ASCAT services status – Global and regional services

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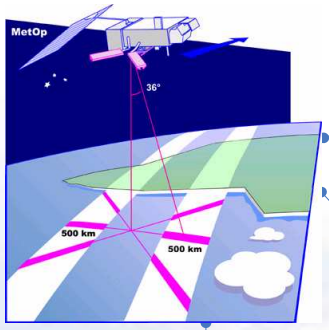
EUMETSAT

Outline

Overview
ASCAT L1b service
ASCAT L2 Soil Moisture and Wind services
EARS ASCAT L2 Winds service

News and developments since Amsterdam 2007
Current areas of work and future plans

ASCAT services overview



L-BAND

Local processor

Single AHRPT station

L0: raw power echoes

LOCAL COVERAGE

REAL TIME

L-BAND

X-BAND

EARS network of AHRPT stations

EARS processing system (EUMETSAT and KNMI)

L2: Wind vectors on 25 km swath grid

L2: Wind vector on 12.5 km swath grid

REGIONAL COVERAGE

30 min

EUMETSAT POLAR SYSTEM (EPS) main acquisition station (Svalvard)

EPS Ground Segment (EUMETSAT and OSI SAF)

L1B: averaged normalised backscatter values (s0) on 25 km and 12.5 km swath grid

L1B: Full-resolution normalised backscatter values (s0)

L2: Soil Moisture product

L2: Wind vectors on 25 km and 12.5 km swath grid

GLOBAL COVERAGE

2-3 h ARCHIVE

ASCAT products overview

	Definition	Cov	Time	Source	Form	Diss. in NRT	Archive
L1B	Averaged s0 **values on a swath grid 25 km spacing, res. 50 km**	GLOB	2h	EUM	EPS	EUMETCast, NOAA	UMARF
					BUFR	EUMETCast, GTS	
	Averaged s0 **values on a swath grid 12.5 km spacing, res. 35 km**				EPS	EUMETCast, NOAA	
					BUFR	EUMETCast, GTS	
	'Full resolution' pre-averaging s0 **values: 256 s0 samples along beam for all 6 beams, res. 25x10 km**				EPS	To NOAA	
L2	Relative Soil Moisture **(top soil) on a swath grid 25 km spacing, res. 50 km**				BUFR	EUMETCast, GTS	
	Relative Soil Moisture **(top soil) on a swath grid 12.5 km spacing, res. 35 km**						
	Near surface wind vectors **on a swath grid25 km spacing, res. 50 km**			OSI SAF		EUMETCast, GTS, ftp	
	Near surface wind vectors **on a swath grid12.5 km spacing, res. 35 km**						
L2 EARS	Near surface wind vectors **on a swath grid 25 km spacing, res. 50 km**	REG	30min	EUM/ KNMI		EUMETCast, ftp	NO
	1 near surface wind vector **after ambiguity removal, for Nowcasting applications, res. 35 km**						

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Products format

L1b: EPS Native format

Binary, uncompressed, MRD (Measurement Data Record) based

– Readers available from EUMETSAT in fortran, idl, c, c++

L1b and L2: BUFR

Binary, compressed, common template for all L1B and L2 products, which can be filled with all or a selection of them

– Reader available from the KNMI scatterometer page

L2 surface winds: NetDCF

Currently under definition, feedback from this group would be very important!

