EUMETSAT Activities for CDR Generation with Special Emphasis on MHS

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(with contribution of Viju John, UKMO)

EUMETSAT

NOAA CDR Workshop,
2 to 3 March 2011

CDR Generation with Emphasis on MHS

- **Sustained Information Flow and Schedule**
- **MHS Validation Aspects**
  - **SNO’s**
  - **Antenna Corrections**
  - **NEDT**
  - **Data Processing**
- **Outlook**

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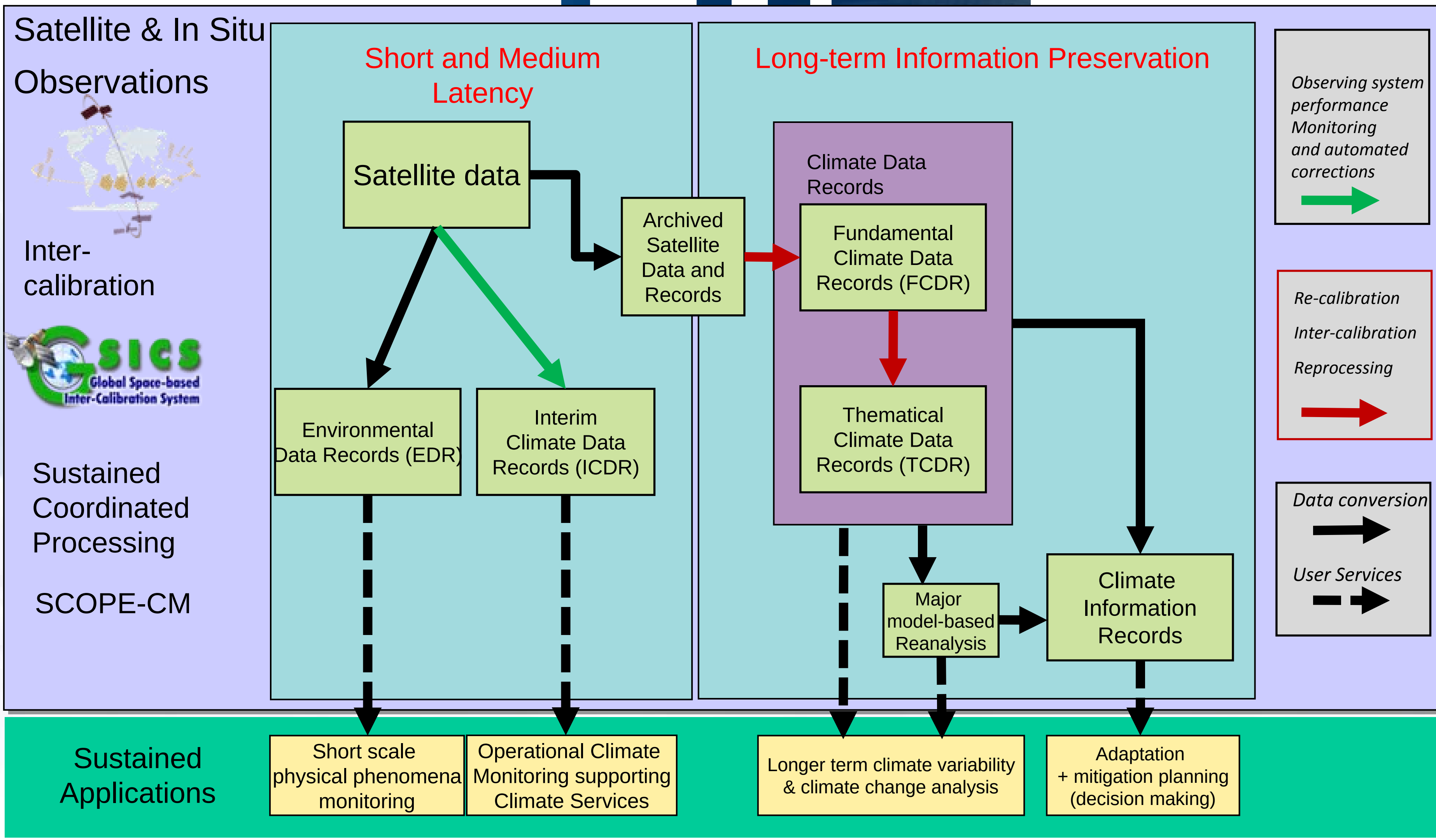
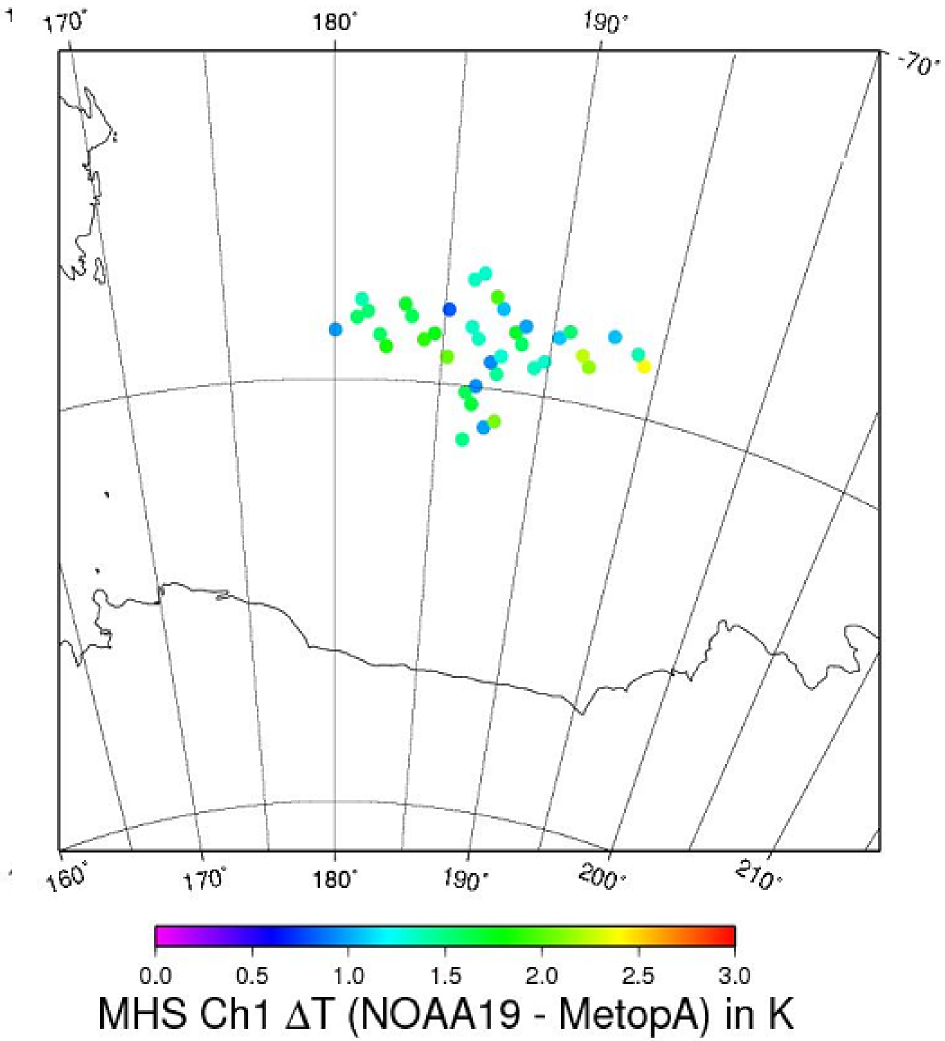
Sustained Climate Information Flow



EUMETSAT Climate Data Records Overview (~next 3 years)

- Aim for combined FCDR for Meteosat series (MVIRI, SEVIRI homogenised IR radiance record);
- Aim incrementally for FCDRs for all EUMETSAT instruments flown onboard Metop (first records using latest operational algorithm version are called interim FCDR);
- Aim to support activities towards FCDRs for all NOAA heritage instruments onboard Metop (AVHRR, HIRS, AMSU-A/B, MHS);
- Aim at consistent radio-occultation data (bending angles) back to 2001 from GRAS, CHAMP, GRACE and COSMIC sensors;
- TCDR production aims at ECVs including data for assimilation in atm. reanalysis as Atmospheric Motion Vectors (MVIRI, SEVIRI, AVHRR);
- FCDR and TCDR production is performed within the EUMETSAT's distributed ground segment, i.e., at Central Application Facility (CAF) and Satellite Application Facilities (SAFs);
- Supports specific international activities as WMO (GSICS, SCOPE-CM), ECMWF Reanalysis, WCRP (GEWEX Radiation Panel Reprocessing and Assessment), ESA-Climate Change Initiative.

