ERA-CLIM2-WP3:
Satellite data reprocessing and inter-calibration

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Thanks to:
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EUMETSAT

Content

- **EUMETSAT's Role in ERA-CLIM2**
- **EUMETSAT's Status and Plans**
- **Planning for next period**

ERA-CLIM outcomes

Data delivered in the framework of ERA-CLIM:

- Level-1 Metop_A (2007-2012): ASCAT L1b, GRAS RO L1a/1b bending angles
- Level-2 Metop_A (2007-2012): AVHRR polar AMVs (two algorithms)
- Level-2 MSG (2004-2012): Clear sky and all sky radiances
- Level-2 MSG (2004-2012): AMVs

	AMV vs. Radiosonde in m/s		*AMV vs. ERA-Interim in m/s*	
	EUMETSAT OPE	**CIMSS Proto**	**EUMETSAT OPE**	**CIMSS Proto.**
Speed Bias	1.84	-0.15	-1.32	0.38
V_diff_mean	5.72	5.08	4.67	3.50
V_diff_std	3.03	2.78	2.57	1.86
Collocations	1046	1123	35202	45826

[1]*CIMSS = Cooperative Institute for Meteorological Satellite Studies*

ERA-CLIM2 – EUMETSAT Planned Activities

ERA-CLIM2 – EUMETSATs Tasks in WP3

WP3 -> EARTH SYSTEM OBSERVATIONS

Task 3.2 -> Satellite data rescue, reprocessing, and inter-calibration.

- To inter-calibrate of radiance measurements from Meteosat First and Meteosat Second Generation, and for other geostationary satellites in collaboration with NOAA and JMA within SCOPE-CM.
- To provide consolidated radio occultation data records for Metop A and Metop-B instruments, and third-party instruments (CHAMP, COSMIC, and GRACE).
- To create an FCDR of SSM/T2 and AMSU-B/MHS radiances in collaboration with CMSAF and UK MetOffice
- To extend the polar wind retrievals for AVHRR record back to 1982;
- To improve the AMV data records from Meteosat First Generation and Second Generation, and for other geostationary satellites in collaboration with JMA (and potentially NOAA) within SCOPE-CM.

ERA-CLIM2 – EUMETSATs Deliverables

WP3 -> EARTH SYSTEM OBSERVATIONS
Task 3.2 -> Satellite data rescue, reprocessing, and inter-calibration.

Deliverable	Deliverable Title	Delivery date *(months after kickoff)**
D3.10	AVHRR: polar winds (30+ years)	24
D3.11	SSM/T2 and AMSU-B/MHS: radiance data	24
D3.12	MFG and MSG: inter-calibrated radiances	36
D3.13	MFG and MSG: Atmospheric Motion Vectors (AMVs) *including All Sky Radiances (ASRs) and Clear Sky Radiances (CSRs)*	36
D3.14	Metop, CHAMP, COSMIC (GRACE): consolidated Radio Occultation data	36

**ERA-CLIM2 Kickoff date: February 2014*

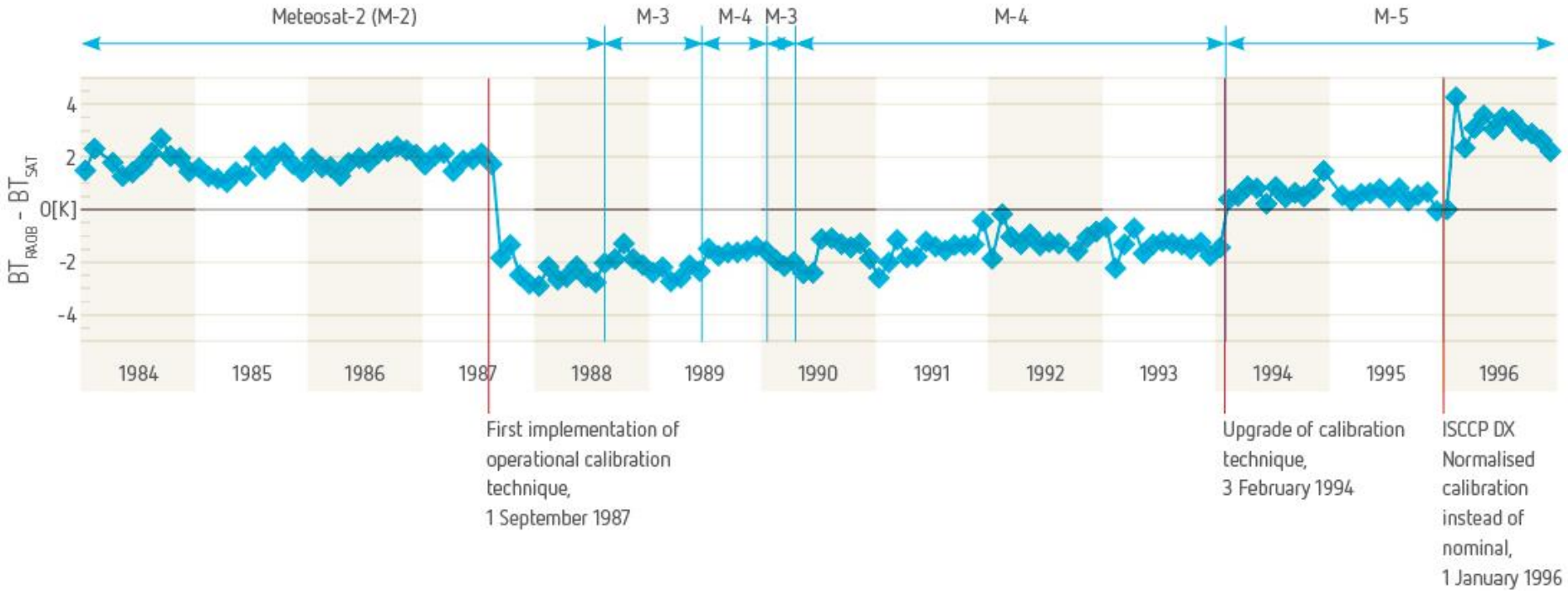
Caveats

- The Climate section has 3 staff and 3 consultants (situation 2014) – 1 consultant is explicitly working for ERA-CLIM2;
- The ERA-CLIM2 consultant will leave by 31-12-2014. The replacing consultant needs to be in place as soon as possible. However, EUMETSAT recruitment process will most likely lead to a gap of about 2 months (Jan. Feb. 2015). This is a potential threat on the deliverable D3.10.
- The realisation of Climate Data Record infrastructure, including more compute power and more central storage, is planned to start in 2015. This infrastructure is part of EUMETSAT's overarching activities, and therefore realisation is not under full control of the Climate Section
- Some ERA-CLIM2 deliverables depend on non ERA-CLIM2 partners (e.g. the CM SAF)