Product access

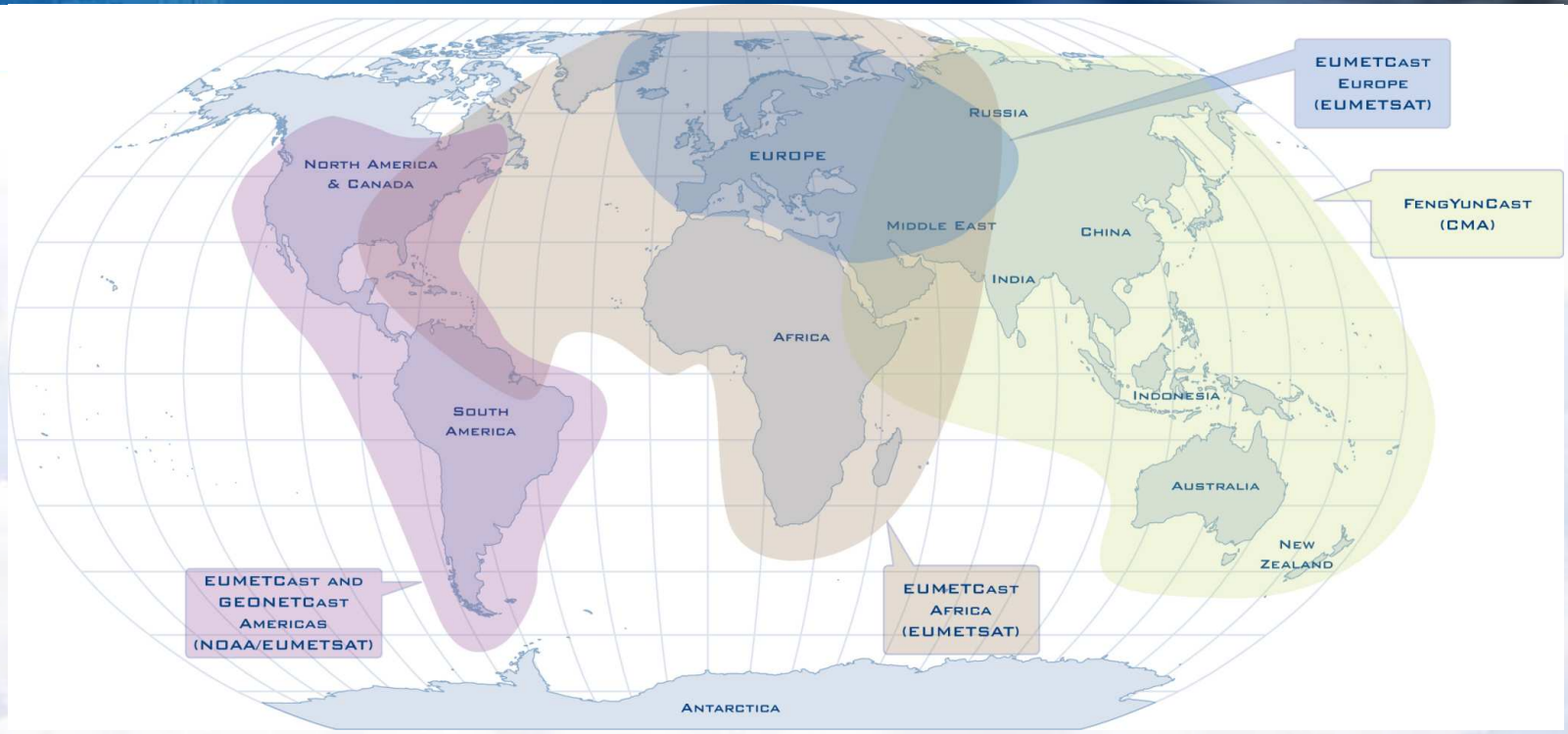
Near real time

EUMETCast (all products)
GTS (global products, BUFR format)
ftp server at KNMI (all L2 wind products)
NOAA gets all L1b ASCAT products via the **transatlantic link**
(3 min granularity)

Access to EUMETSAT Archive (UMARF)

All reconstructed global products (1 dump)
On retrieval, EPS format and conversion to HDF5 and BUFR is possible

Where can you receive EUMETCast data today?



Multi-service dissemination system based on standard Digital Video Broadcast (DVB) technology. It uses commercial telecommunication geostationary satellites to multicast files (data and products) to a wide user community.

Part of a bigger picture: **GEONETCast**

http://www.eumetsat.int/Home/Main/What_We_Do/Technical_Cooperations/GEONETCast/index.htm

