



ASCAT mission overview and current developments

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Outline



- Metop-B launch, SIOV and Cal/Val
- Metop-A/B dual operations concept
- ASCAT-A/B processor developments
- ASCAT-A reprocessing plans
- EPS-SG status
- Revision of NWP assimilation of ASCAT winds



Metop-B launch

17.09.2012
at 16:28:40z



The Soyuz/Fregat flight and trajectory were
100% nominal
Metop-B was separated at 17:37:45z



ASCAT-B switch-on and start of processing

23.09.12 - 5 min telemetry check

25.09.12 - 100 min measurement mode check

25.09.12 - ... - continuous measurement operations

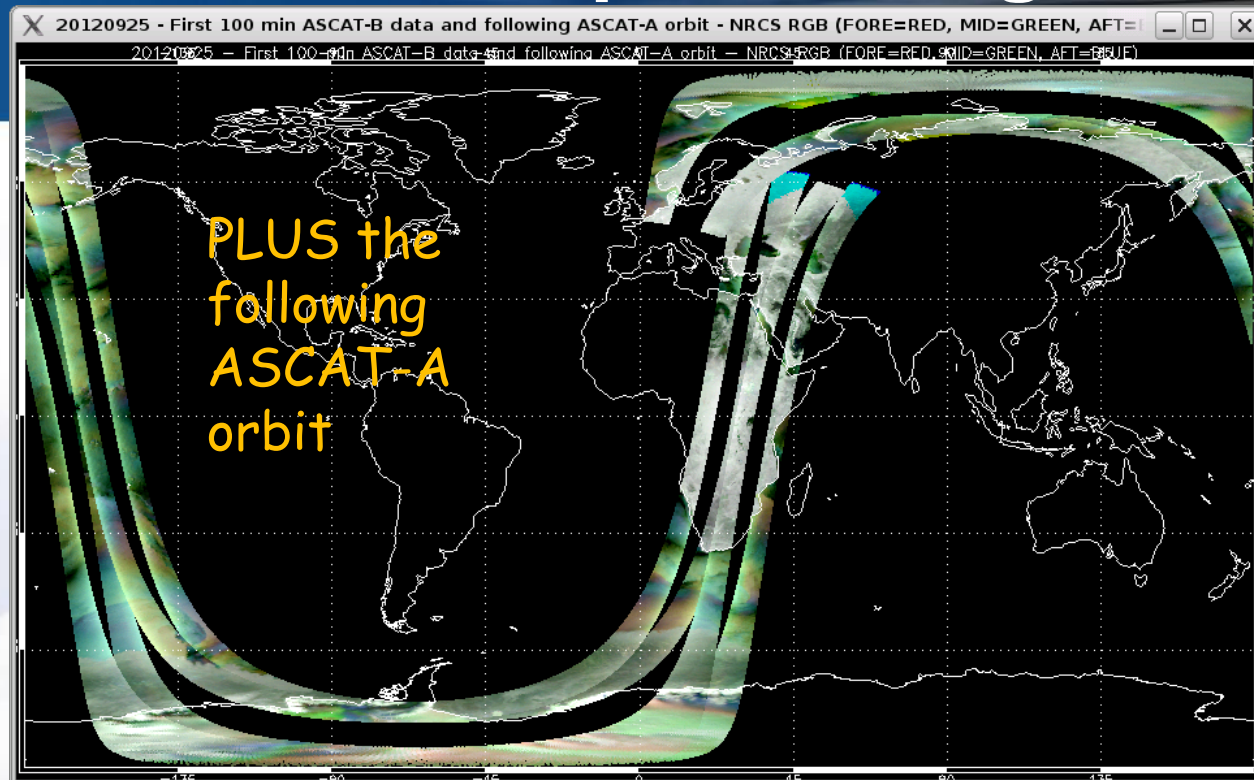
Processing and calibration:

23.10.12 - Dissemination of Level 1 backscatter to cal/val partners, based on preliminary calibration (ASCAT-A)