MHS Validation using SNO’s



Metop-A 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

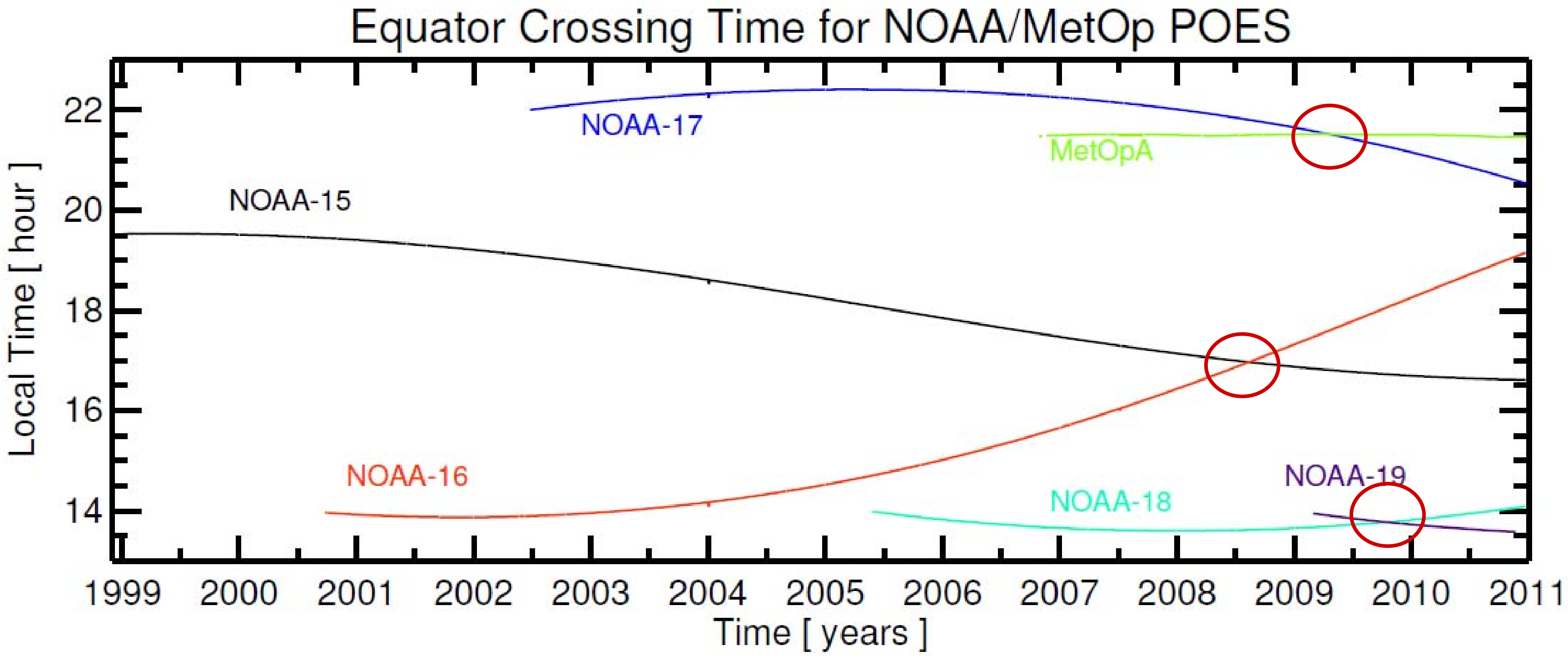
Computation of BT Differences

How good are polar SNOs for microwave humidity sounder inter-calibration?

Viju John (with thanks to Gerrit Holl)

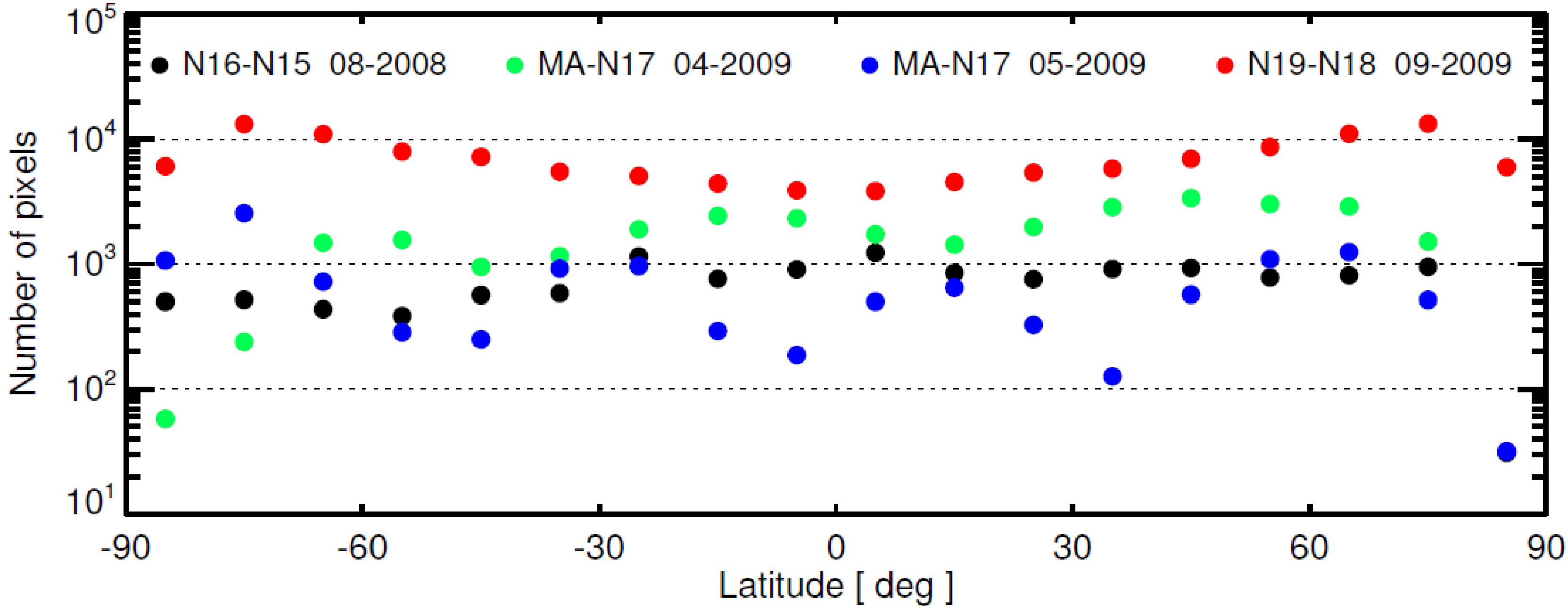
Met Office
Hadley Centre

Something good about orbit drift!



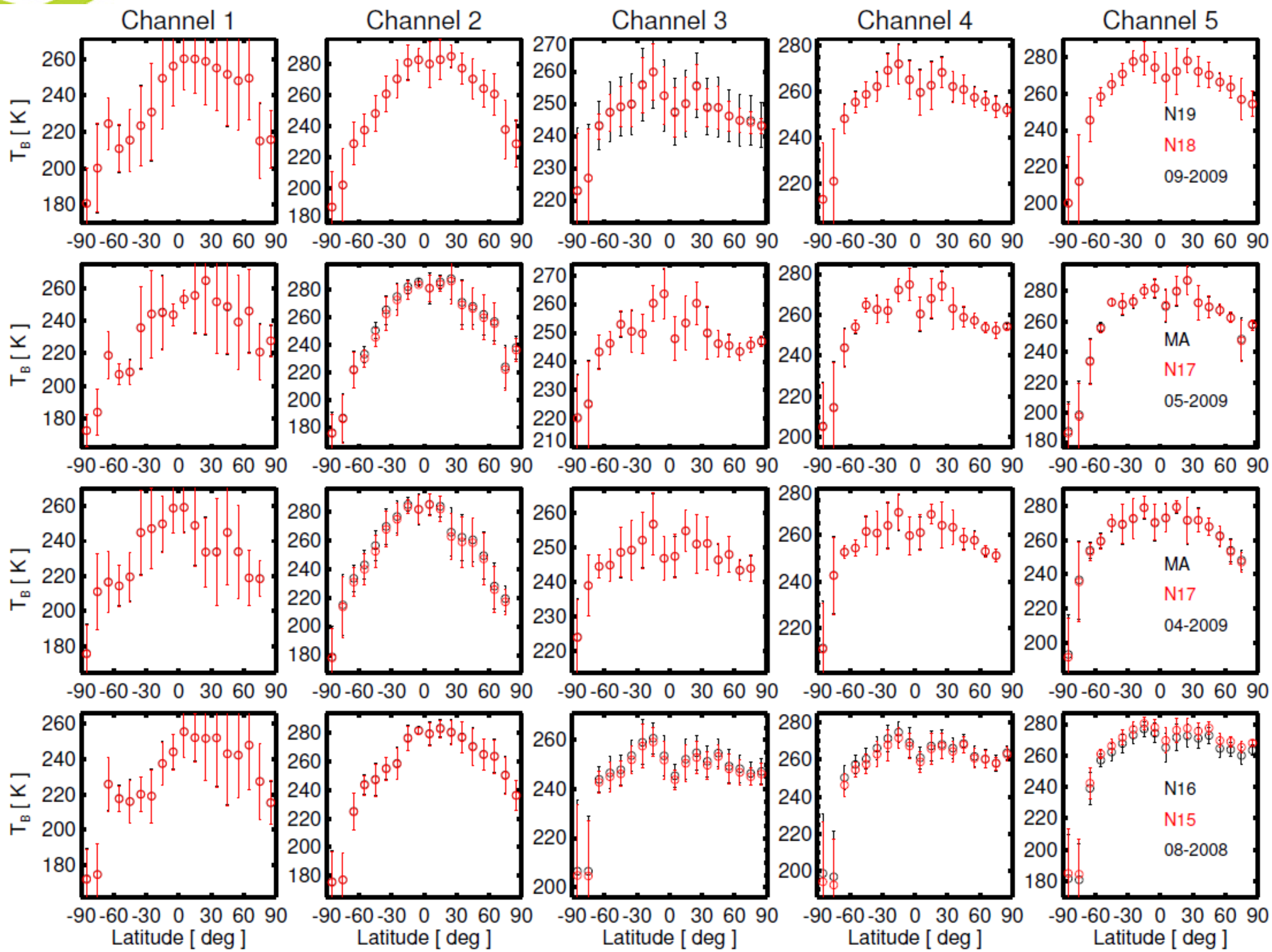
SNOs occur over all latitudes when Xing times are identical