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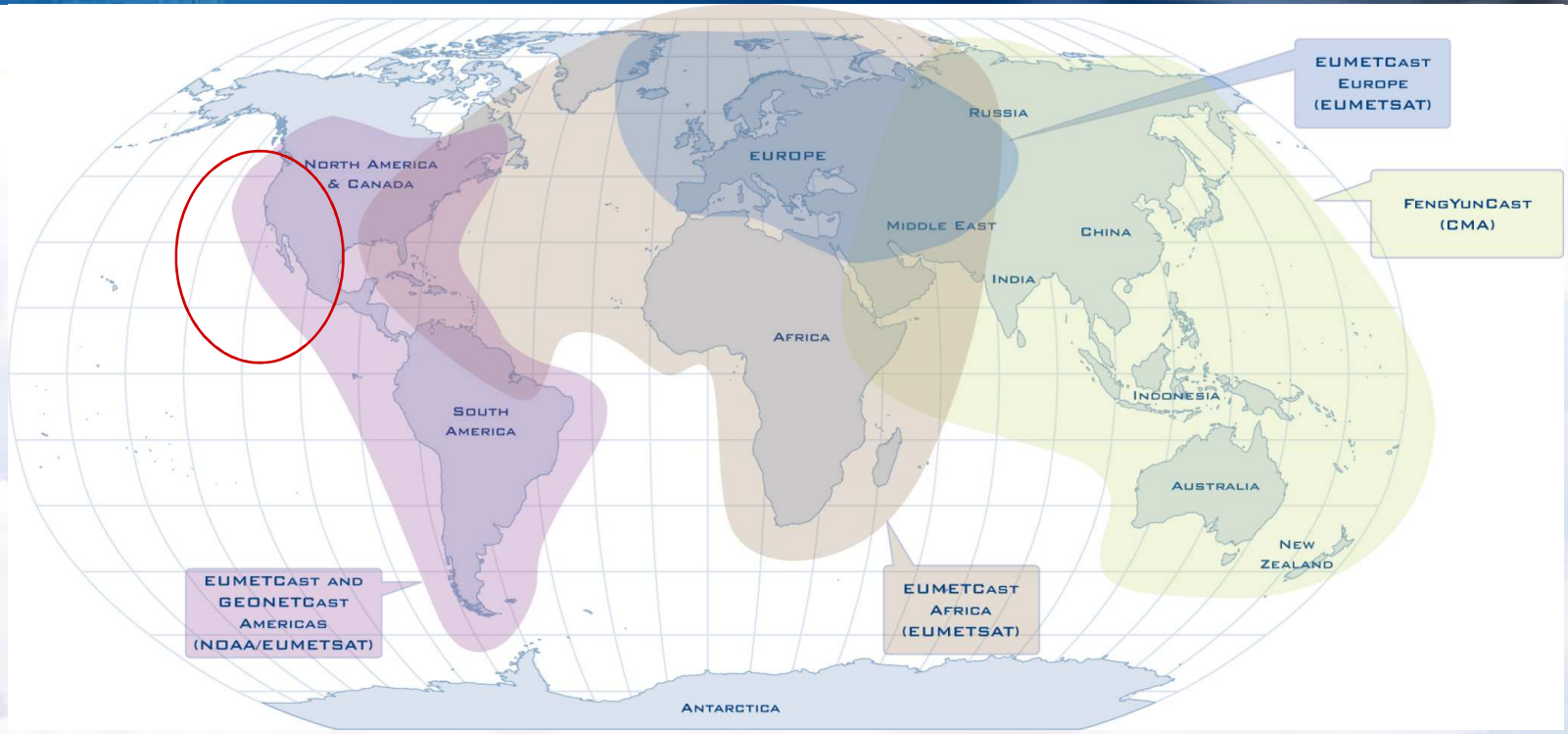

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L1b - Status

Routine product generation and dissemination since February 2007 with provisional calibration

ASCAT L1b **products declared operational** 03/04/08, including full absolute calibration, as derived after processing instrument calibration measurements over the three ground transponders

After validation of the calibration, **definite static L1b calibration** will be uploaded to the operational processor on 02/12/08.

L1b - Current areas of work and future plans

L1b averaging

Assessment of different possibilities for different applications, e.g., box-like for a coastal product, etc…

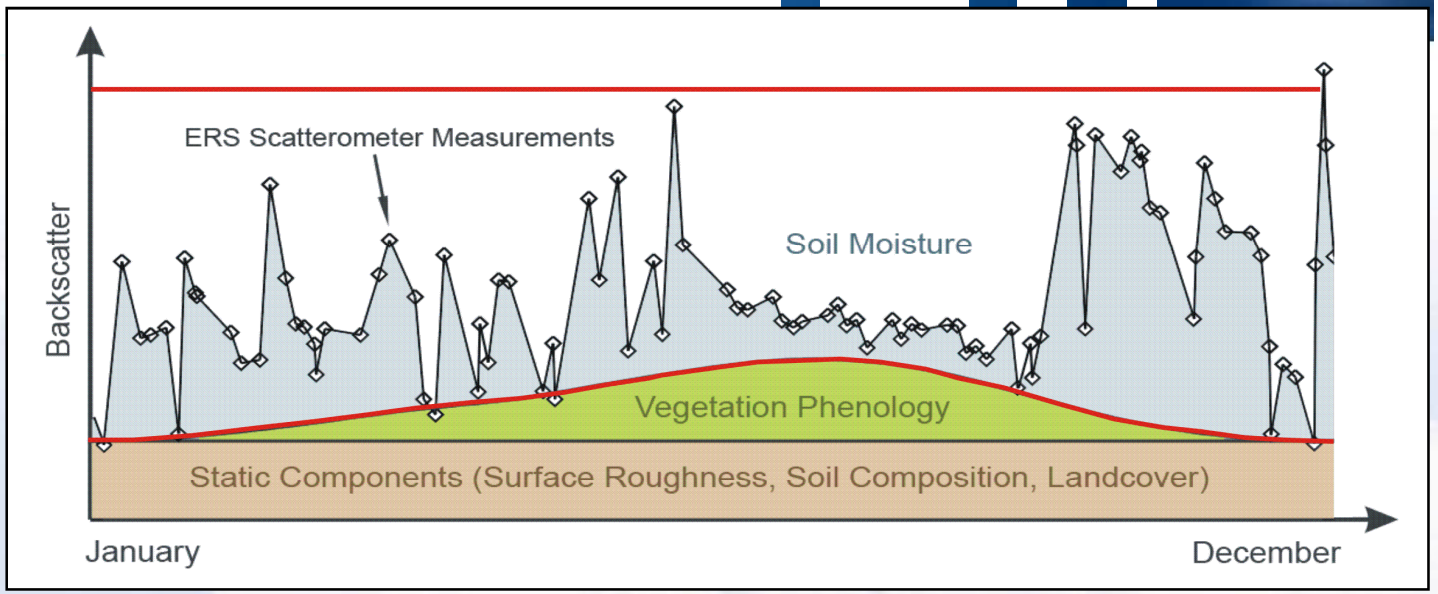
Dynamic implementation of power-to-s0 normalisation