04.12.12 - Dissemination to all users

External calibration with transponders 11.10.12 – 03.02.13

Final calibration tuning planned for 28.05.13





First ASCAT-A/B winds received from KNMI

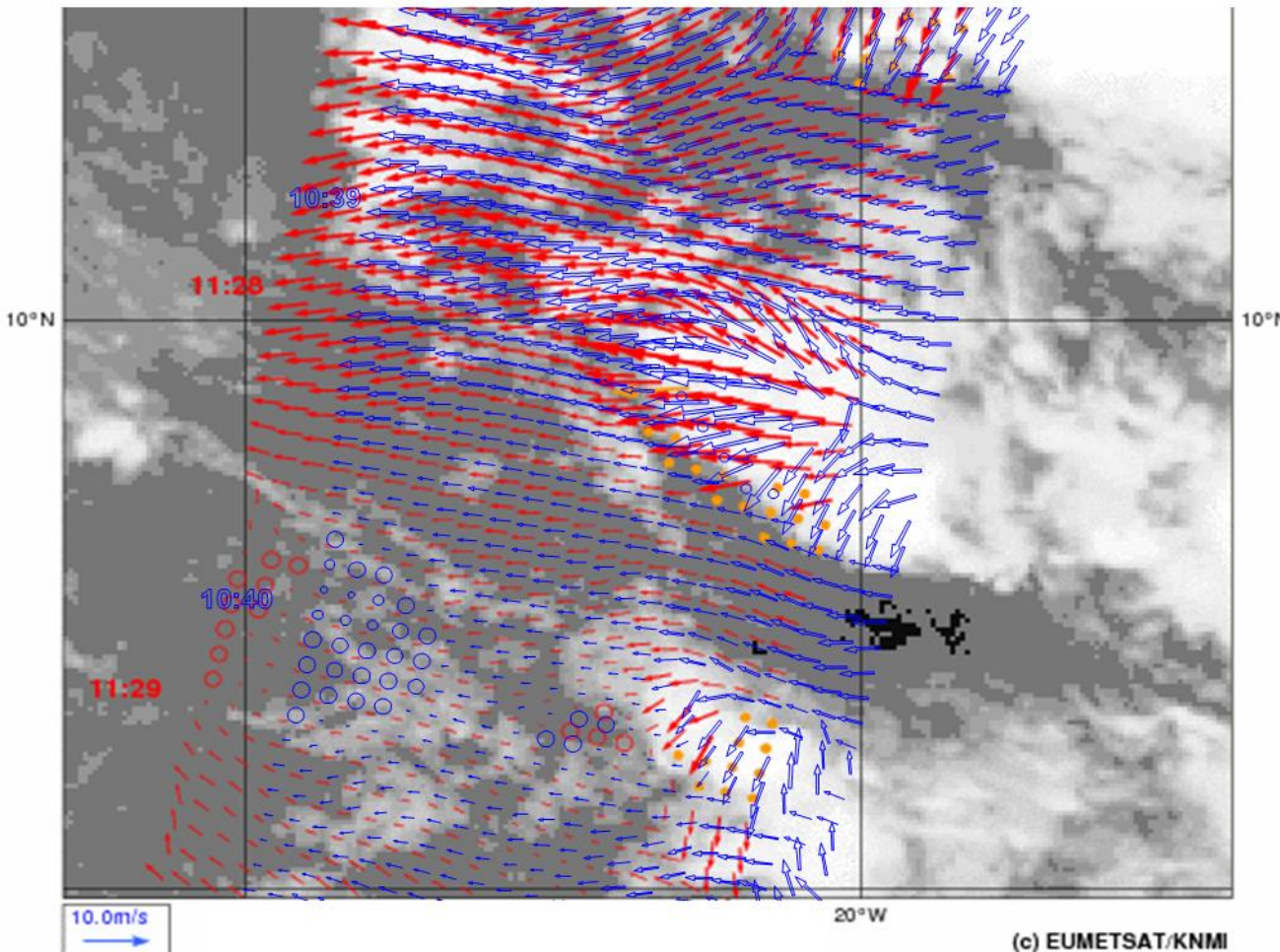
ASCAT-A and ASCAT-B come together



ASCAT-A and
ASCAT-B come
together

ASCAT-A (red)
ASCAT-B (blue)

Measurements
separated 50 min





Metop-A/B dual operations concept

Originally 14 years of 3 Metop's, 5 years in-orbit and 6 month overlap. Baseline lifetime extended to 6 years (delayed Metop-B launch to 2012 and Metop-C to 2018)

In 2012, Metop-A end-of-life strategy was approved:

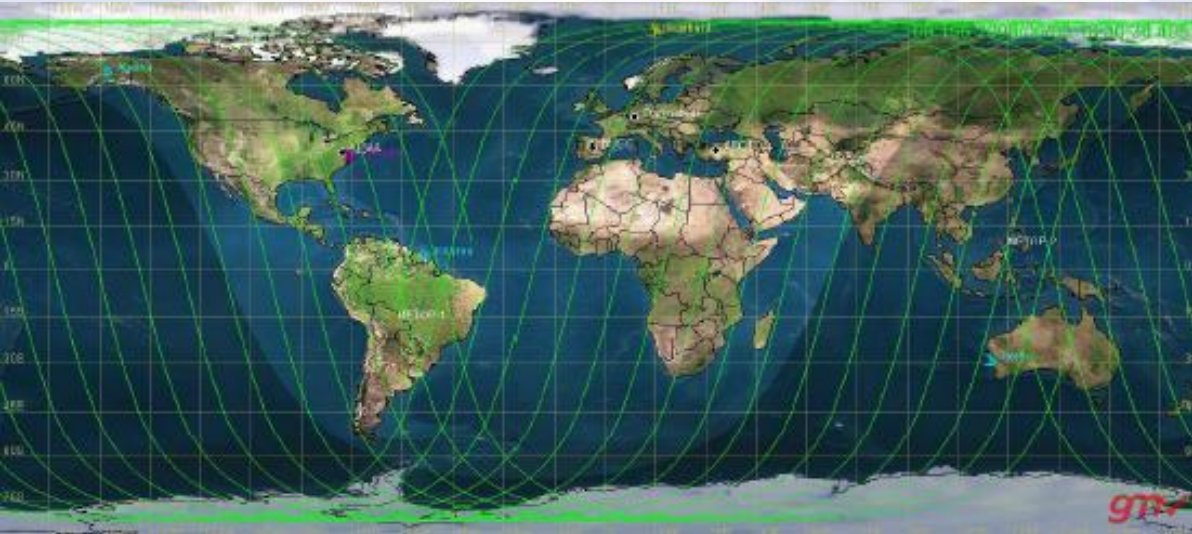
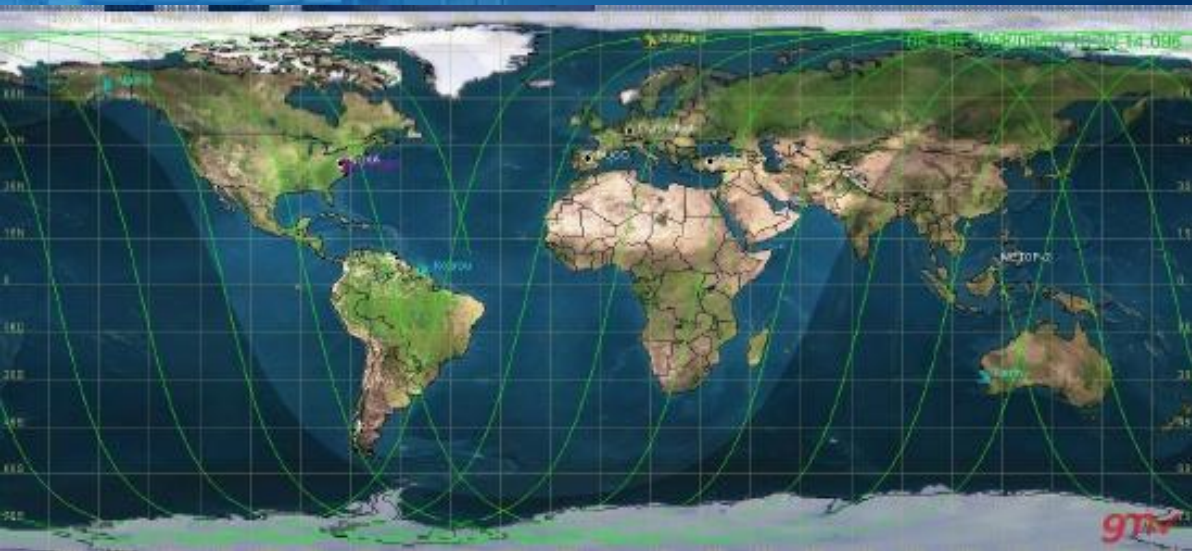
- Targets dual-Metop A/B services to end of Metop-C commissioning
- Lifetime review (A+B) will assess feasibility each year