Distribution of collocations

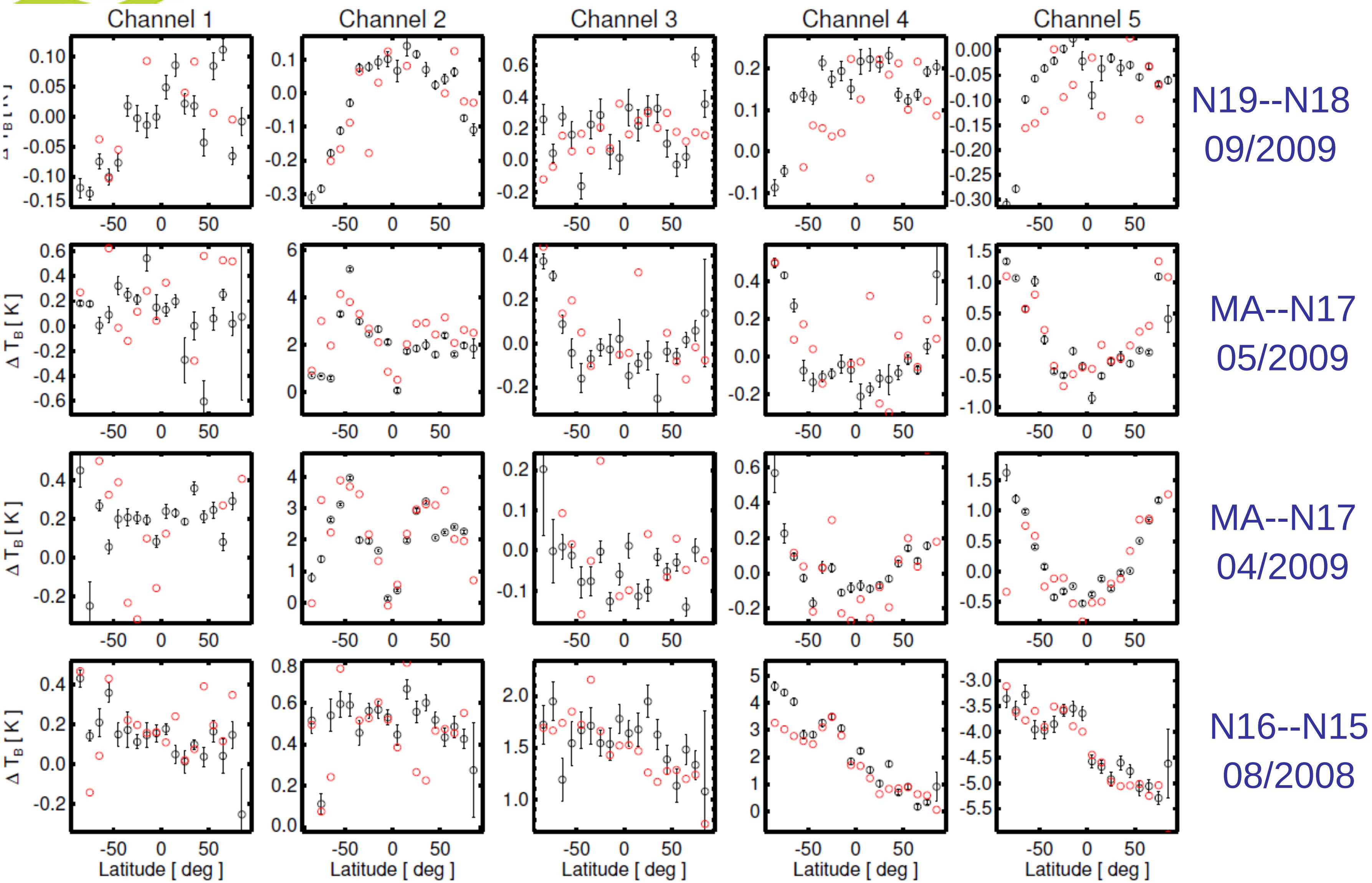


Sufficient number of collocations (dx < 5km, dt < 30 sec)
for all latitude bins

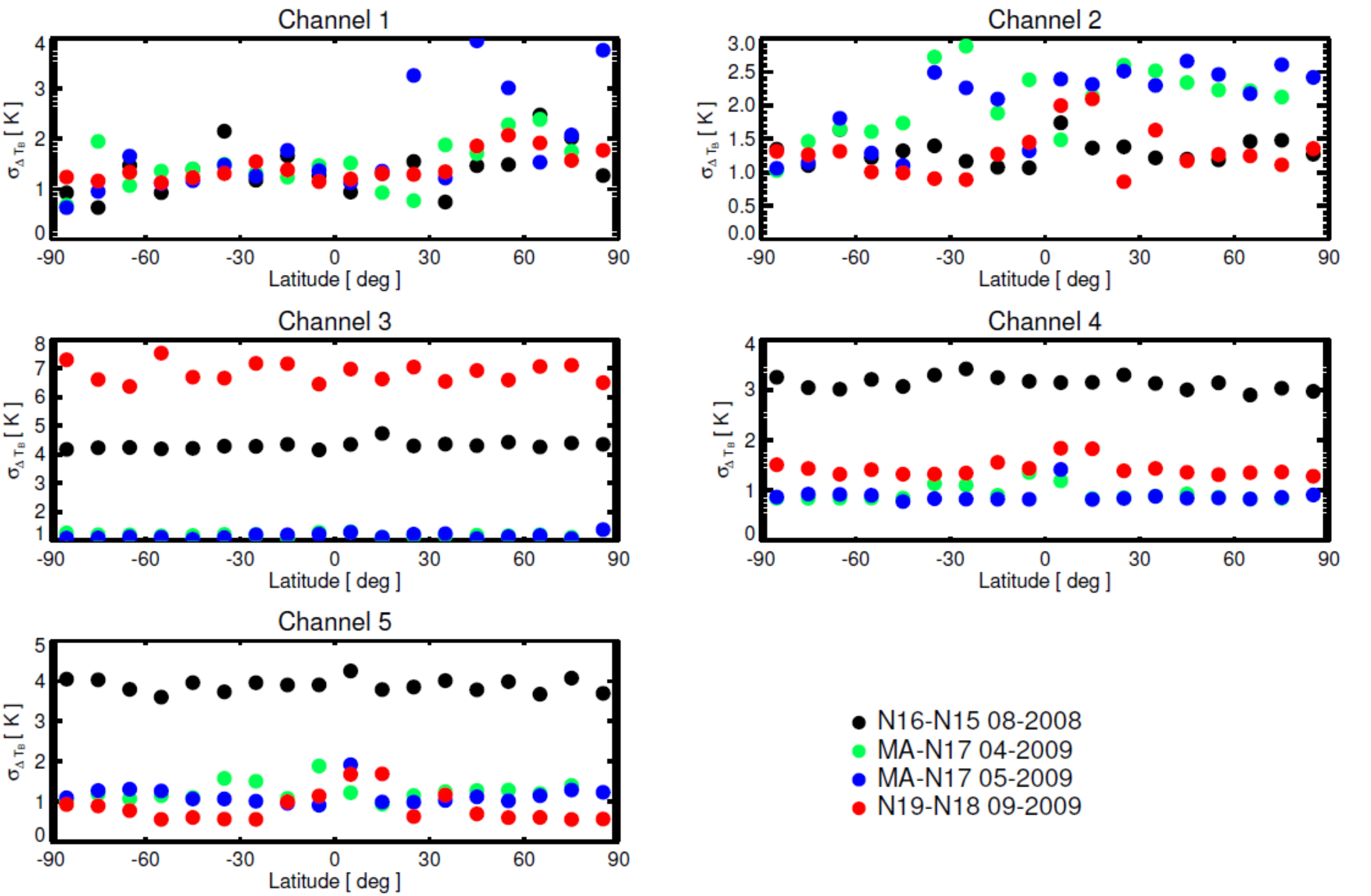
Brightness temperature distribution



Distribution of bias

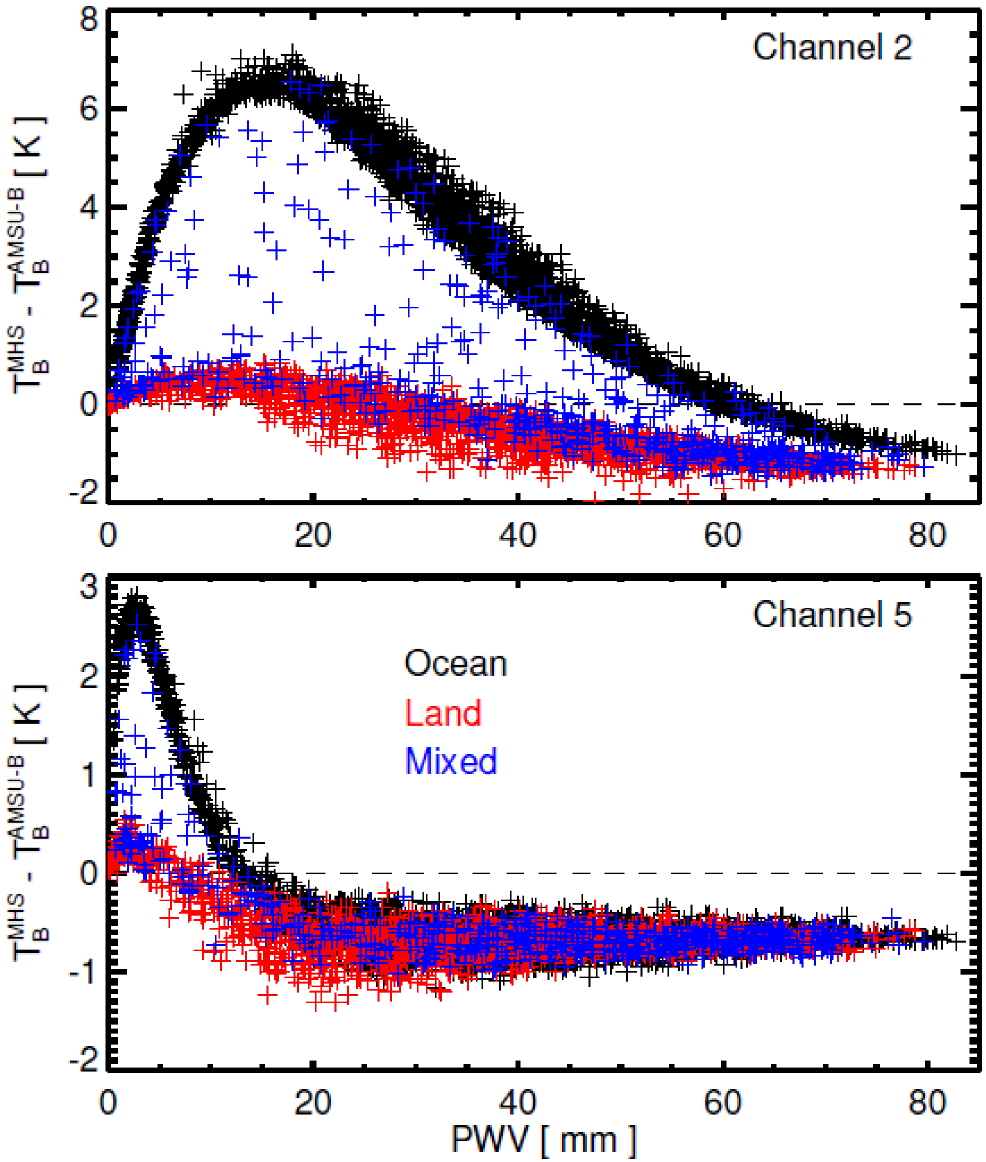


SNO variability is similar for all latitudes



SNO variability is dominated by instrument noise

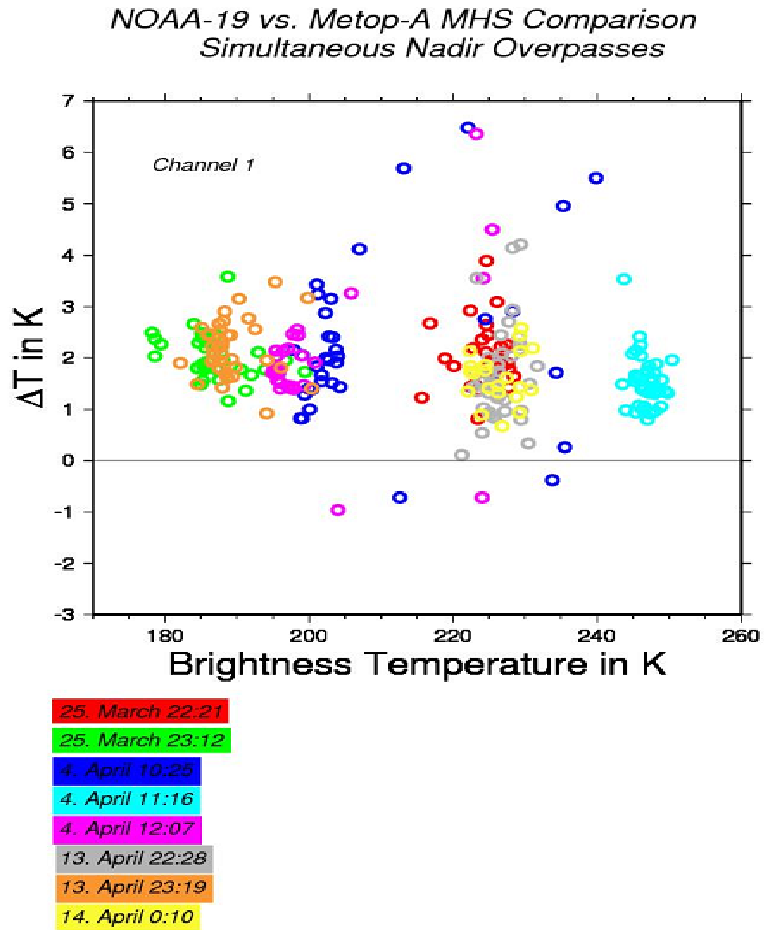
MHS – AMSU-B depends on PWV



Summary

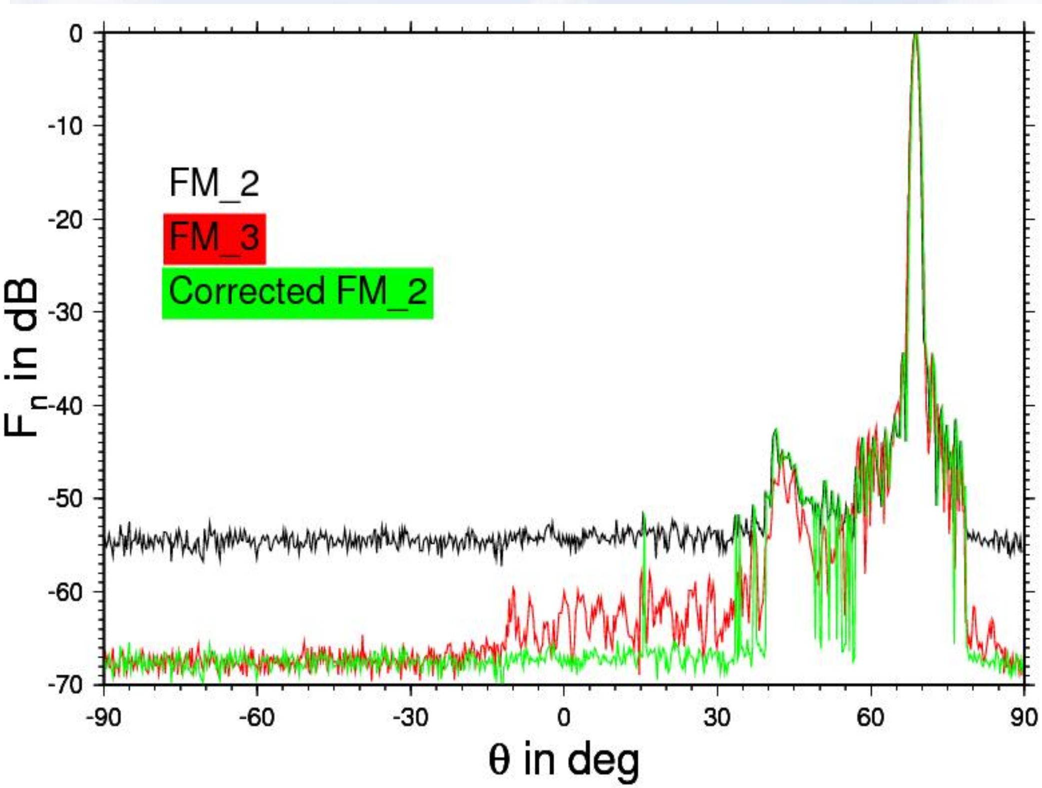
- Orbit drift of the satellites has provided a unique opportunity to look at SNOs over all latitudes
- Bias is not uniform for all latitudes