Planned for spring 2009

Reprocessing

- Phase 1: Long record of consistent ASCAT L1b product, 3-transponder calibration. Necessary to tune models for L2 retrieval (winds and soil moisture) (Dec08-Jan09)
- Phase 2: Long record of ASCAT L1b product derived with dynamic normalisation (second half of 2009)
- Other requests for long record L1b?

L2 Soil moisture – product definition and retrieval method



Top 5cm of soil moisture in relative units between 0 and total water capacity [%]

Basic Assumptions

- Land cover patterns and "roughness" at a 50 km scale do not change over time
- Vegetation cycle unchanged from year to year
- Linear relationship of soil moisture and backscatter in dB (availability of measurements over several incidence angles is very important)

Change-detection, data history-based approach, ERS-1/2 scatterometer data long-term data series starting 1992 (s0 bias corrections necessary)

L2 Soil moisture – history and status

Product definition

Level 2: Surface soil moisture in orbit geometry, tailored for NWP assimilation

(Level 3 value-added products are also planned in partnership with the H-SAF)

Implementation of the L2 product

L2 surface soil moisture processing prototype WARP_NRT_2.0 from TU Wien (2006/07)

Integration of WARP_NRT_2.0 into the EPS product generation environment (2007/08)

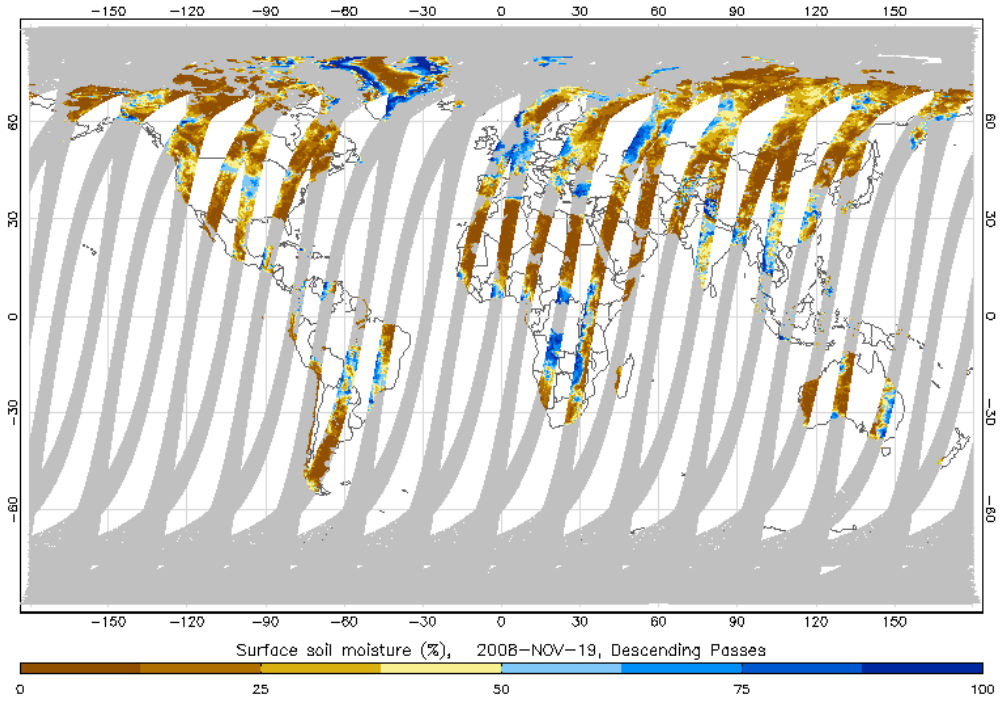
Activation and start of a trial dissemination on EUMETCast in May 2008, products available in UMARF since then