After the Commissioning phase, Metop-B satellite has primary role, Metop-A remains in operations as the secondary mission (24.04.2013)

In May-June 2013, this operations concept is expected to be approved by delegations, including a user survey planned in early 2014, in order to ascertain more precisely the user benefits of this strategy



Metop-A/B dual operations orbit formation



Same orbital plane, with
Metop-B over
ascending node ~49
min ahead of Metop-A

Both in morning orbit

Same 29 day repeat cycle
track



Metop-A/B dual operations – data services

Data acquisition:

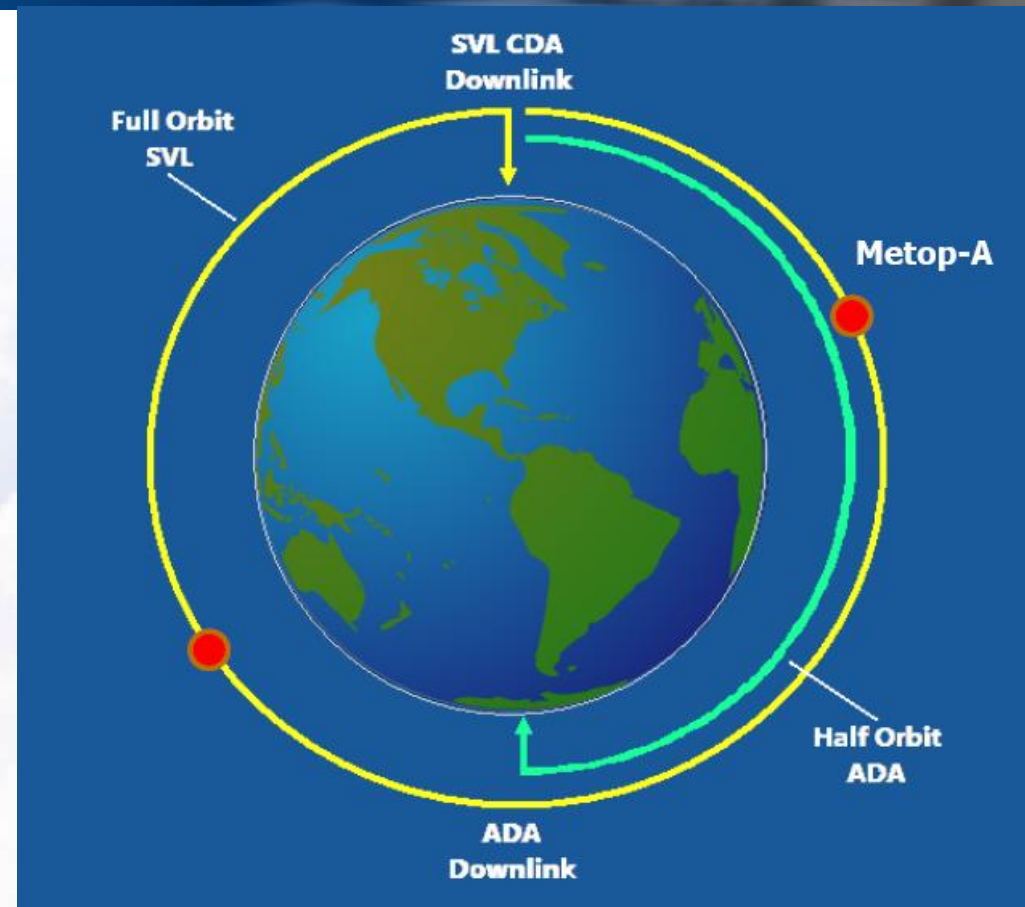
- Svalbard: 14 orbits per satellite on same data acquisition station
- McMurdo: currently 9 half-orbits for primary mission, early 2014 14 orbits

Timeliness:

- ASCAT-B ~ 80 min
- ASCAT-A ~ 120 min

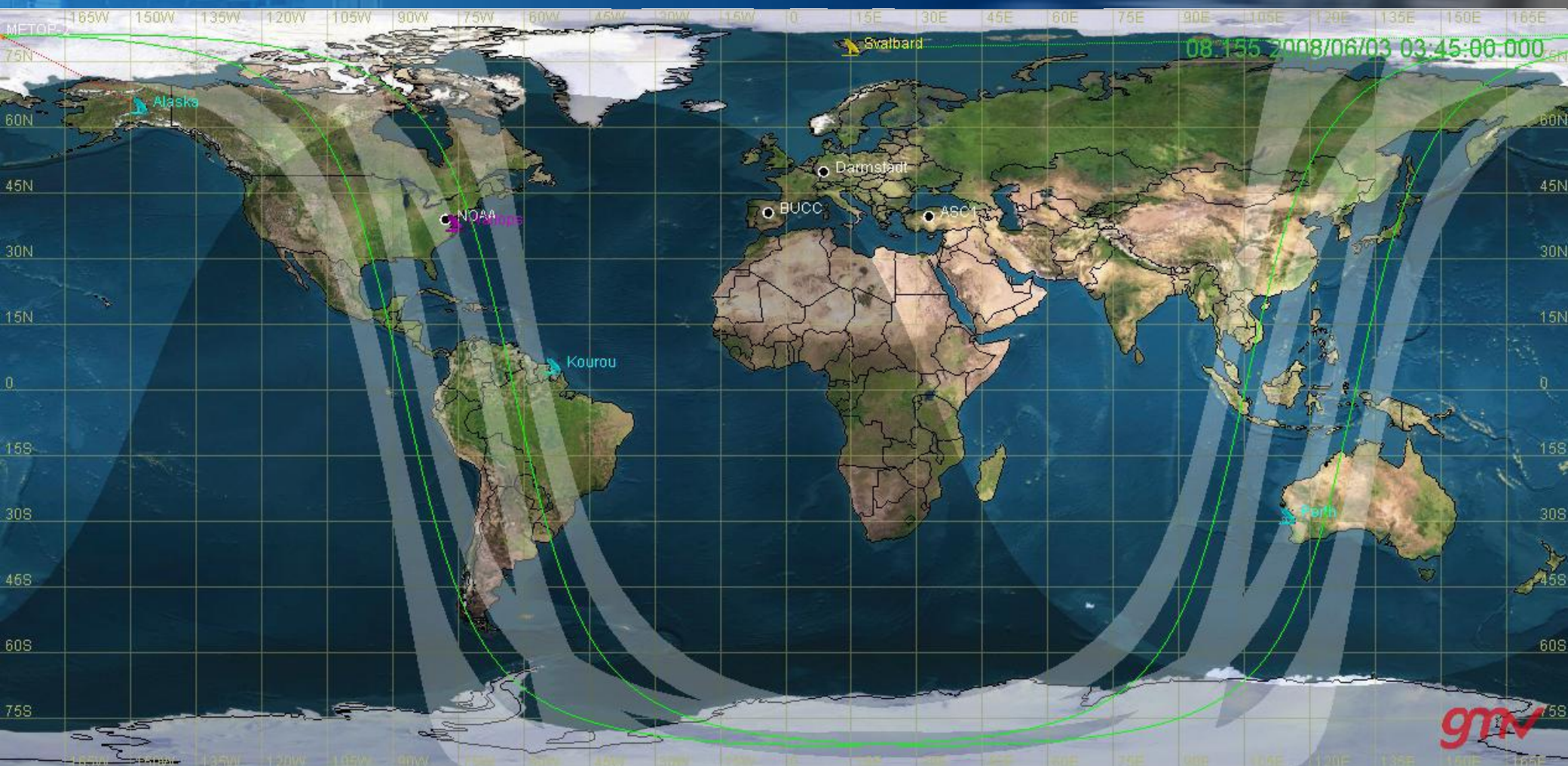
Direct readout mission:

- Metop-A continues zone base operation
- Metop-B AHRPT reengineered – operated permanently



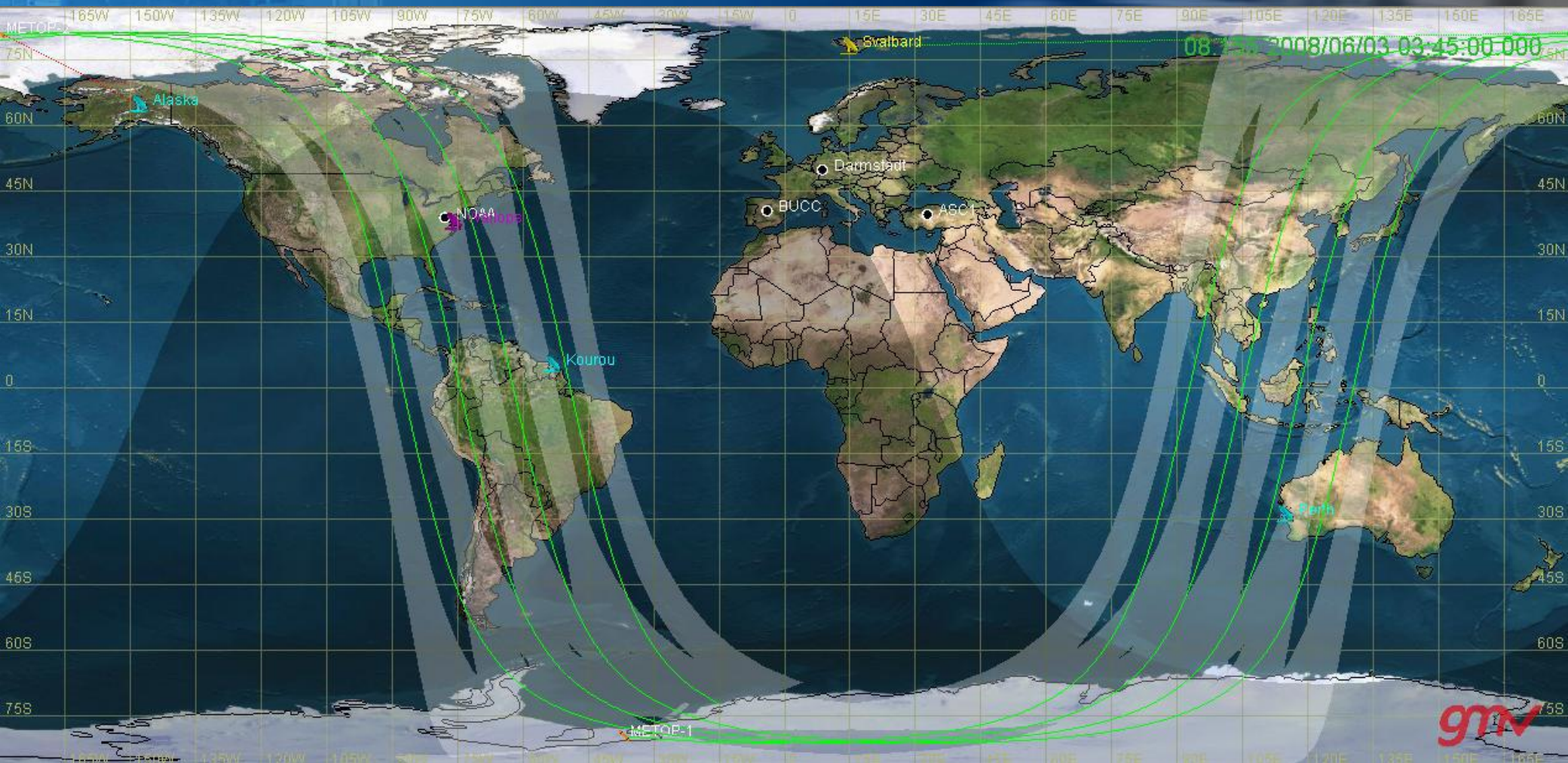


ASCAT A/B orbit phasing – One ASCAT





ASCAT A/B orbit phasing – 50 min





Metop-A/B orbit phasing

Trade-off between 29 / 50 min phasing scenarios. Maximizing sounder observations available to NWP assimilation windows (short term)