ERA-CLIM2 - EUMETSAT Status and Planning

D3.12 - FCDR MFG and MSG radiances (1982- 2014)

Task: *To inter-calibrate of radiance measurements from Meteosat First and Meteosat Second Generation, and for other geostationary satellites in collaboration with NOAA and JMA within SCOPE-CM.*



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D3.12 - FCDR MFG and MSG radiances (1982- 2014)

Status:

- The MFG/MSG data and HIRS/AIRS/IASI data (1982-2014) were brought on-line;
- The development of infra-red (IR) and water vapour (WV) re-calibration method is ongoing;

Planned:

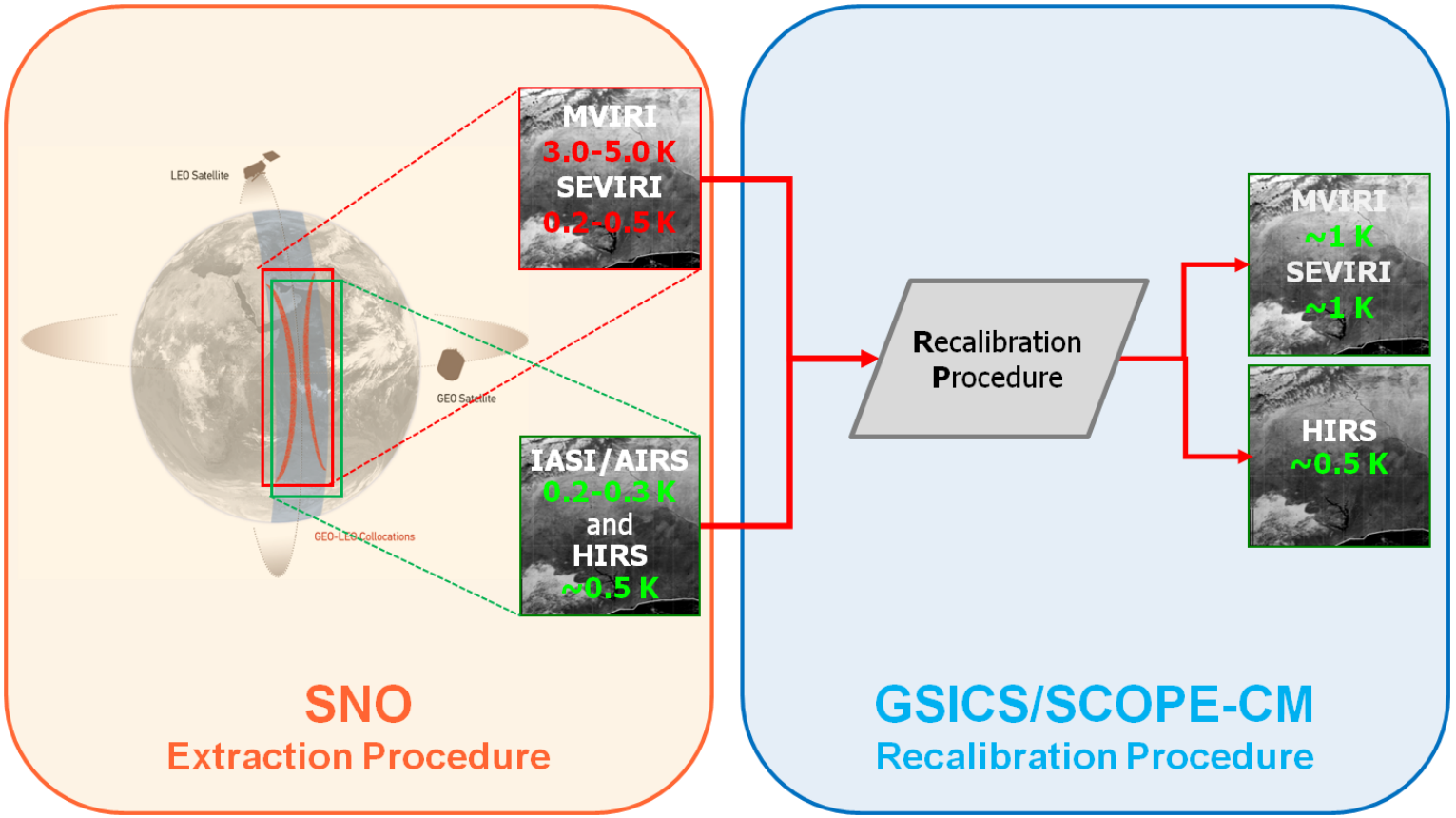
- To reprocess MFG and MSG radiances for the IR/WV channels;
- To invite visiting scientist (Brian Soden) to support the validation of the FCDR.

Side note:

- SCOPE-CM discusses providing a Global Gridded Satellite Data product of inter-calibrated VIS/IR/WV radiances from all geostationary satellites (not before 2018).