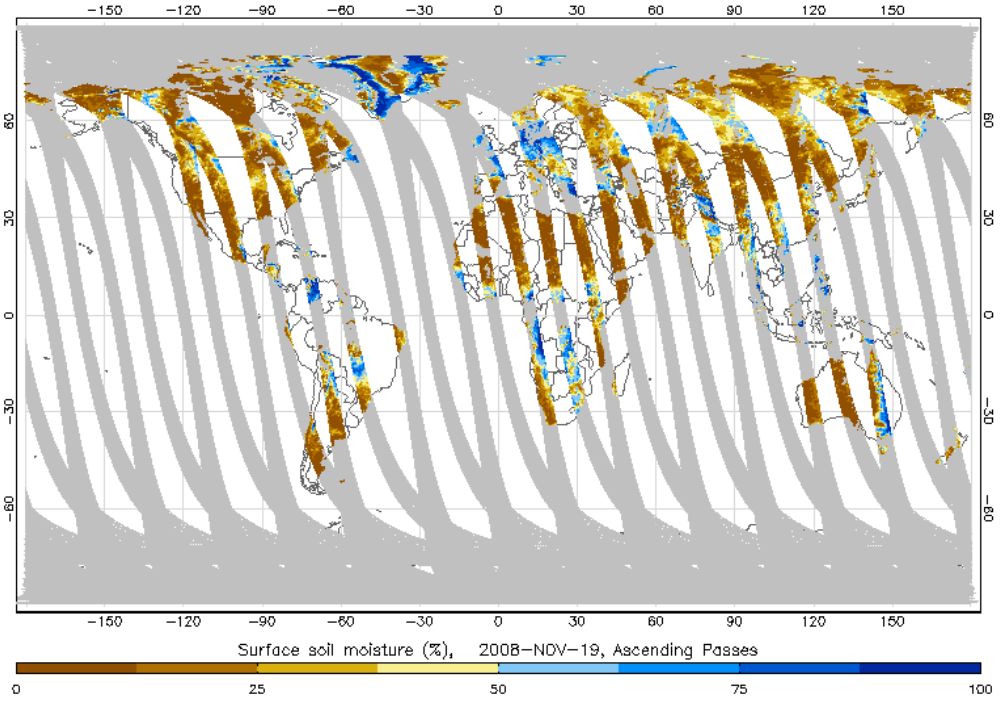
After 6 months of trial dissemination, the service will be declared operational and start open dissemination on 02/12/08 (including GTS)

Next steps

Cross-calibration with ERS scatterometer and removal of s0 bias corrections will be addressed