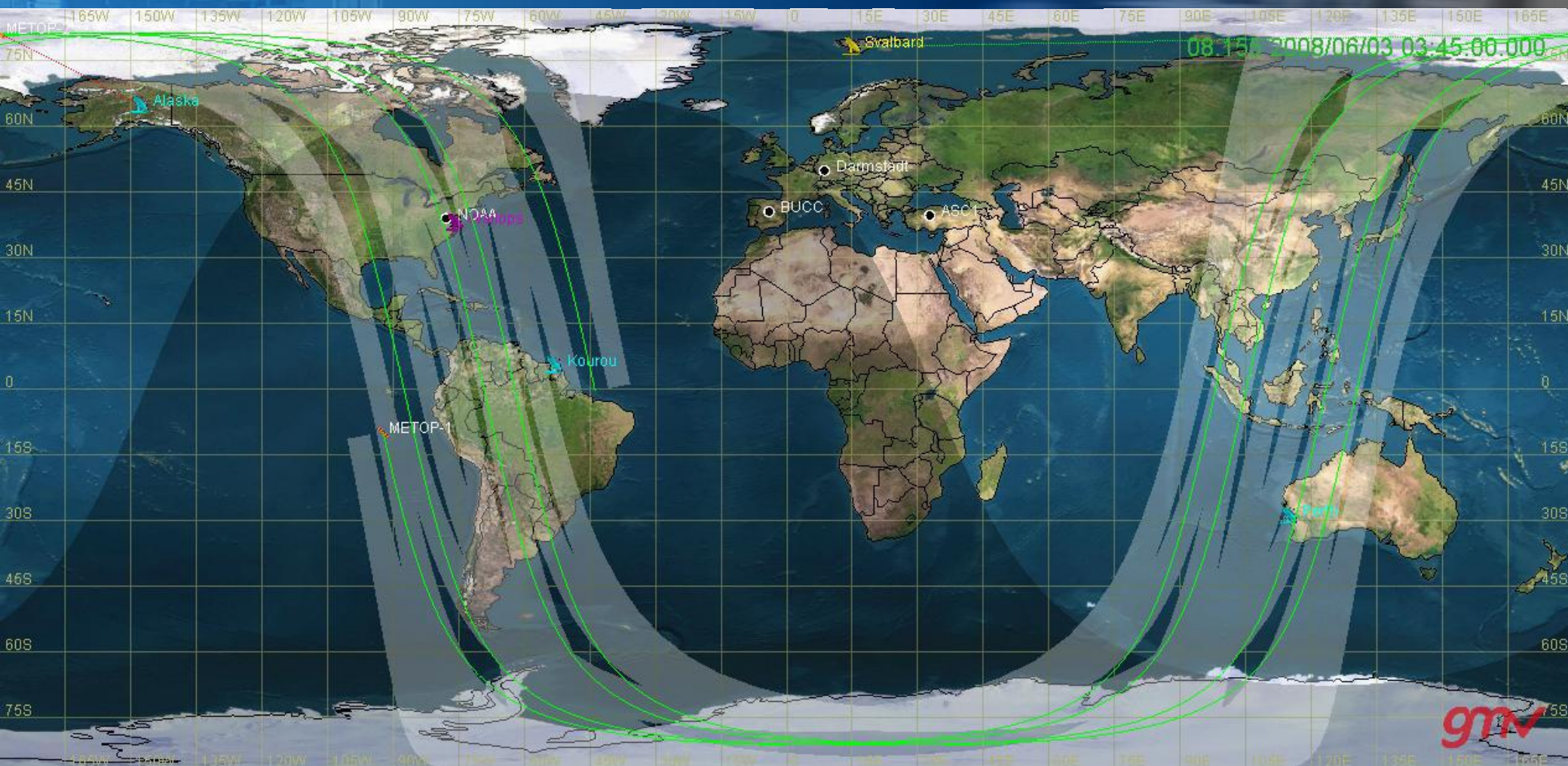
For ASCAT: significant gaps in short term and daily coverage over the tropics and mid latitudes, affecting:

- **Nowcasting** of severe weather (hurricanes and extra-tropical storms)
- Regional and local applications in near real time (**coastal**)
- **Oceanography** and **climate** (non-geostrophic component of ocean currents) – incomplete daily coverage
- **Soil moisture assimilation** (sampling and modelling of soil moisture anomalies)
- ... ????

As part of the VC work, we need to review quantitatively and to document the ASCAT situation



ASCAT A/B orbit phasing – 29 min





Coming L1b processor upgrades - May 16th

- ✓ Line of backscatter triplet nodes generation on a fixed time-based grid
- ✓ Format optimisation of the full resolution geolocated sigma0 product for near real time use: size (60%) and addition of a high resolution (6,25 km) swath grid for resampling

Coming version of L1b processor (16.05.13) is **9.0** and product format version is **12.0**

December 2012: Availability of spatially averaged sigma0 products in **netCDF** (CF compliant, netCDF4, classical model)



ASCAT-A reprocessing

ERA-CLIM is a new EU-FP7 project that prepares for the next major reanalysis at ECMWF

EUMETSAT is expected to contribute by carrying out **first reprocessing of** all Metop-A data including ASCAT (soil moisture, surface ocean wind)

ASCAT reprocessing is currently starting, 2 months of data (Oct-Nov) per year, in order to assess calibration, planned to finish within 2013

Peer review process – request for involvement



ASCAT L1b reprocessing product specifications

Record type: ASCAT-A NRCS FCDR, input to ERA-CLIM reanalysis

Format: EPS Native (v12.0), BUFR and **netCDF4** (Classic model)

Spatial coverage: Global (ocean and land), sampling:

- ASCA_SZR on 12.5km, ASCA_SZO on 25 km spacing swath grid
- ASCAT_SZF on measurement sampling pattern (i.e. full resolution)

Temporal: Continuous, **full ASCAT-A mission:** 01.2007– 06.2013, full data dumps

Target Accuracy:

- Absolute and inter-beam: 0.1 dB
- Relative (w.r.t inc angle): p2p variations of antenna patterns within 0.1 dB