Nr.	Task Name	2014	2015	2016
1	IR/WV: Algorithm development, testing, and verification	❶❷❸❹	❶	
2	IR/WV: Algorithm implementation and processing		❶❷❸	
3	Validation and documentation		❸❹	❶❷
4	Data Record Release Delivery (D3.12)			❸❹

D3.12 - FCDR MFG and MSG radiances (1982- 2014)



Reference time-series based on HIRS/2 from NOAA-1 till NOAA-15, AIRS, and IASI

D3.12 - FCDR MFG and MSG radiances (1982- 2014)

Water Vapour

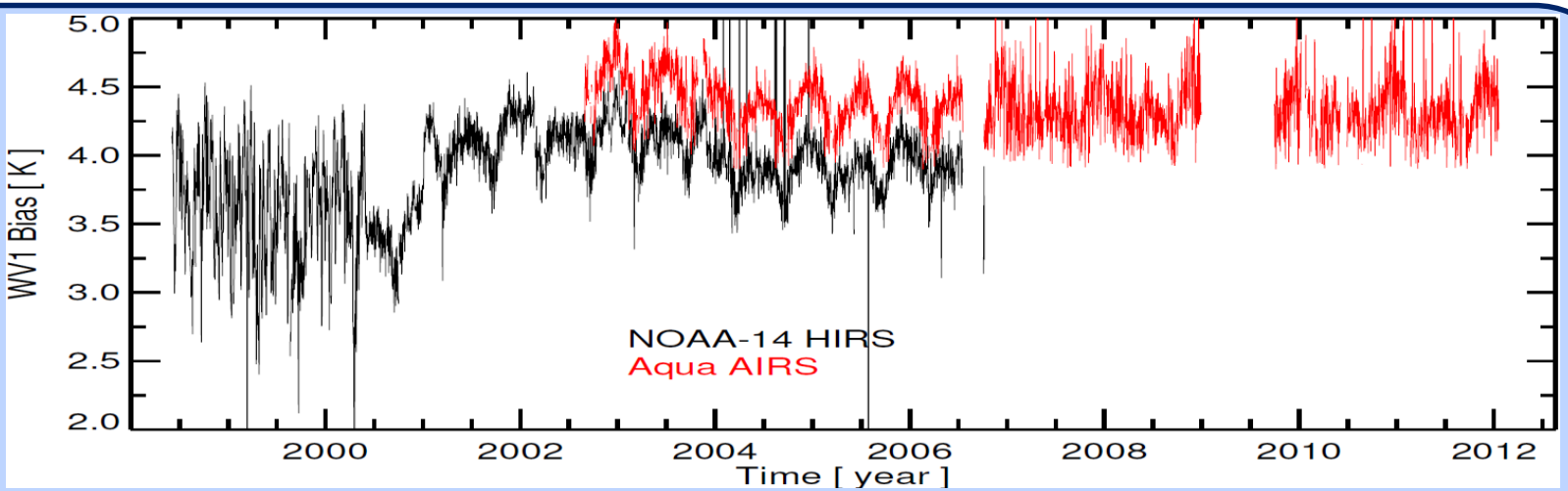


Fig: *Time series of Meteosat-7 water vapor biases relative to HIRS/2 from NOAA-14 and AIRS*

Infra-Red

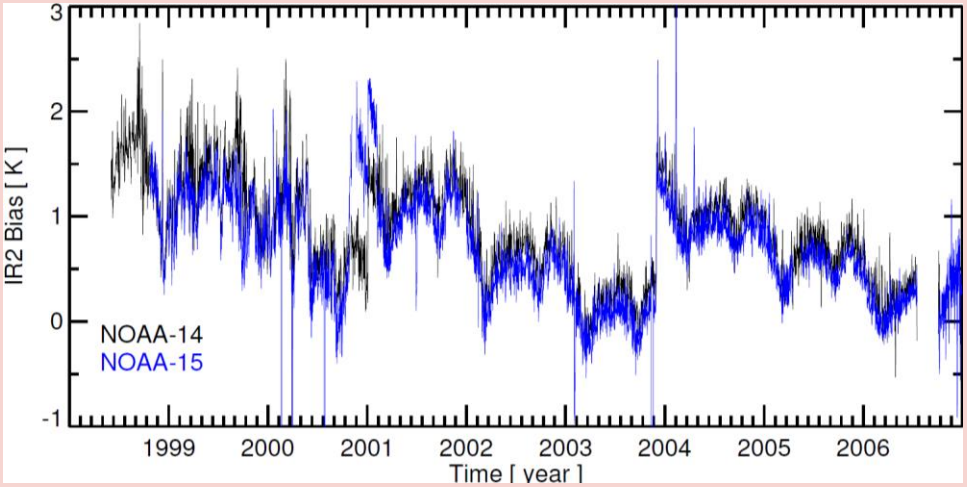
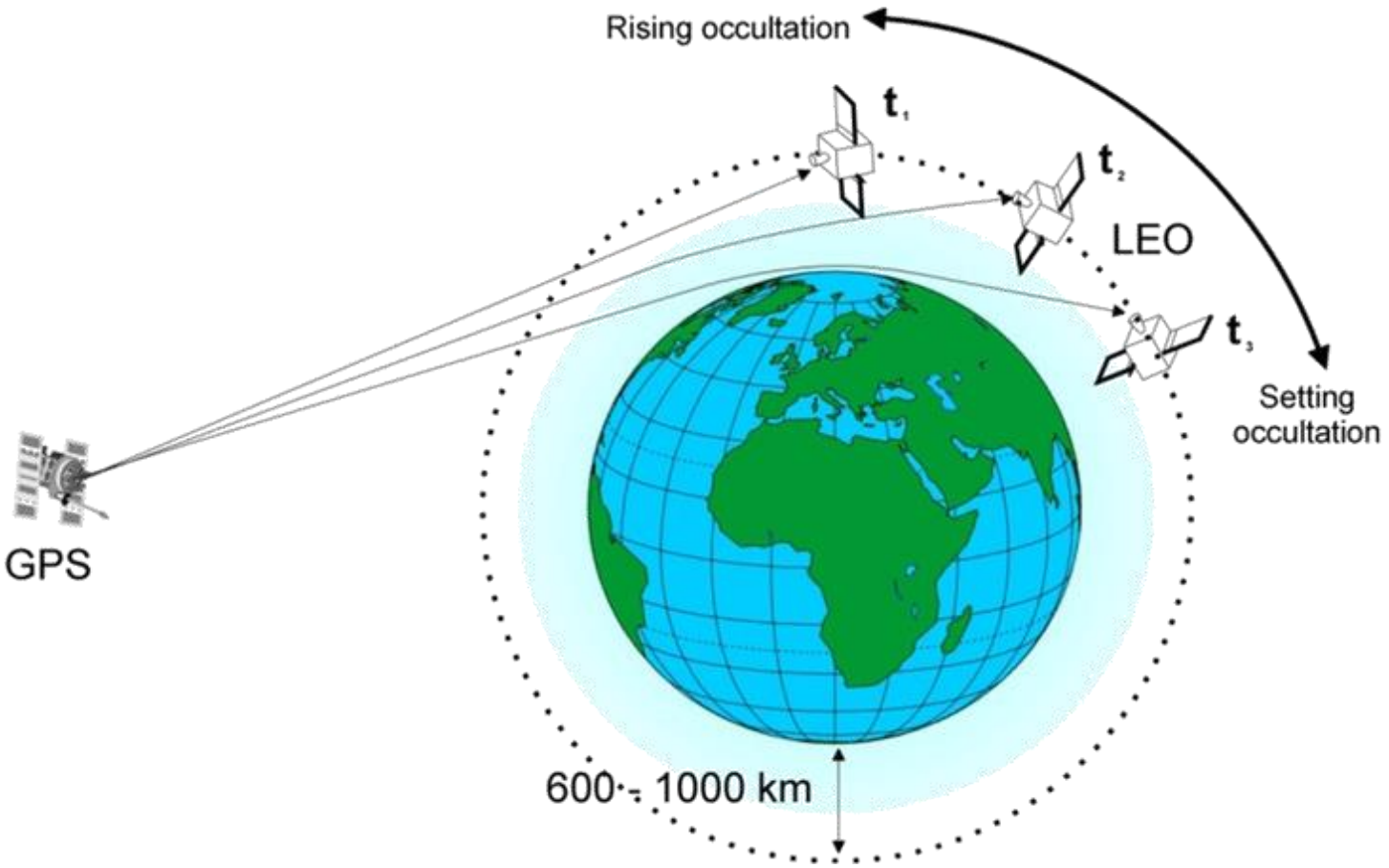