- The reason for this non-uniformity is due to the temperature dependence of bias
- Polar SNOs alone may not be adequate for inter-calibration
- Biases due to known frequency changes varies with the amount of water vapour
- We are looking at NWP “O-B” statistics for inter-calibration
- Also looking at other instruments such as AMSU-A and HIRS over all latitudes

N-19 MHS Validation using SNO’s



=> Significant Bias due to high space view correction factors

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



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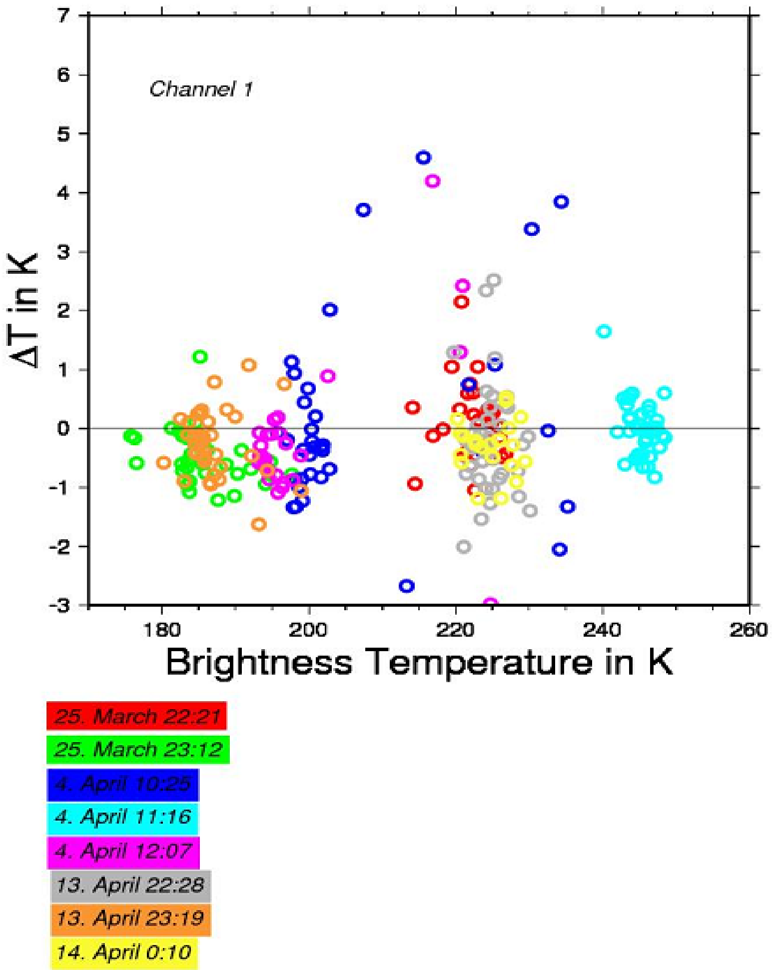
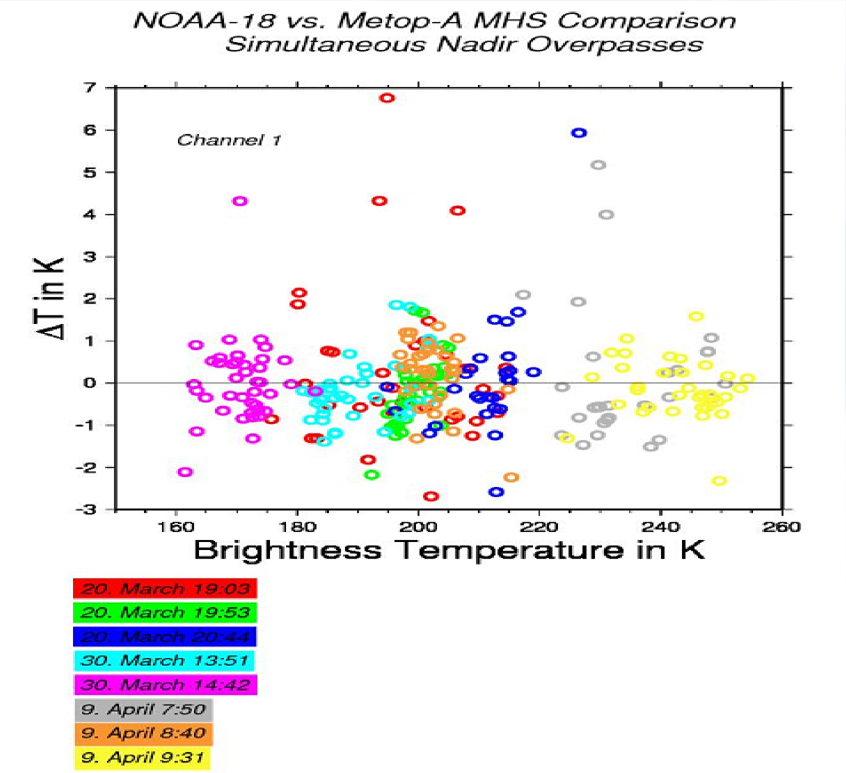
N-19 MHS Validation using SNO's



