EUMETSAT Activities for CDR Generation with Special Emphasis on MHS

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(with contribution of Viju John, UKMO)
• Sustained Information Flow and Schedule
• MHS Validation Aspects
  SNO’s
  Antenna Corrections
  NEDT
  Data Processing
• Outlook
Sustained Climate Information Flow

Satellite & In Situ Observations

Short and Medium Latency

Satellite data

Environmental Data Records (EDR)
Interim Climate Data Records (ICDR)

Archived Satellite Data and Records

Fundamental Climate Data Records (FCDR)
Thematical Climate Data Records (TCDR)

Long-term Information Preservation

Climate Information Records

Major model-based Reanalysis

Adaptation + mitigation planning (decision making)

Short scale physical phenomena monitoring
Operational Climate Monitoring supporting Climate Services

Longer term climate variability & climate change analysis

Sustained Applications

Inter-calibration
Sustained Coordinated Processing
SCOPE-CM

Observing system performance Monitoring and automated corrections

Re-calibration
Inter-calibration
Reprocessing

Data conversion
User Services

NOAA CDR Workshop
2 to 3 March 2011
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

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

Computations of BT Differences
How good are polar SNOs for microwave humidity sounder inter-calibration?

Viju John (with thanks to Gerrit Holl)

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Something good about orbit drift!

SNOs occur over all latitudes when Xing times are identical
Sufficient number of collocations \((dx < 5\text{ km}, \ dt < 30\text{ sec})\) for all latitude bins
Brightness temperature distribution
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
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
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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

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Metop-A MHS Data Processing

Metop-A 13/04/10 8:00 to 11:30 UTC

Space View Monitoring

Metop-A 14/04/10 4:20 to 7:45 UTC

Space View Monitoring

Warm Target View Monitoring

Warm Target View Monitoring
Metop-A MHS Data Processing

Gain Monitoring

Channel 3 Gain (Counts/K)

Channel 4 Gain (Counts/K)

Scan Time in Hours of Day

Gain Monitoring

Channel 3 Gain (Counts/K)

Channel 4 Gain (Counts/K)

Scan Time in Hours of Day

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Metop-A MHS Data Processing

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