Fig: *Time series of Meteosat-7 infra-red biases relative to HIRS/2 from NOAA-14 and NOAA-15*

D3.14 – FCDR Radio Occultation (GRAS/CHAMP/COSMIC/GRACE) (2001-2014)

Task: *To provide consolidated radio occultation data records for Metop A and Metop-B instruments, and third-party instruments (CHAMP, COSMIC, and GRACE).*



D3.14 – FCDR Radio Occultation (GRAS/CHAMP/COSMIC/GRACE) (2001-2014)

Status

- In ERA-CLIM: did development work on **W**ave**O**ptics;
- In ERA-CLIM: did reprocessing of Metop-A GRAS, using **G**eo**O**ptics and **W**ave**O**ptics;
- Reprocessed data, using **G**eo**O**ptics, are superior to those from the operational processing;
- Reprocessed data, using **W**ave**O**ptics, did not show large improvement;
- CHAMP/COSMIC/GRACE data were collected in agreement with the data providers;
- 3rd party data processing (CHAMP/COSMIC/GRACE) is done in ERA-CLIM2 (task 3.2);

Planned

- To further develop **W**ave**O**ptics based processor;
- To process Metop-B(eventually Metop-A) /GRAS/CHAMP/COSMIC/GRACE data with the **W**ave**O**ptics based processor.

Nr.	Task Name	2014	2015	2016
1	Algorithm update to WaveOptics	❷❸❹	❶	
2	Algorithm testing and verification	❹	❶	
3	Algorithm implementation and processing GRAS		❶❷	
4	Algorithm update for CHAMP, COSMIC, and GRACE I/O		❸❹	
5	Algorithm implementation and processing CHAMP, COSMIC, and GRACE		❹	❶
6	Validation and documentation		❷❸	❶❷
7	Data Record Release Delivery (D3.14)			❹

D3.14 – FCDR Radio Occultation (GRAS/CHAMP/COSMIC/GRACE) (2001-2014)