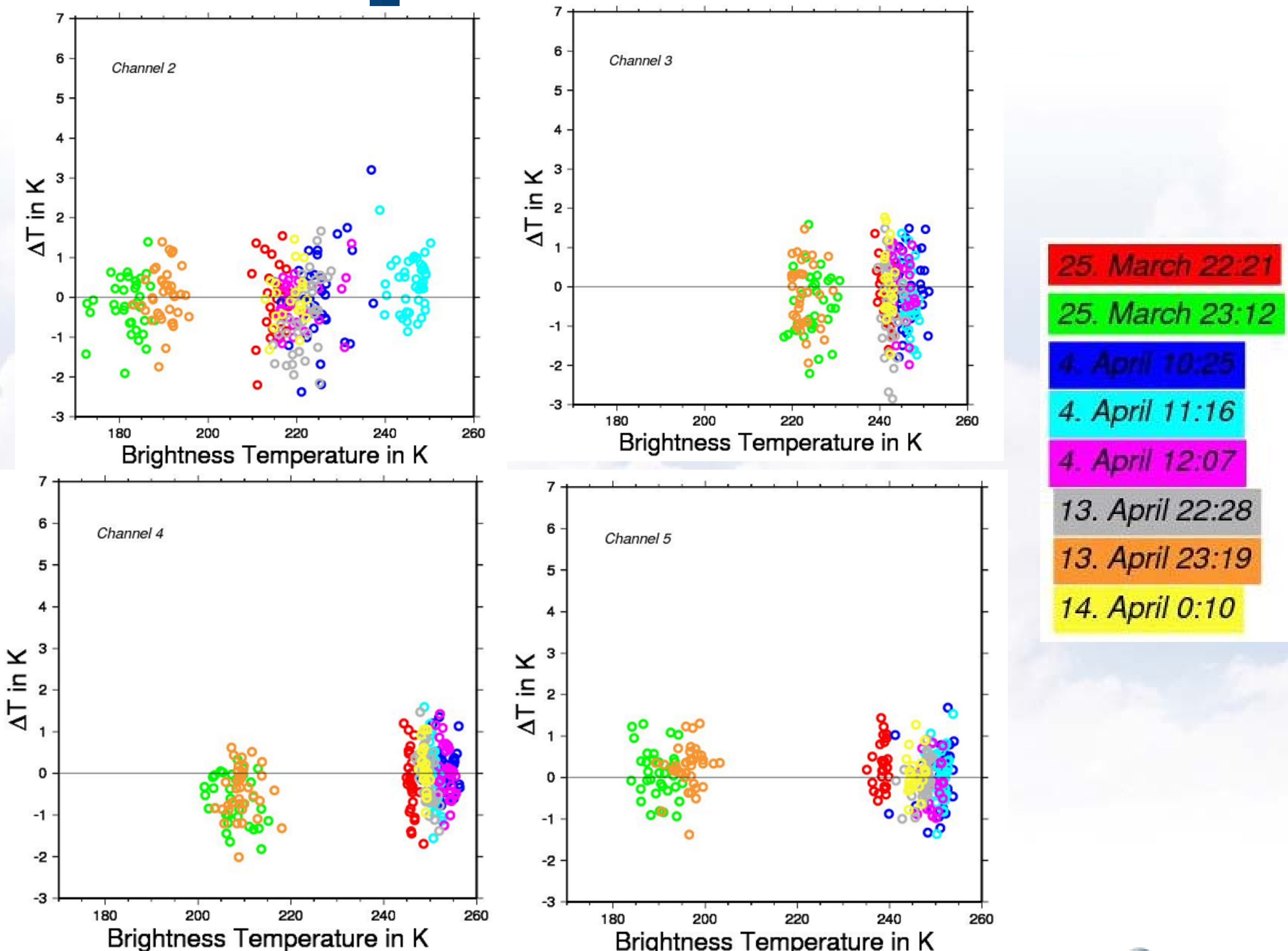
=> Correction of the antenna pattern

=> Re-calculation of the space view correction

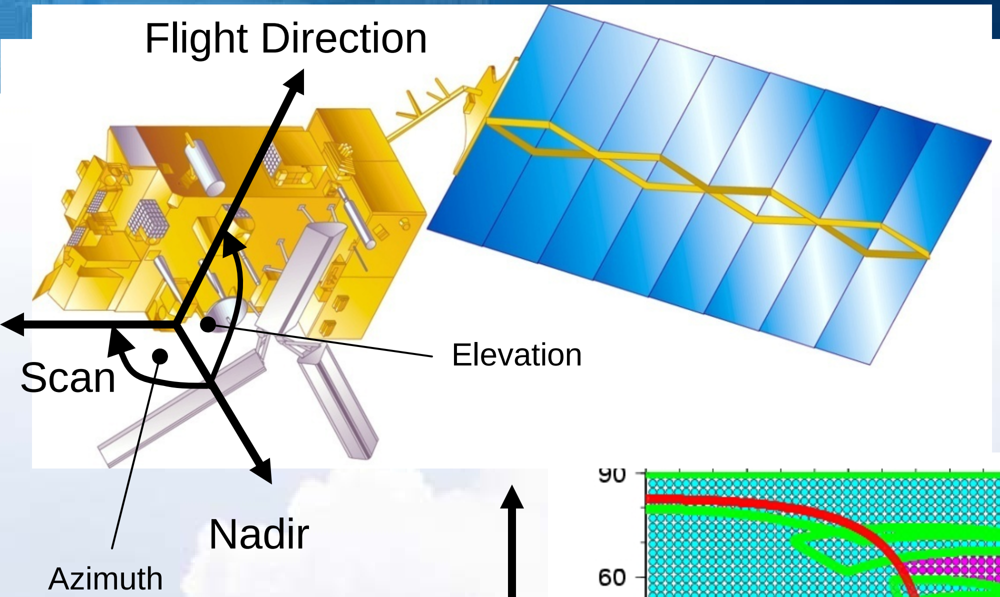
=> Repetition of the SNO analysis



N-19 MHS Validation using SNO's

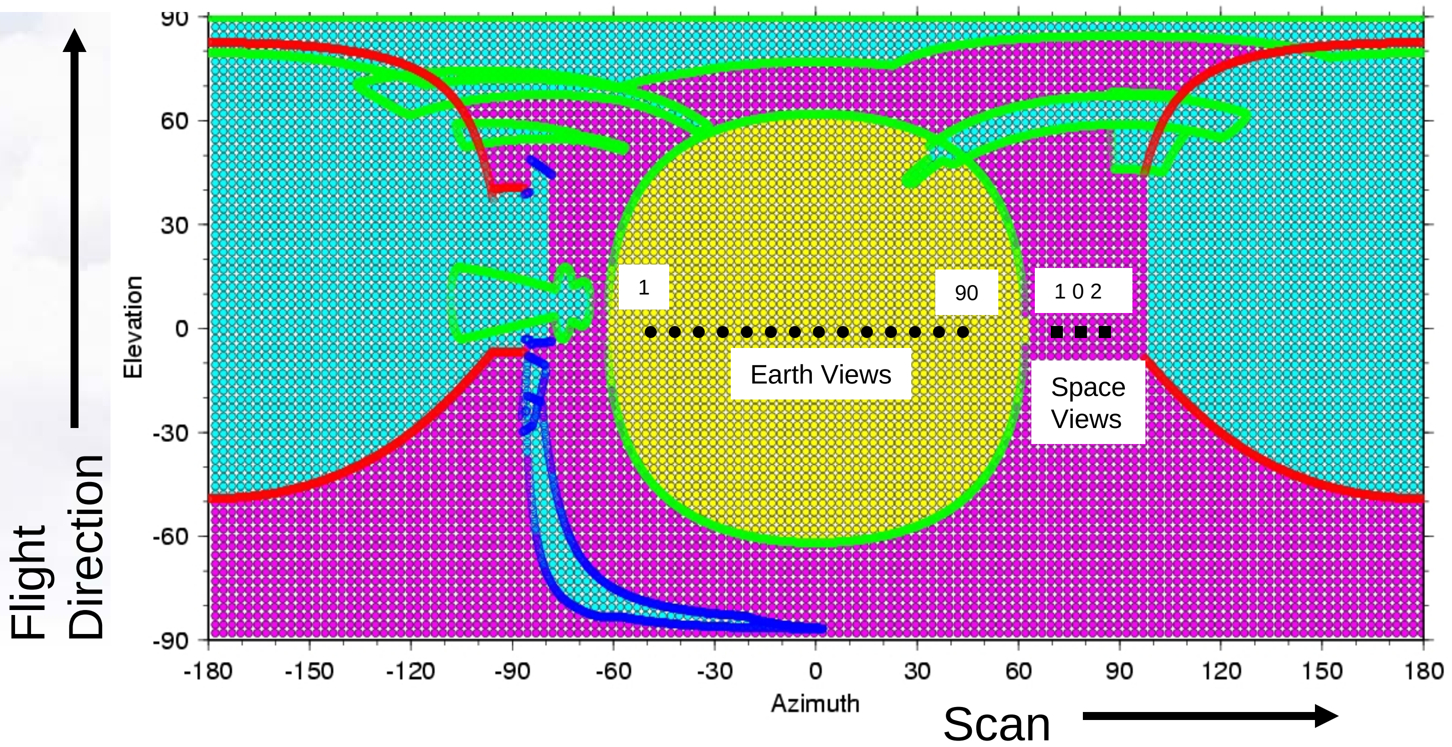


Metop-A MHS Antenna Correction



MHS Signal Simulation

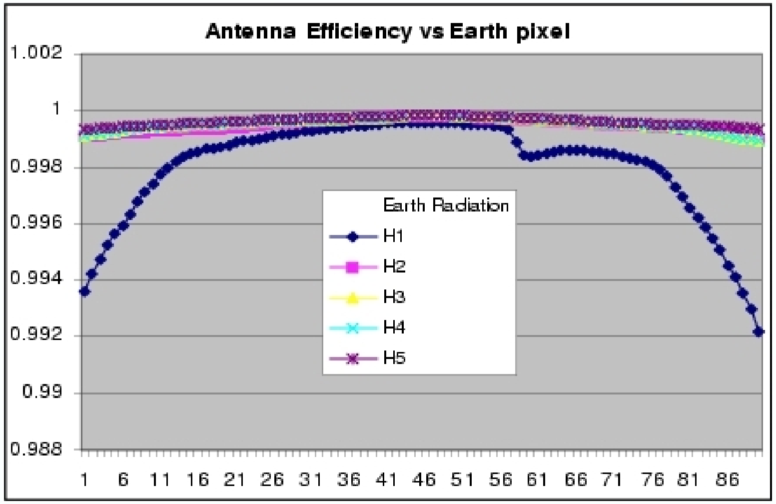
Input: * Antenna pattern
* Geometrical model of emitting and reflecting bodies in the MHS views