L2 Soil moisture – daily coverage





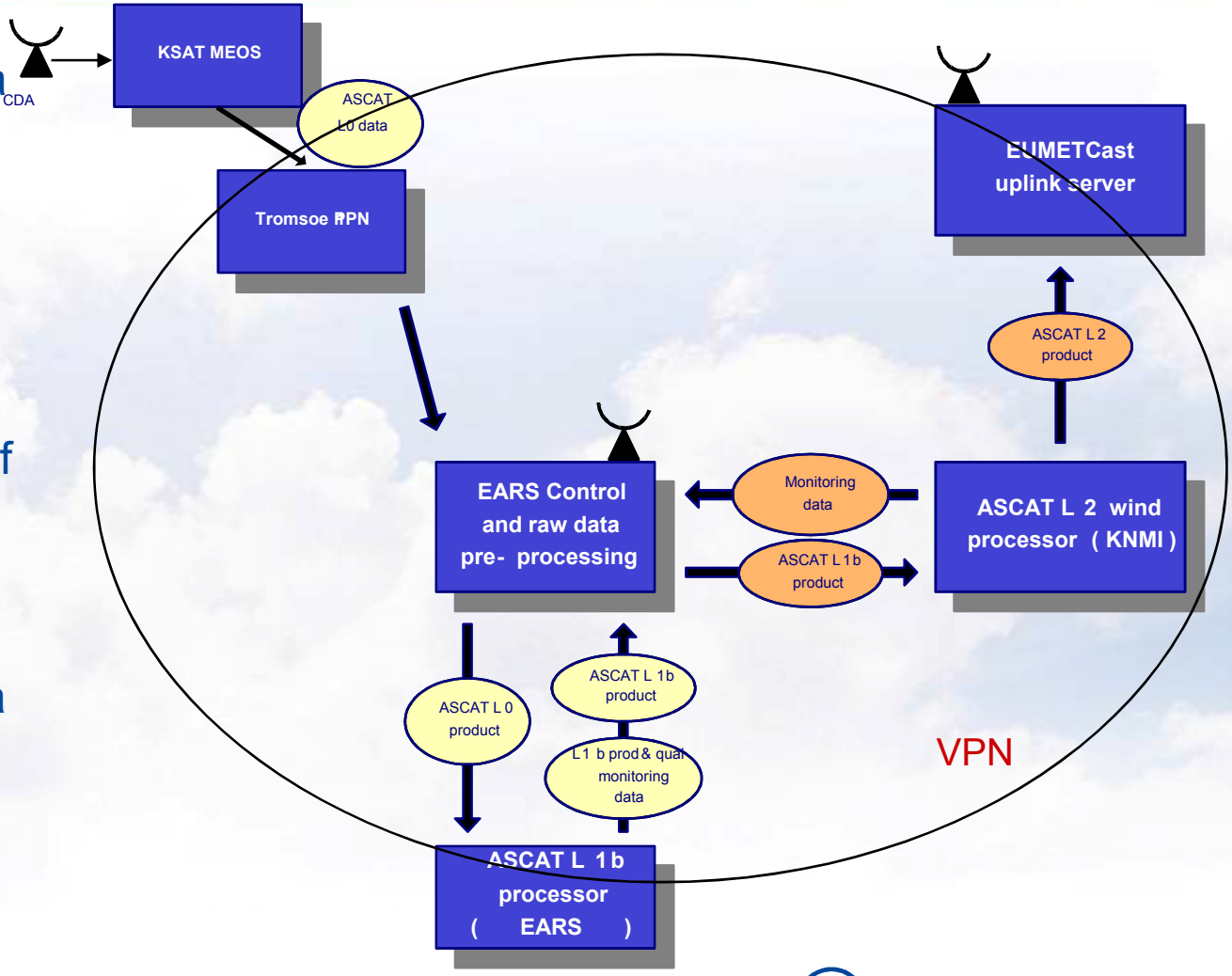
ftp://adsp_01:12qwas@cvfftp.eumetsat.org/../ASCAT_SOMO/output/html/index.html

EARS ASCAT L2 winds – system overview

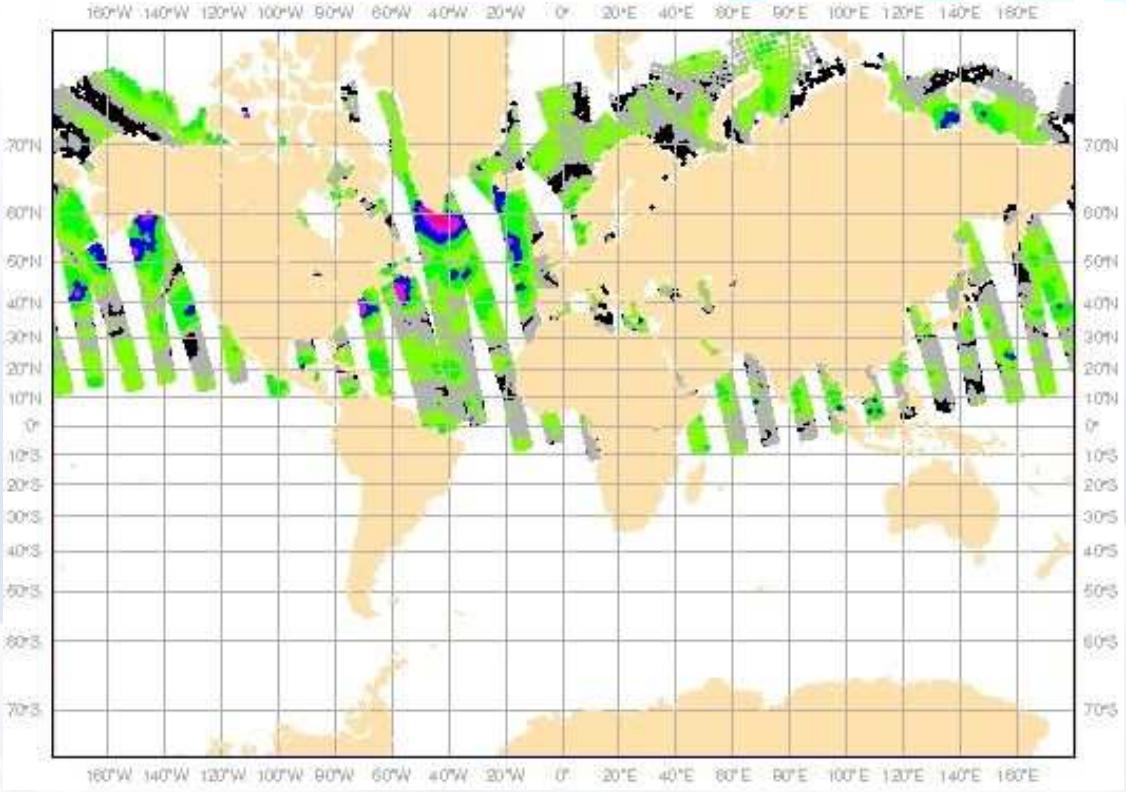
System requirements and design tailored to AHRPT data feed.
… but AHRPT failure on 04/07/2007