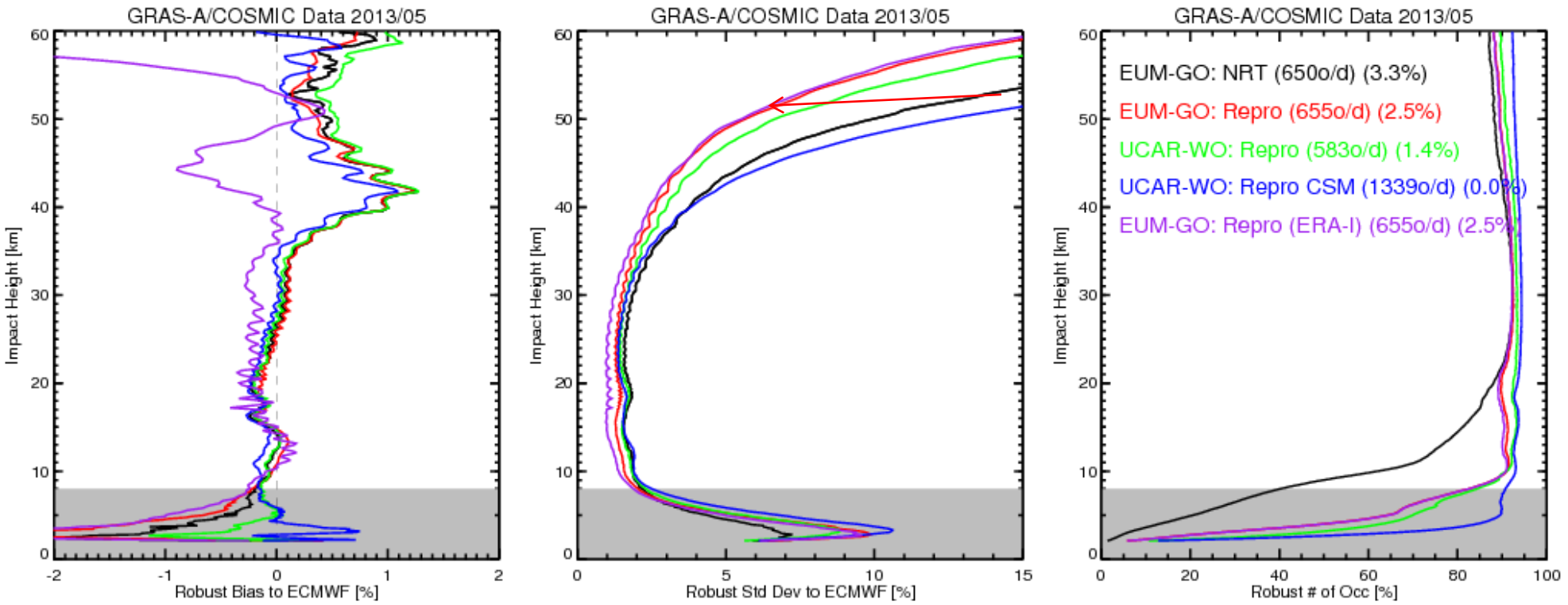
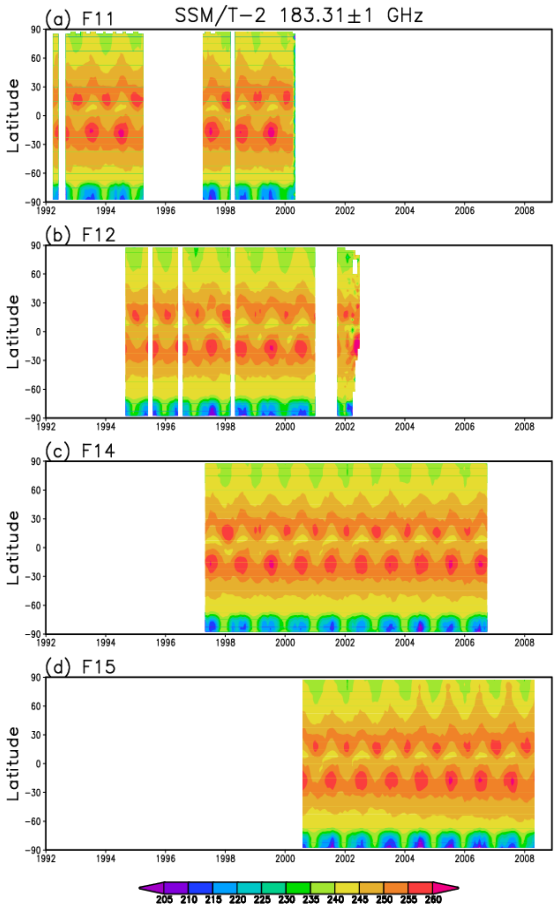


Fig: *Validation of GRAS Metop-A data vs. ECMWF forecasts and ERA-I analysis, May 2013: Bias (left), std. dev. (middle), robust weight (right, indicating number of outliers). Notes:*
*(1) EUM NRT and EUM Repro only **G**eo**O**ptics, thus lowest 8km grey shaded;*
*(2) UCAR GRAS repro and UCAR COSMIC Repro. based on **W**ave**O**ptics;*
(3) bias, std dev ripples at higher altitude due to ECMWF model resolution (reduced with updated ROPP).
(4) statistics are calculated as (o-b)/b

D3.11 - FCDR SSM/T2 and AMSU-B/MHS radiances (1991-2012)

Task: *To create an FCDR of SSM/T2 and AMSU-B/MHS radiances in collaboration with CMSAF (UK MetOffice)*

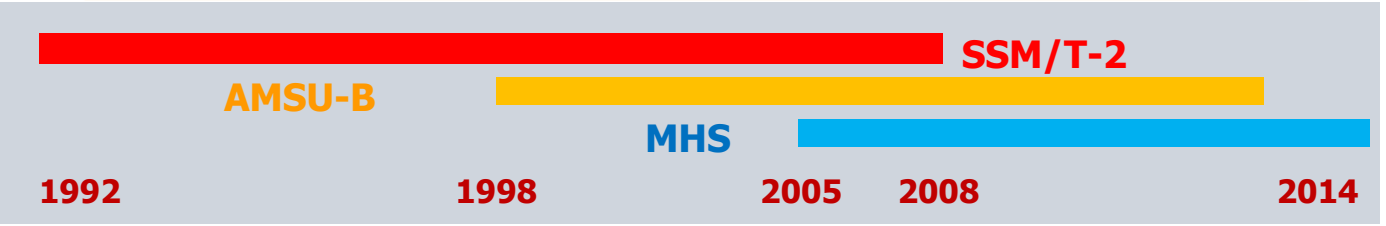


Status:

- Data have been converted to standard NetCDF
- Data have been transferred to EUMETSAT
- *CM SAF-VS @UKMO* on error characterisation of SSM/T2
- *CM SAF-VS @ECMWF* on inter-calibrating SSM/T2 radiances using ERA-Interim feedback information

Planned:

- UKMO (CM SAF) to evaluate the following issues (2015): *scan & time dependent biases; diurnal cycle aliasing (orbit drift); assessment of inter-calibration methods*
- Generate, validate, document, and release FCDR (Q3 2015)
- Archive and distribute the release (Q4 2015).