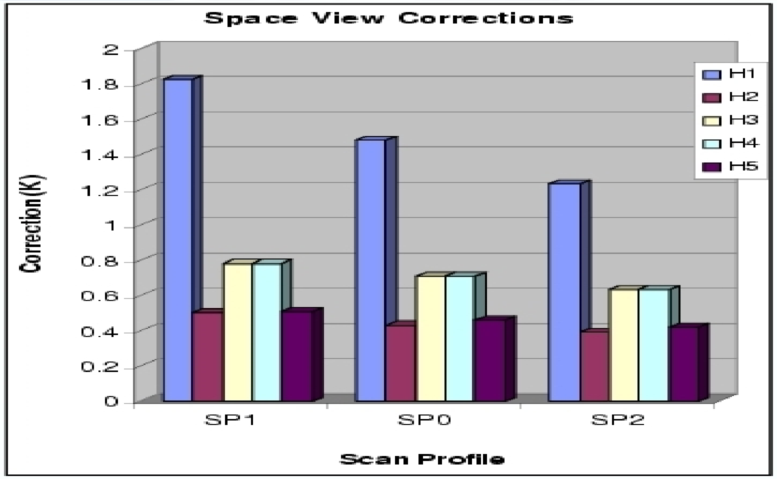


Metop-A MHS Antenna Correction

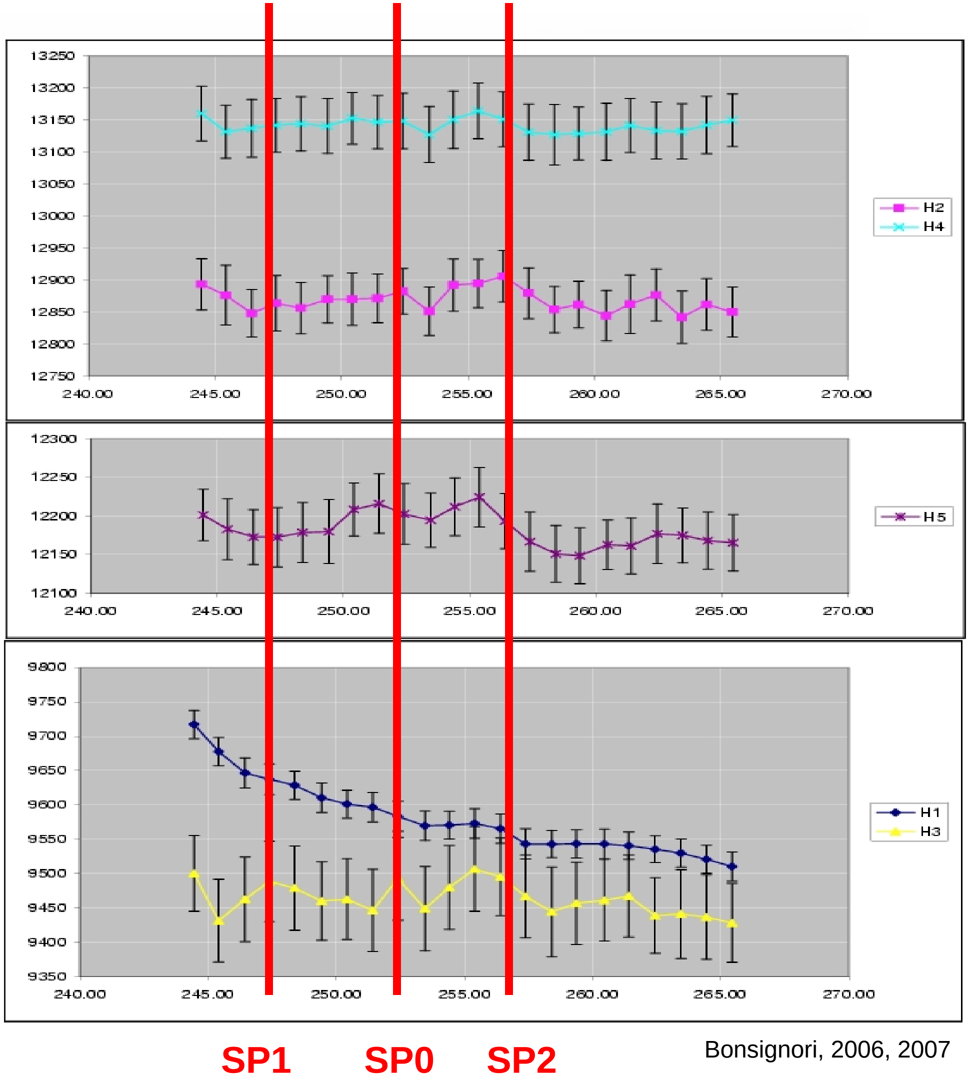
MHS Signal Simulation

Output: * Antenna correction





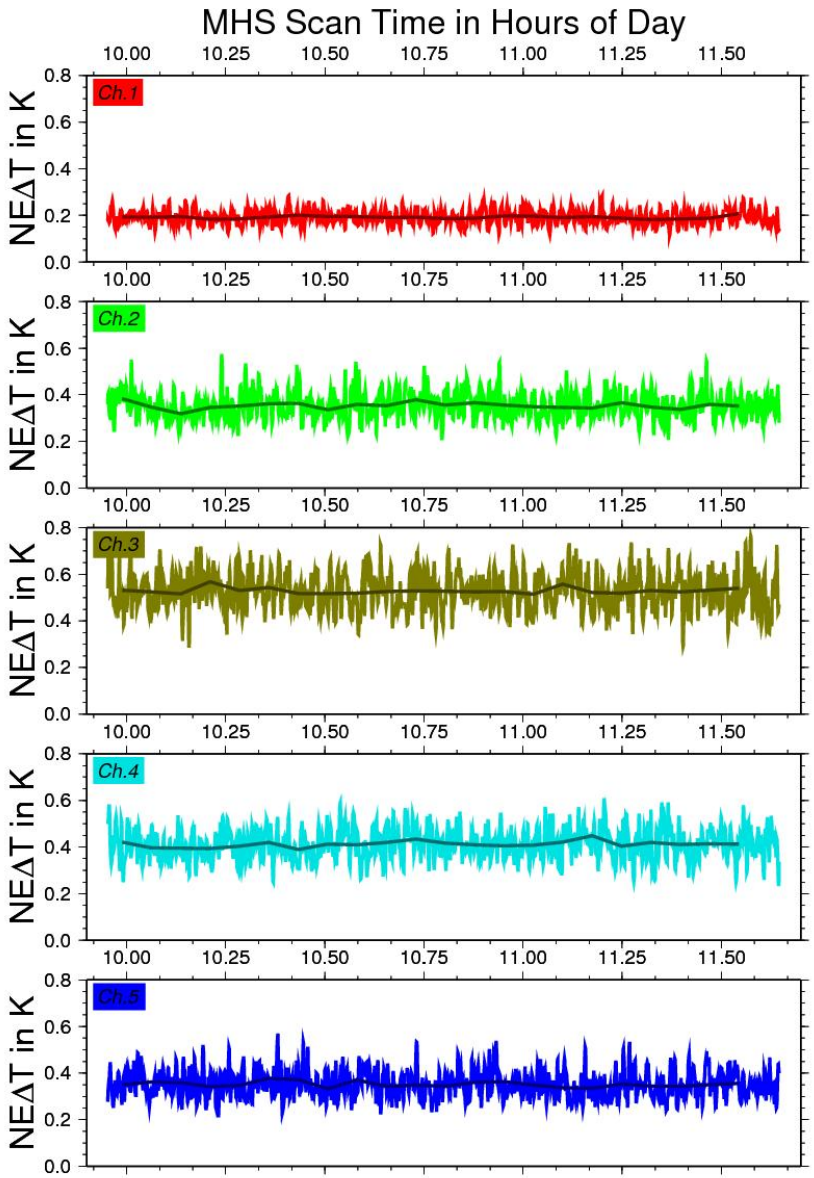
In-Orbit Verification Results



Bonsignori, 2006, 2007