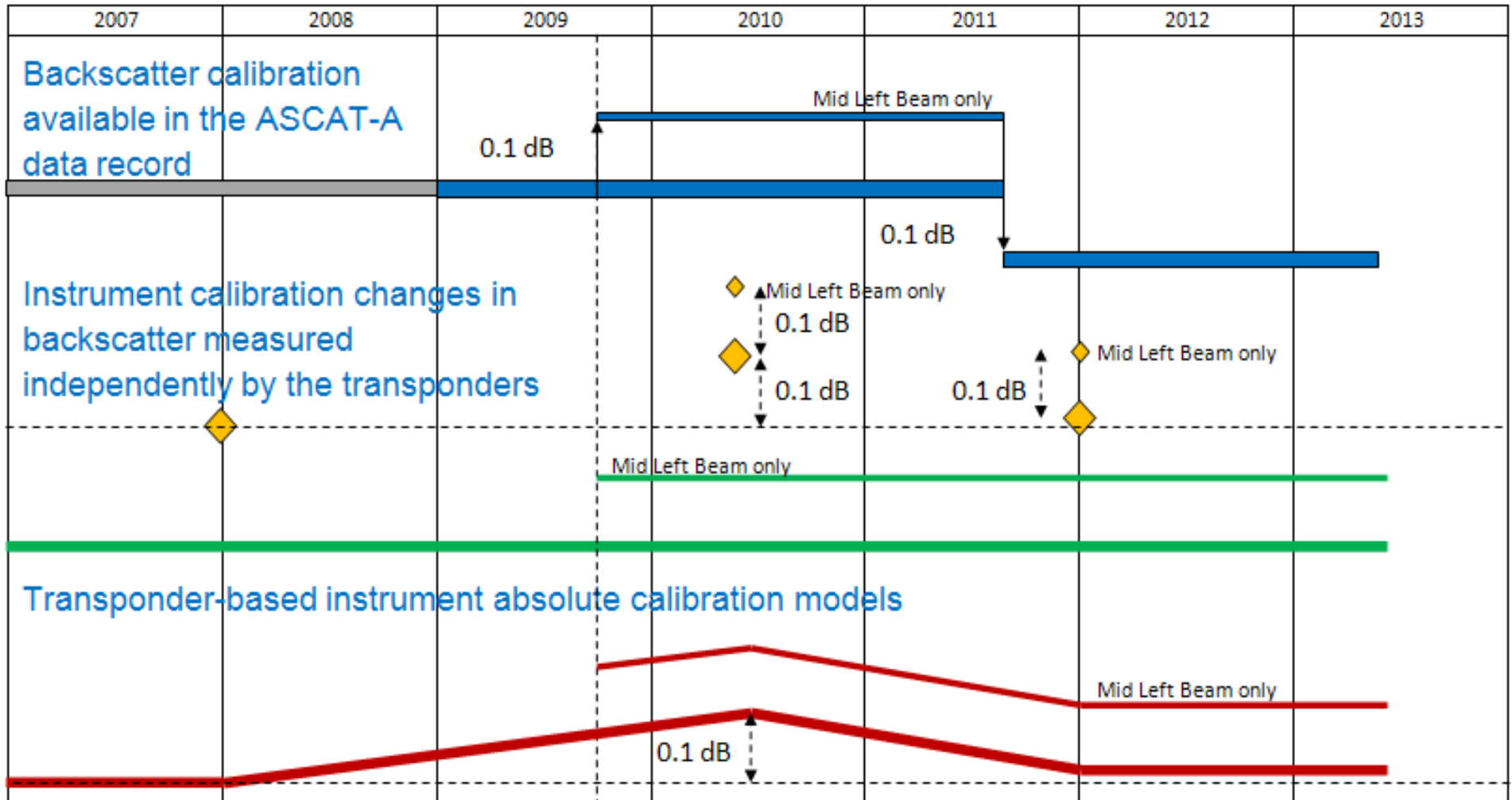
Target Precision: radiometric resolution 4%

Target Stability: 0.1 dB over 5 years

Absolute calibration based on the transponders, validation over natural targets



ASCAT-A backscatter record and calibration model





EPS – SG status

EPS-SG Preparatory Program was approved by our Council in 2012, covering the Phase B work (until end 2014). Full Program Proposal is being prepared for 2013

For SCAT, competitive industrial studies ongoing, strong heritage from ASCAT

Coming activities for the ASCAT/SCAT team

- Support System Requirements Review 2nd part in October
- Drafting ATBD, processor and product content specification

ASCAT science advisory group extended mandate to SCAT



Assimilation of ASCAT in NWP – a revision

Important NWP model evolutions and addition of new observations
- > need to revise how scatterometer winds are being assimilated and if necessary tune the assimilation scheme to optimize impact

ECMWF 2-year study, several Observing System Experiments

- Focus on aspects where scatterometer wind observations are expected to provide unique and essential information:
 - Forecasting of severe weather (position and intensity)
 - Additional diagnostics/metrics: wave and wind verification
- Impact of ASCAT in the context of the current GOS



Summary and conclusions

- Metop-B launch and commissioning success, primary satellite in Metop A/B dual operations
 - We encourage feedback from ASCAT oceanography and climate users on Metop-A/B orbit phasing
- ASCAT-A and -B are of similar quality
- ASCAT new L1B near-real time full resolution products
- ASCAT-A reprocessing starting
 - advise on instrument calibration model welcomed
 - get involved in reprocessing results analysis

Come to GMES-PURE poster and get involved in shaping the long term marine services requirements



Back-up slides



ASCAT-A/B instrument status and events

Both ASCAT-A and –B maintain full redundancy, no instrument anomalies open at the moment.

Due to high solar activity, In Plane manoeuvres are needed now for both Metop missions every 3-4 months and will get even more frequent in the next year. One Out Of Plane manoeuvre per year is still the baseline.

The ASCAT instrument is left on during manoeuvres, but dissemination of data has been discontinued in the case of OOP



History of main L1b processor upgrades

Routine product generation and dissemination started on February 2007 with provisional calibration
ASCAT L1b products declared **operational** 03/04/08, including

- First full 3-transponders absolute calibration,
- Format change (header and auxiliary data records)

Tuning of the calibration on 09/12/08 as a reference to start adapting the existing ERS-based geophysical parameter retrieval models to ASCAT data, and used for first re-processing of the mission

Implementation of **dynamic (orbit-based) Power-to-s0 normalisation** on 10/09/09 and start of non-frozen eccentricity orbit phase on 17/09/09

Correction of Hamming window for SZR product, **updated Kp algorithm** and **tuning of calibration** to 2010 external calibration transponder campaign on 18/08/11

Clean-up of the L1a processing and flag handling in order to facilitate code maintenance, as well as real time **monitoring of instrument and platform telemetry** during the processing on 20/03/2012