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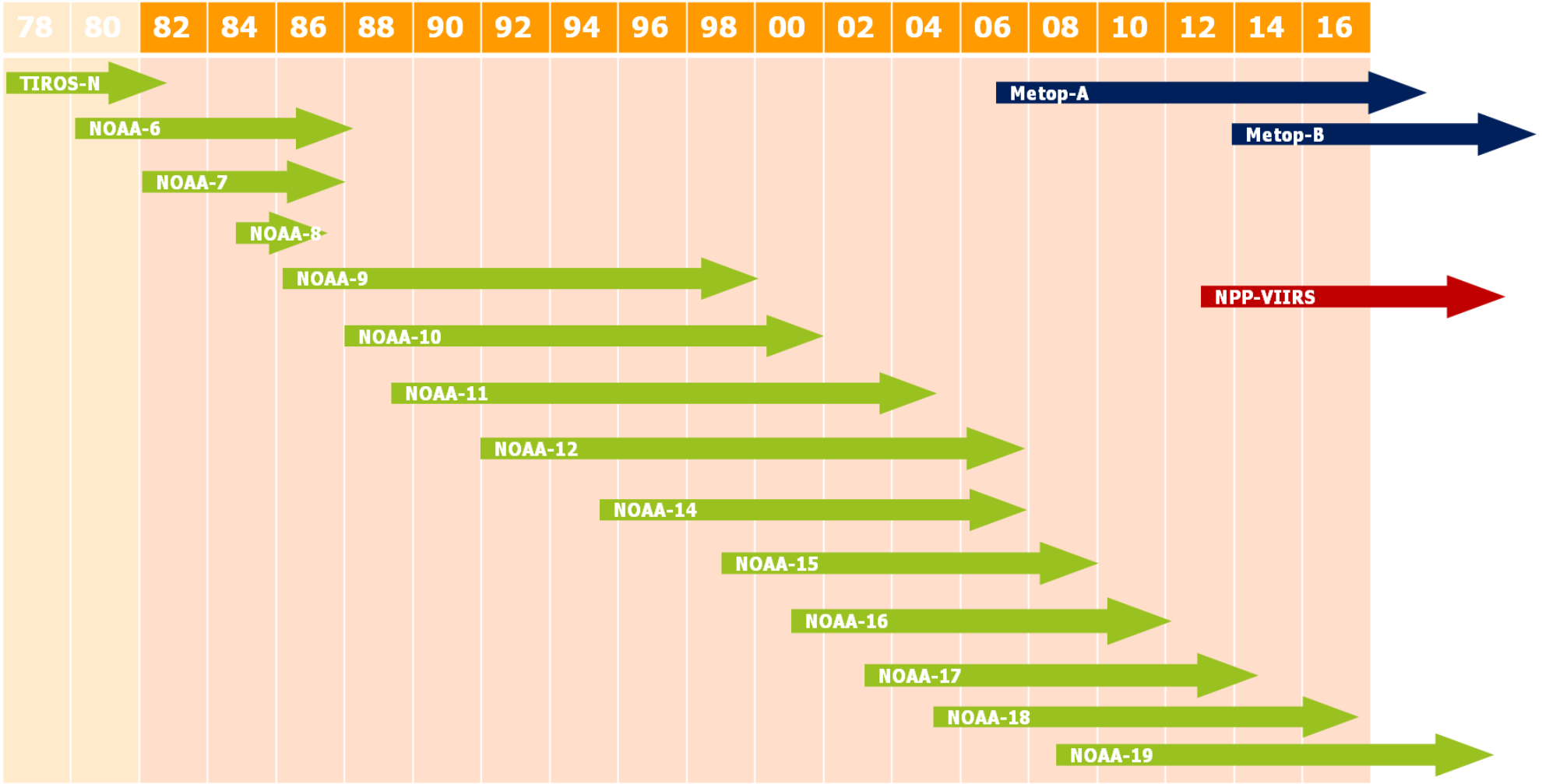
D3.10 - TCDR AVHRR polar winds (1982-2011)

Task: *To extend the polar wind retrievals for AVHRR record back to 1982*



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D3.10 - TCDR AVHRR polar winds (1982-2011)

Status

- ERA-CLIM: The AVHRR polar winds for Metop (2007-2011) were reprocessed with two algorithms, i.e., the EUM and CIMMS algorithms;
- The AVHRR polar winds reprocessing is repeated with latest version EUM algorithm;
- The modification of the EUM algorithm, making it applicable to AVHRR Global Area Coverage (GAC) data, is ongoing;.
- The collection of AVHRR GAC data (1982-2014) from the CM SAF (PATMOS-X) is ongoing;