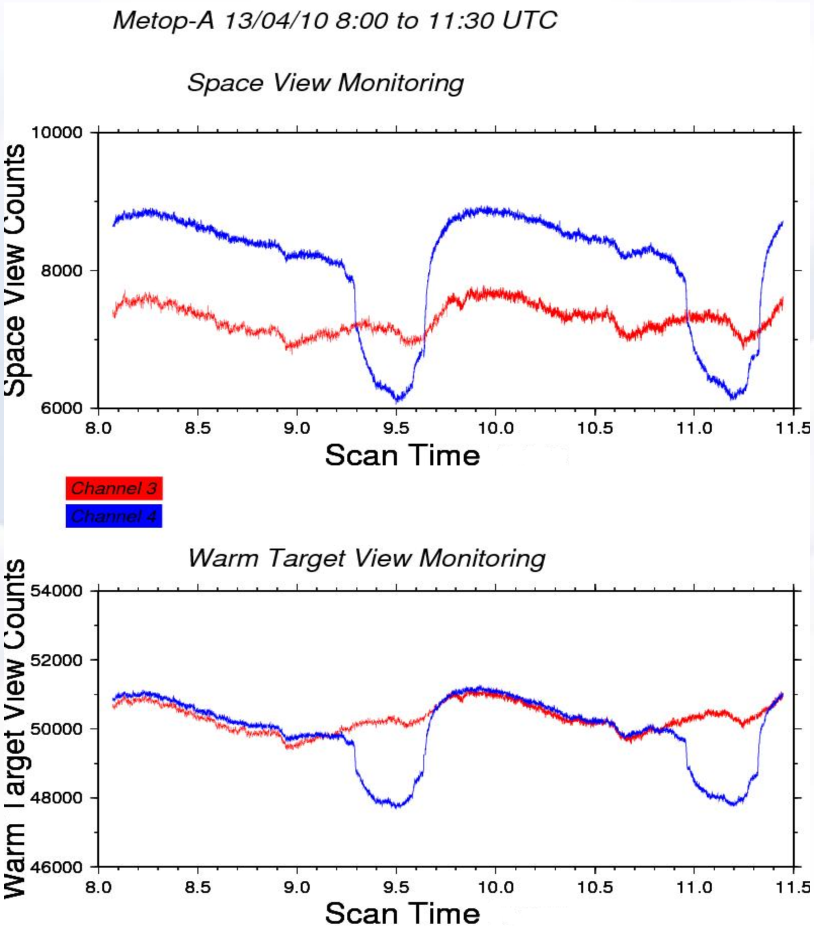
Metop-A MHS Noise Equivalent Delta T

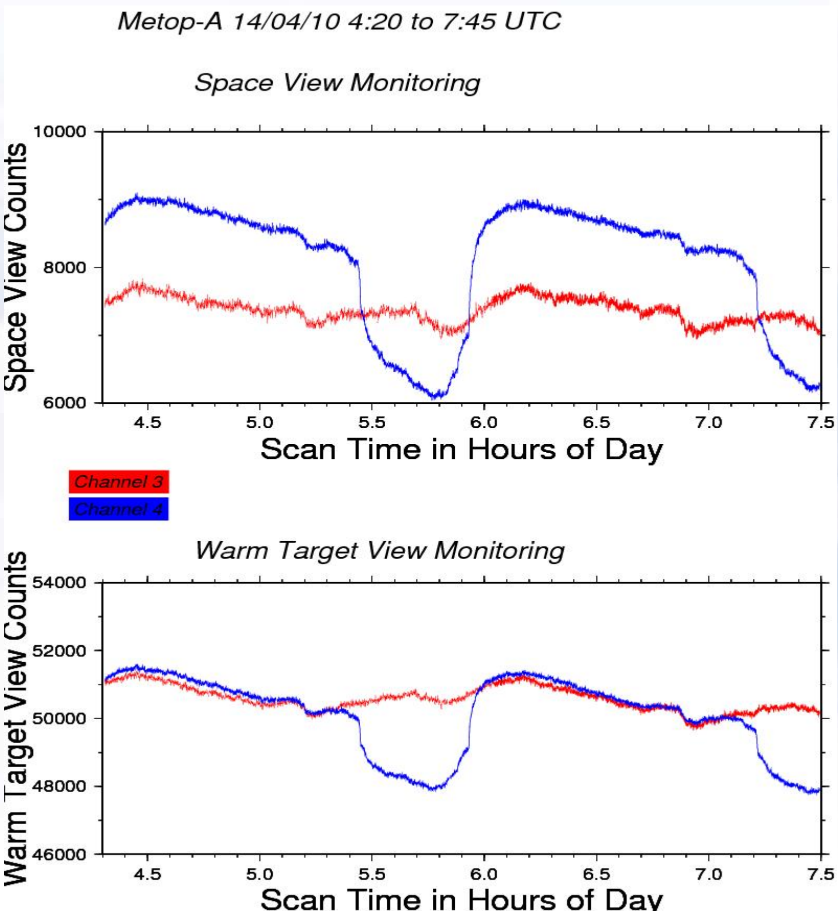
8. Dec. 2009



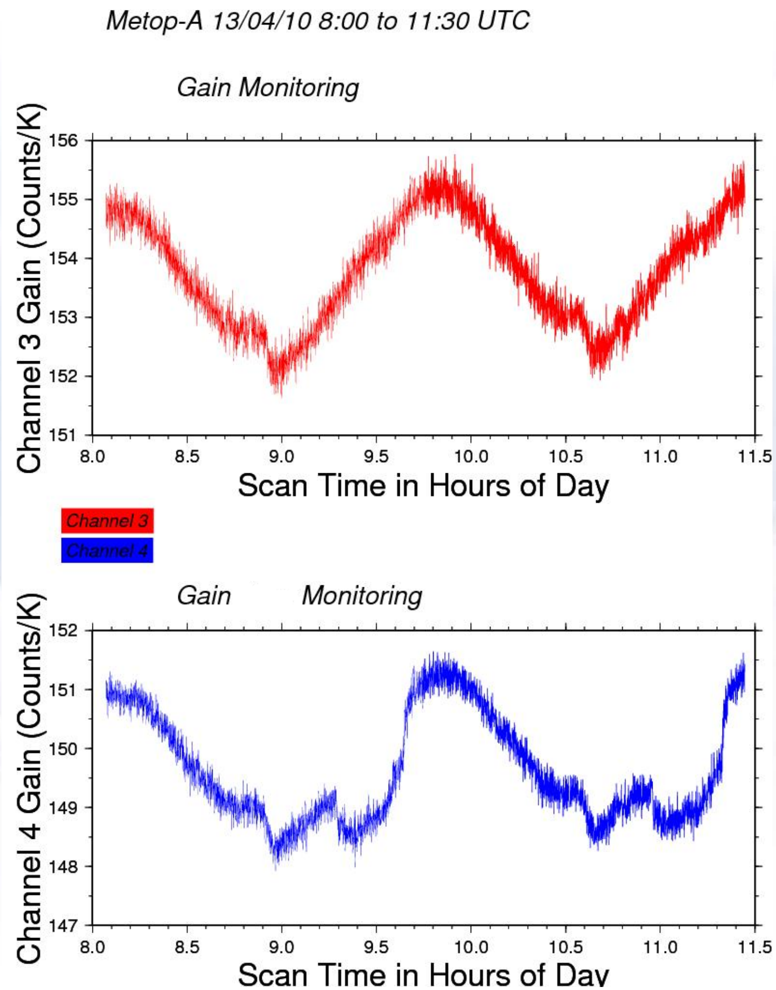
EUM: 0.19 K	NOAA: 0.31 K
EUM: 0.35 K	NOAA: 0.45 K
EUM: 0.53 K	NOAA: 0.56 K
EUM: 0.41 K	NOAA: 0.46 K
EUM: 0.35 K	NOAA: 0.46 K