- ✓ Line of backscatter triplet nodes generation on a fixed time-based grid
- ✓ Format optimisation of the full resolution geolocated sigma0 product for near real time use: size (60%) and addition of a high resolution (6,125 km) swath grid for resampling
- ✓ User-requested format improvements for the L1B averaged products
- ✓ Level 1b processing performance improvements through multi-threading, processing in ground segment down to half

Coming version of L1b processing facility (16.05.13) is **9.0** and product format version is **12.0**



Other Level 1B product changes and next steps

December 2012: Availability of spatially averaged sigma0 products in **netCDF** (CF compliant, netCDF4, classical model)

Next steps:

- Improve handling of outlier values of Noise Power in the receive filter shape estimation and sharp PGP variations
- Fractional land flag
- Align the **ASCAT BUFR template** to benefit from new fields and calibration information: Q3 2013, in coordination with level 2 product experts



Full ASCAT backscatter data record to date

- ✓ Reprocessed data 2007 → 2008
- ✓ Operational data 2009 Jan → June
- ✓ Operational data 2009 July → August (fast NTG)
- ✓ Operational data 2009 Sept → now (dynamic NTG and non-frozen eccentricity orbit)
- ✓ Sept 2009 → Change in Mid Left Beam calibration: increase of 0.1 dB over all incidence angles
- ✓ August 2011 → EC_2010 and compensation for the MLB calibration change

Other events influencing the consistency of the data record

- ✓ Manoeuvre record



ASCAT L1b reprocessing product specifications

- General
 - **Record type:** **ASCAT-A NRCS FCDR**, input to ERA-CLIM reanalysis
 - **Description:** Full mission ASCAT NRCS data (dB), global coverage, latest ASCAT operational processor (PGS v8A, PFS v9A, PPF v9.1)
 - **Output data:** ASCA_SZO/R, ASCA_SZF
- Dissemination
 - **Format:** EPS Native (v12.0), BUFR and **netCDF4** (Classic model)
- Coverage
 - **Spatial:** Global (ocean and land), sampling:
 - ASCA_SZR on 12.5km, ASCA_SZO on 25 km spacing swath grid
 - ASCAT_SZF on measurement sampling pattern (i.e. full resolution)
 - **Temporal:** Continuous, **full ASCAT-A mission:** Jan 2007 – June 2013, full data dumps



ASCAT L1b reprocessing product specifications

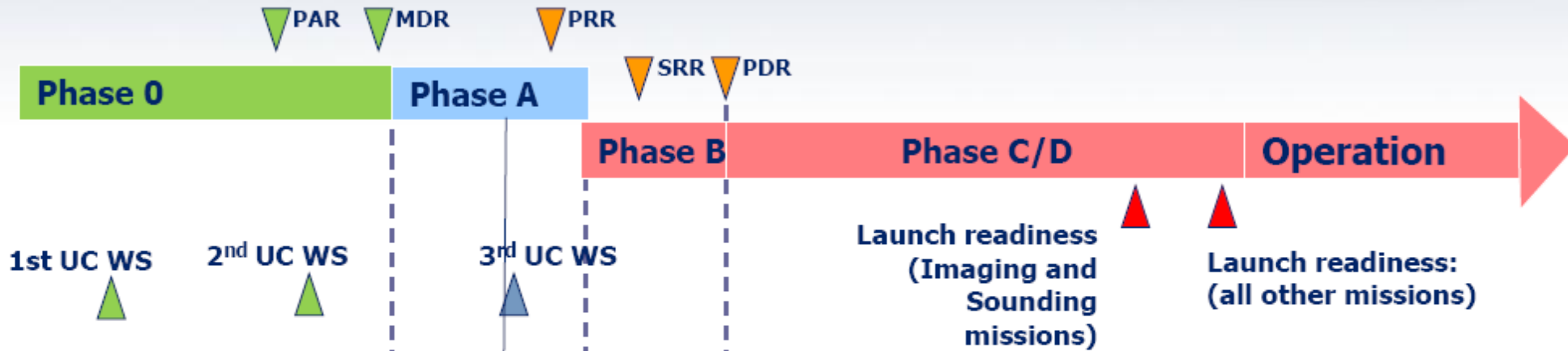
- Uncertainty (target)
 - Accuracy:
 - Absolute and inter-beam: 0.1 dB
 - Relative (w.r.t inc angle): p2p variations of antenna patterns within 0.1 dB
 - Precision: radiometric resolution 4%
 - Stability: 0.1 dB over 5 years
- Validation method
 - Accuracy:
 - Absolute: ensured by transponder calibration and validated over global ocean and rainforest (as far as possible)
 - Relative: global ocean, rainforest, sea ice
 - Inter-beam: global ocean measurement space
 - Precision: over stable sea ice
 - Stability: global ocean measurement space



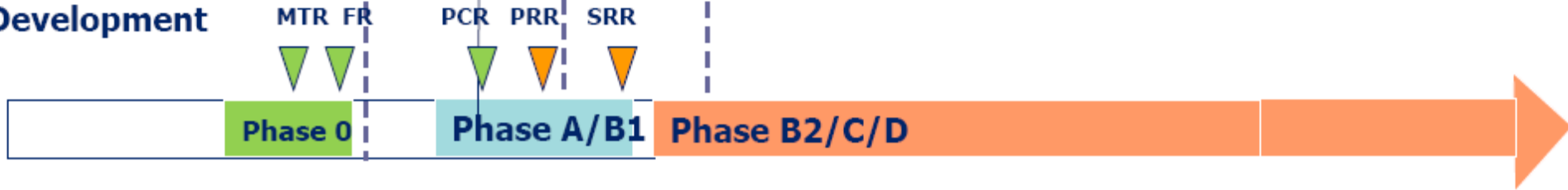
EPS-SG schedule



EUMETSAT EPS-SG Phasing



Satellites Development



Long-term marine service requirements evaluation: GMES - PURE

The Copernicus/GMES Marine Service (MS) as currently implemented by MyOcean2 will become operational in 2014.

The EC has recently started the two-year project called GMES-PURE (Partnership for User Requirements Evaluation), to define and apply a structured process for the elaboration of the future MS user requirements and their translation into service specifications, service data and technical requirements (2020-...)

