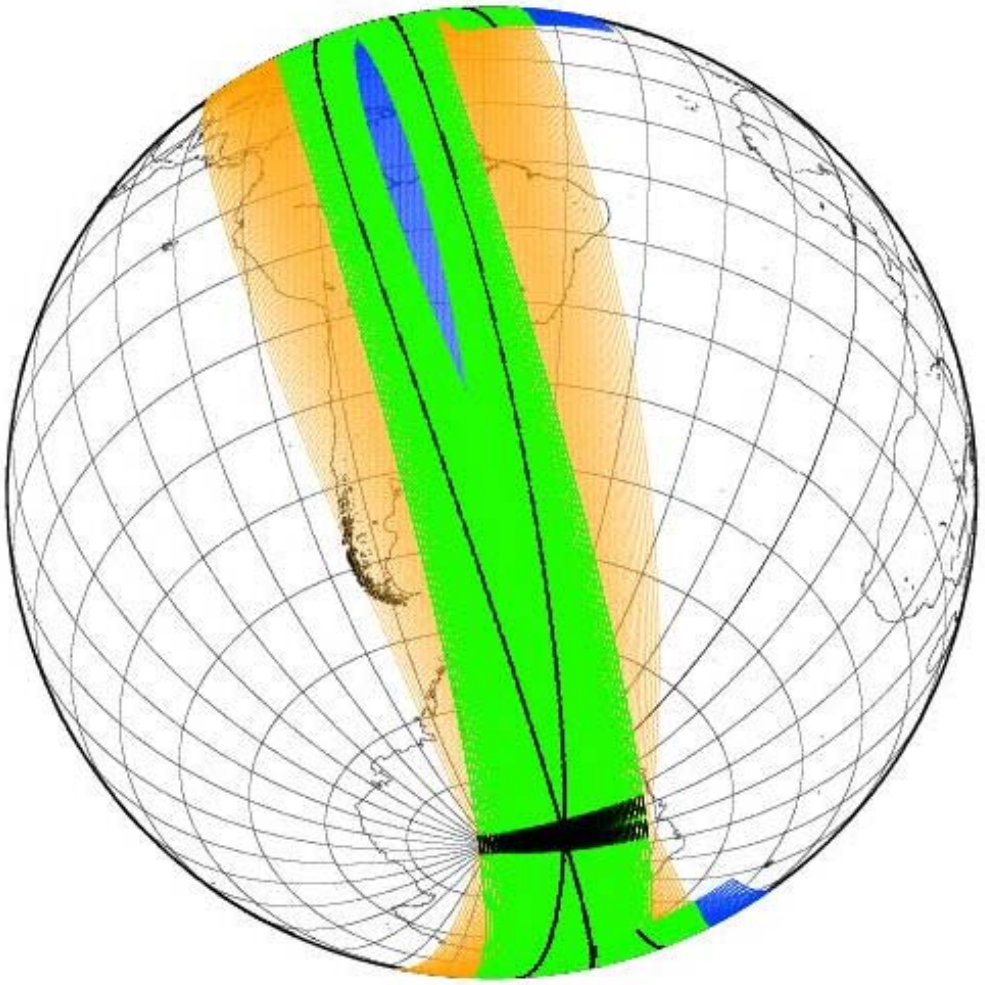


	GS-2 vs. Radiosonde Winds	GS-2 vs. Analysis
Speed Bias (m/s)	0.50	1.31
Speed RMS (m/s)	5.71	6.00
Direction Bias (deg)	4.27	7.79
Direction RMS (deg)	43.13	55.97
Mean Speed AMV	18.41	14.20
Mean Speed Analysis	17.91	12.89
Sample size	162	55760

Winds will be ready for trial dissemination in the second half of May 2010

EUMETSAT

Metop-A and Metop-B



Metop-A

Metop-A + Metop-B

Metop-A/B Overlap

Metop-A/B Coincident Scanning Angles

⇒Potential Applications:

AVHRR/3 winds in non-polar areas

Estimate asymmetric scan bias for AMSU/MHS

EPS METOP

EUMETSAT

Thanks ...

... to all colleagues, who have contributed to this presentation

... to all users, who provided feed back on EPS products' quality

... to the auditory