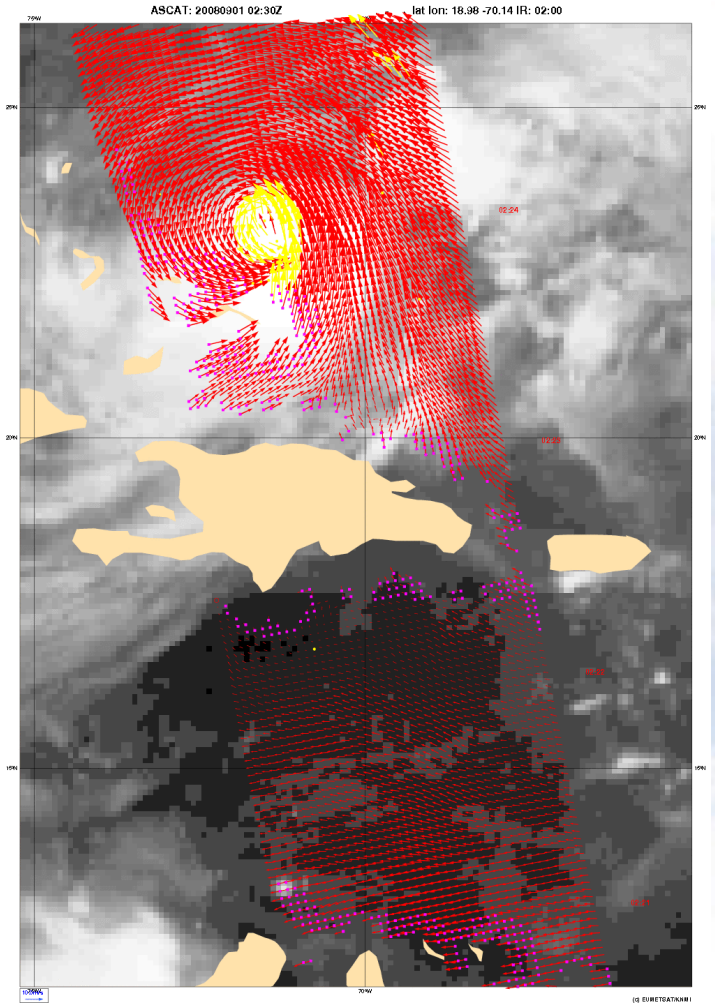
Current data feed from global data dump: 14 Metop dumps/day. Last 30 minutes of ASCAT extracted for further L1b + L2 processing

Timeliness: 40-45 min for data over equator, 15 minutes for data over high latitudes!



EARS ASCAT L2 winds - coverage





Pictures provided by KNMI
Pass over Hanna, Sept 1st, processed and disseminated within 40 min of sensing

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EARS ASCAT L2 winds - Current status and future plans

Trial dissemination of EARS ASCAT products on EUMETCast involving users started in early summer 2008

It has been agreed to start operational dissemination in December 2008 and to continue with the EARS SCAT demonstration running in parallel

Plans are on going to adapt the current system to process AHRPT data when/where available

Concluding remarks

L1b

Calibration settled, pending dynamic implementation of normalisation. Product is good for operational forecasting applications

Issues to address in the context of oceanographic and climate applications: Lb averaging, reprocessing

L2 soil moisture

Start of operational dissemination in Dec08, product tailored for NWP assimilation

EARS ASCAT L2 ocean winds

Fast ocean winds, tailored for Regional forecasting and Nowcasting, timeliness is 15 minutes for high latitudes