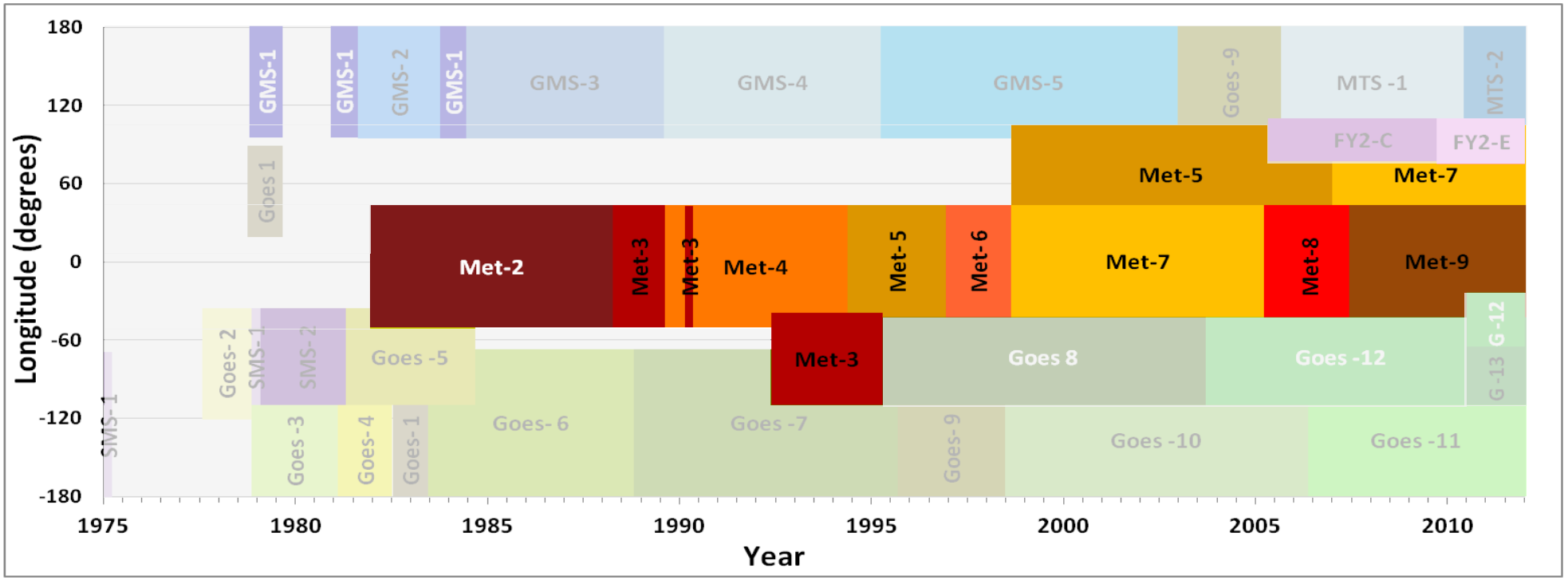
Planned

- To update the algorithm (EUM and/or CIMMS) for use with AVHRR GAC data;
- To generate, validate, document, and release GAC based polar winds data record over the period 1982-2011 (we try to go most actual).

Nr.	Task Name	2014	2015	2016
1	Algorithm update to GAC version	❹	❶❷	
2	Algorithm testing and verification		❷❸	
3	Algorithm implementation and processing		❸❹	
4	Validation and documentation		❸❹	
5	Data Record Release Delivery (D3.10)		❹	

D3.13 - TCDR MFG and MSG Atmospheric Motion Vectors (1982 - 2014)

Task: *To improve the AMV data records from Meteosat First Generation (MFG) and Meteosat Second Generation (MSG), and for other geostationary satellites in collaboration with JMA (and potentially NOAA) within SCOPE-CM.*



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D3.13 - TCDR MFG and MSG Atmospheric Motion Vectors (1982 - 2014)

Status:

- Assessment of *cloud properties and AMV algorithms,* using the VIS/IR/WV heritage channels, for MFG and MSG processing;
- The pilot study to select the algorithm for MFG and MSG data is ongoing *(Link QA4ECV)*
- The MFG and MSG data were brought on-line.

Planned:

- To reprocess MFG and MSG AMVs (and ASR and CSR);
- To validate and document TCDR;
- To archive and deliver the released TCDR.

Side Note:

- SCOPE-CM AMV processing plans need to be consolidated *(User workshop on Observations for Earth System Reanalysis);*

Nr.	Task Name	2014	2015	2016
1	Algorithm assessment	❸❹	❶❷	
2	Algorithm updating, testing, and verification		❷❸❹	
3	Algorithm implementation and processing		❹	❶❷
4	Validation and documentation			❷❸❹
5	Data Record Release Delivery (D3.13)			❹

D3.13 - TCDR MFG and MSG Atmospheric Motion Vectors (1982- 2014)