GMES-PURE constitutes an opportunity for users to ensure that their current and emerging requirements are captured in time and to influence the future evolution of the MS



METOP-A Manoeuvre history

2006/10/21 18:58	OOP	GEO	2011/03/31-13:13	IP	YSM	
2006/10/22 06:30	IP	GEO	2011/05/01-03:28	IP	YSM	CAM
2006/10/22 07:20	IP	GEO	2011/06/09-13:12	IP	YSM	
2006/11/02 15:06	IP	YSM	2011/09/28-12:04	OOP	GEO	
2007/04/19 14:05	IP	YSM	2011/09/28-23:54	OOP	GEO	
2007/04/19 14:56	IP	YSM	2011/12/14-14:08	IP	YSM	
2007/07/12 14:48	IP	YSM	2012/03/02-12:59	IP	YSM	
2008/01/31 14:38	IP	YSM	2012/04/14-18:14	IP	YSM	CAM
2008/04/08 13:26	OOP	GEO	2012/07/18-13:05	IP	YSM	
2008/04/09 03:48	OOP	GEO	2012/11/21-12:57	IP	YSM	
2008/04/09 03:48	IP	YSM	2013/03/20-12:50	OOP	GEO	
2008/04/24 14:46	IP	YSM	2013/03/21-00:40	OOP	GEO	
2008/10/23 14:30	OOP	GEO	2012/04/16-12:35	IP	YSM	
2008/10/30 14:11	IP	YSM				
2008/10/30 15:01	IP	YSM				
2009/01/22 14:11	IP	YSM				
2009/09/17 14:17	OOP	GEO				
2009/12/10 15:31	IP	YSM				
2010/06/10-13:31	IP	YSM				
2010/10/05-12:16	OOP	GEO				
2010/10/06-03:29	OOP	GEO				

(YSM: Yaw Steering pointing mode)

(GEO: Geocentric pointing mode)

(IP: In Plane manoeuvre)

(OOP: Out of Plane manoeuvre)

(CAM: Collision Avoidance Manoeuvre)



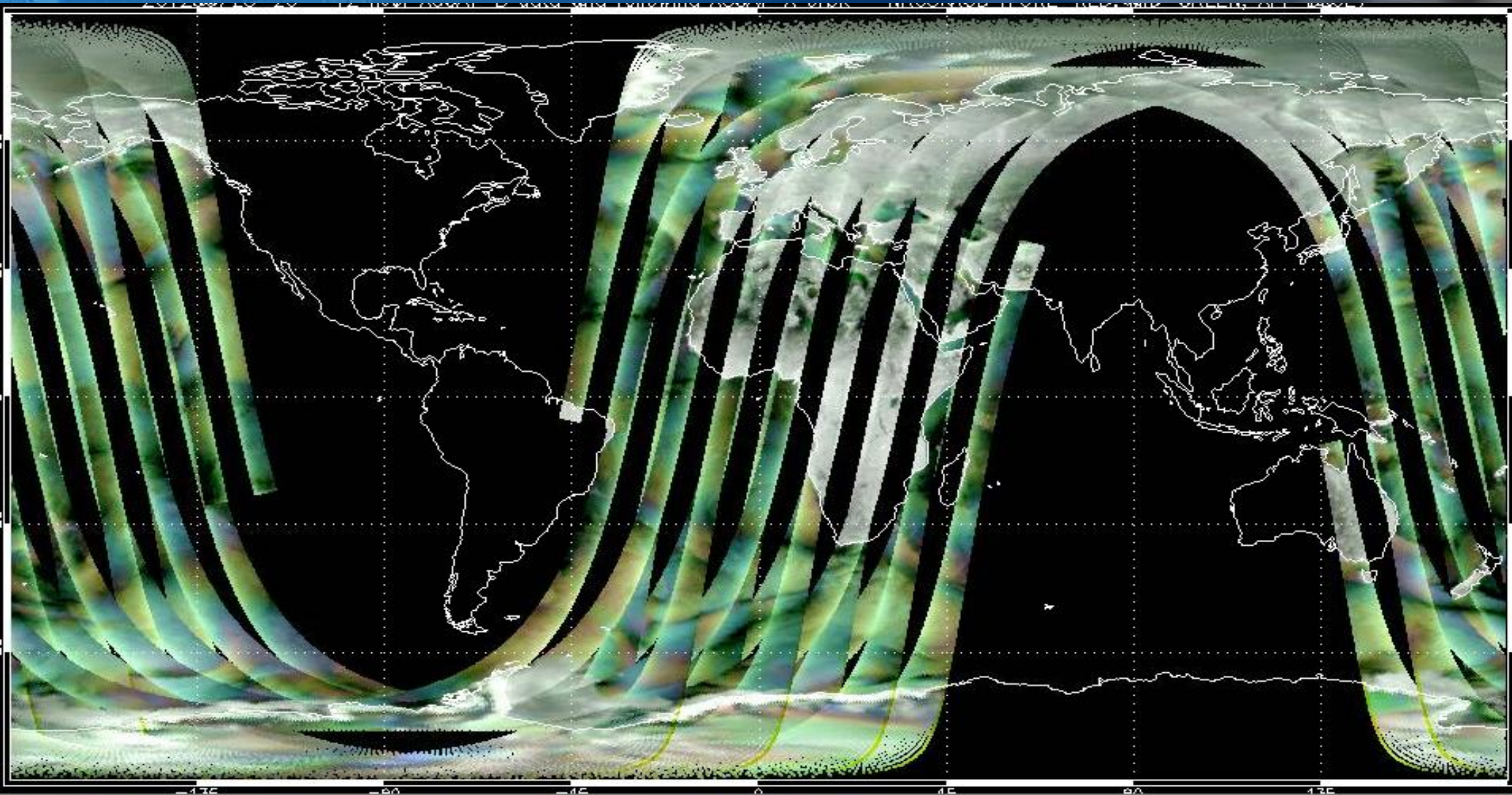
METOP-B Manoeuvre history

2012/09/20 06:53	OOP	GEO	CAM
2012/09/27 13:10	IP	GEO	Drift stop
2012/09/27 14:00	IP	GEO	Drift stop
2012/09/28 13:04	IP	YSM	
2012/10/23 21:41	IP	YSM	CAM
2012/12/19-12:35	IP	YSM	
2013/04/23-12:40	IP	YSM	

(YSM: Yaw Steering pointing mode)
(GEO: Geocentric pointing mode)
(IP: In Plane manoeuvre)
(OOP: Out of Plane manoeuvre)
(CAM: Collision Avoidance Manoeuvre)



ASCAT A+B 6-hour coverage map





ASCAT A+B daily coverage map