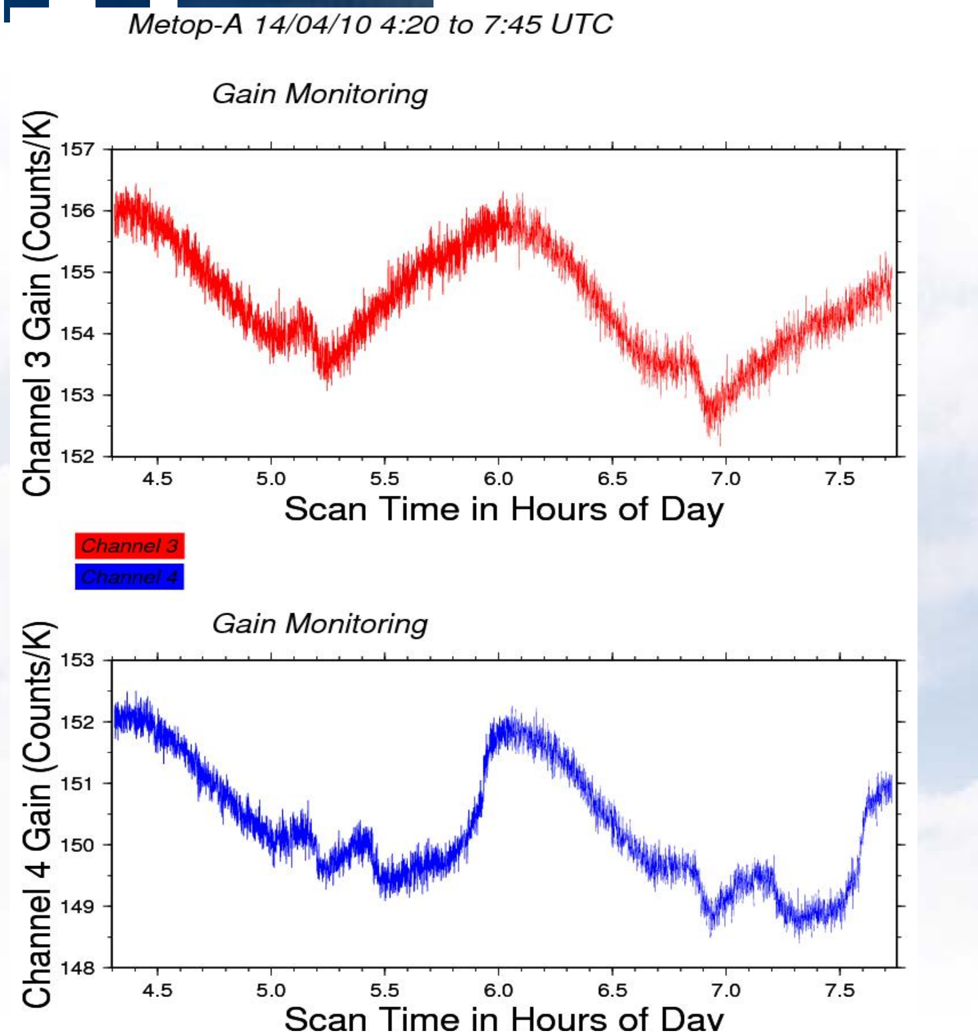
Metop-A MHS Data Processing



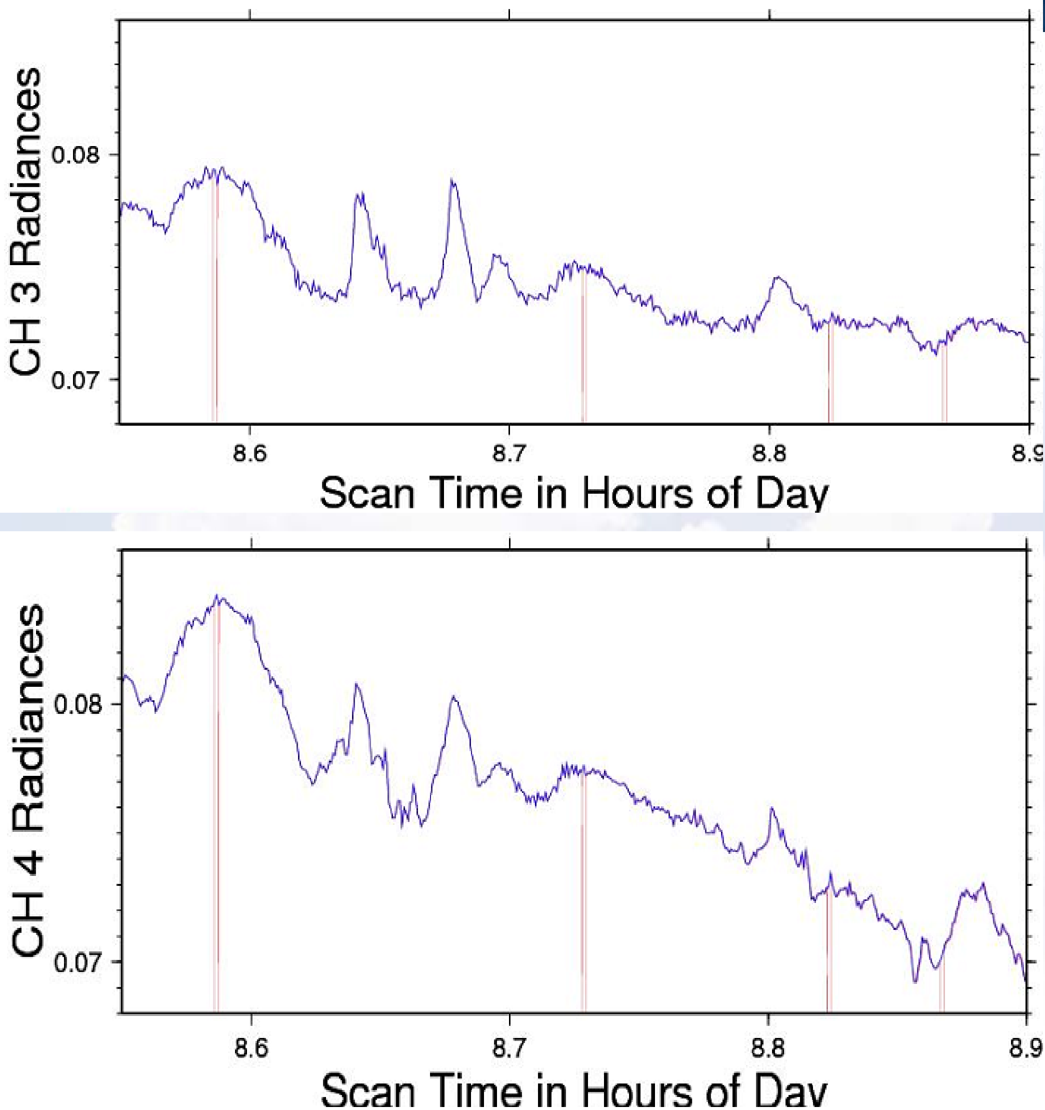


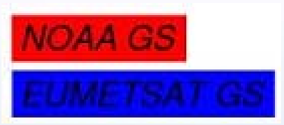
Metop-A MHS Data Processing





Metop-A MHS Data Processing





=> Impact on L1B-product is different for NOAA and EUMETSAT operational processing

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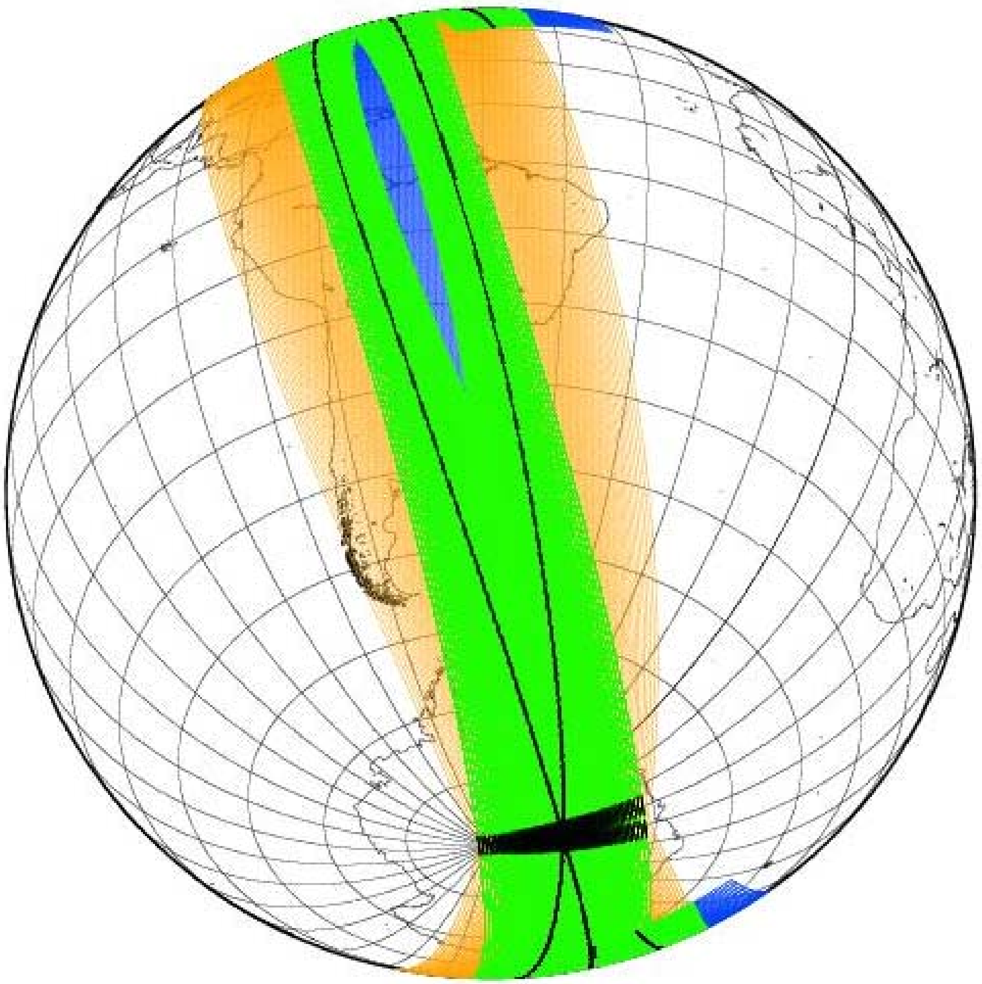
Metop-A and Metop-B



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

Plan for Microwave Sounders

- UKMO performs a study on the use of NWP-model monitoring systems for satellite inter-calibration (double differencing method);
- UKMO as new member of CM-SAF plans to develop a SSM/T2, AMSU-B/MHS FCDR within CDOP-2 (2012-2017) (preliminary work in this presentation);
- EUMETSAT Central Application Facility (CAF) will co-develop, and validate and implement SAF developments and process and issue FCDRs centrally.
- We wish a close collaboration with NOAA's CDR program projects to serve the community with FCDRs for all channels from MSU, SSU, AMSU-A, AMSU-B/MHS, SSM/T2.