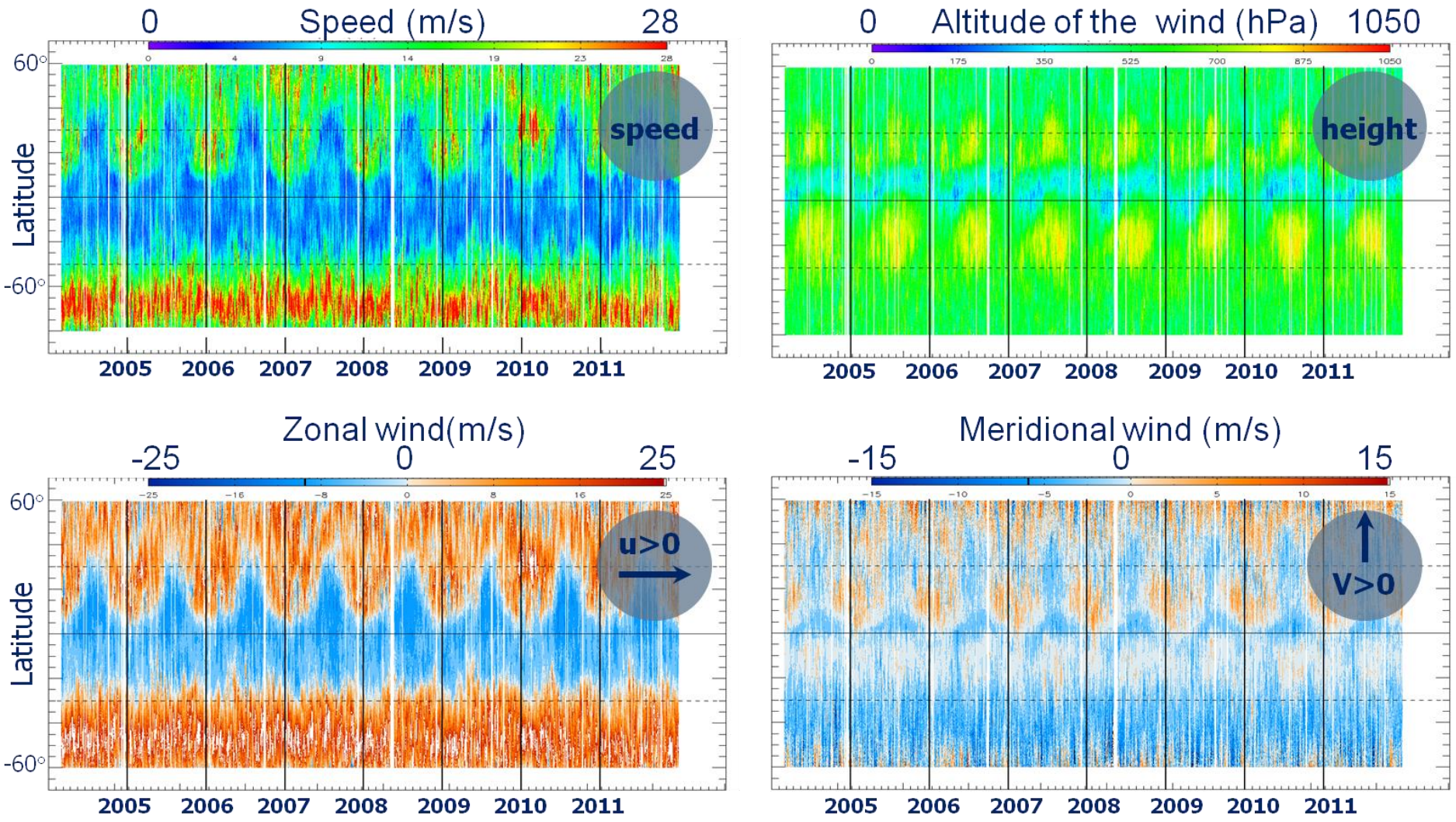
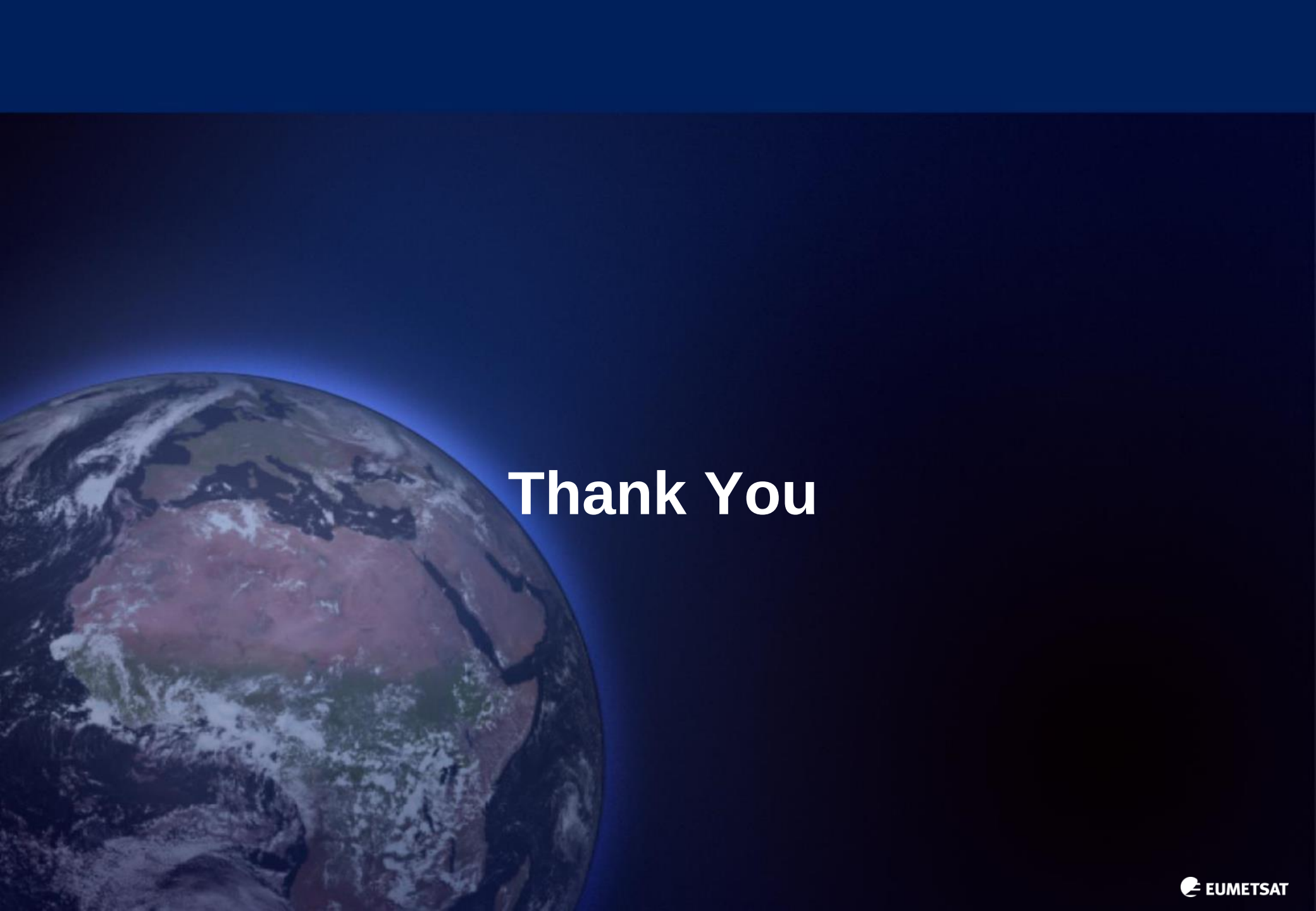


Fig: *Hovmoller plot sof the winds characteristics over the MSG time series (2004-2012)*

Summary

Summary

- **Necessary data are being collected and are being brought on-line;**
  (e.g. MFG, MSG, RO, HIRS/AIRS/IASI, SSM/T2);
- **Computer infrastructure is being expanded;**
- **Several retrieval methods are being developed, updated, or modified;**
  (e.g. re-calibration IR/WV, re-calibration VIS, RO WaveOptics, Polar Winds, SSM/T2)
- **Prototype retrievals of several methods are being tested and verified;**
  (e.g. re-calibration IR/WV, RO WaveOptics)
- **Reprocessing activities have started for some instruments;**
  (e.g. re-calibration IR/WV, GRAS)
- **Several development activities need to be done and completed end 2015.**
  (SSM/T2, Polar Winds)


Thank You