Dissemination

Worth considering GEONETCast as a global dissemination mechanism for operational applications

Useful links

ASCAT Products guide

http://www.eumetsat.int/Home/Main/Publications/Technical_and_Scientific_Documentation/EPS_Product_Guides/index.htm

EUMETSAT User Services

www.eumetsat.int

Contact directly the ASCAT team

ascat_calval@eumetsat.int

Ocean and Sea Ice SAF page

www.osi-saf.org

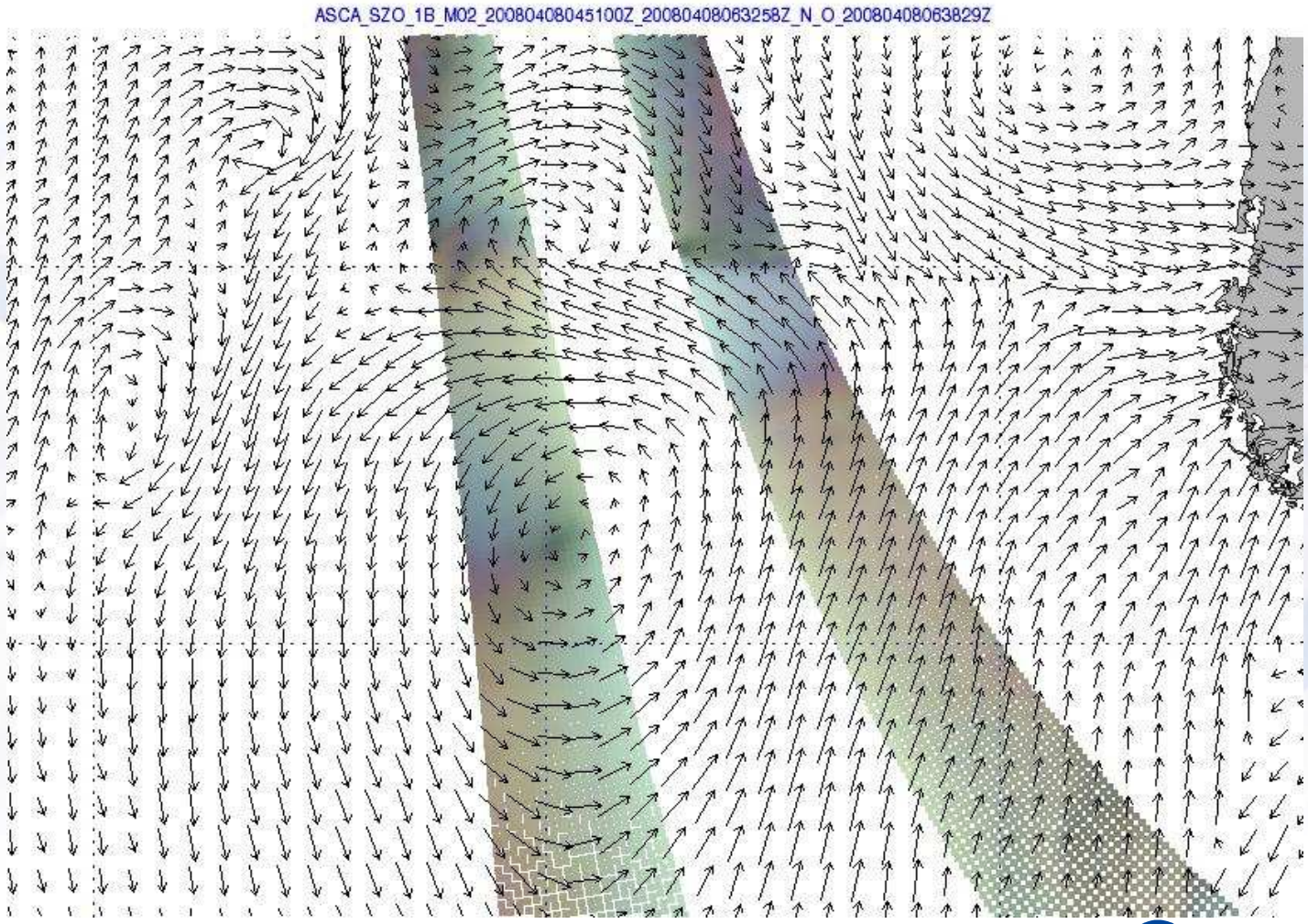
The scatterometer page at KNMI

www.knmi.nl/scatterometer

The scatterometer soil moisture at TUWien

http://www.ipf.tuwien.ac.at/radar/

L1b – a lot of information in the sigma0 ‘image’



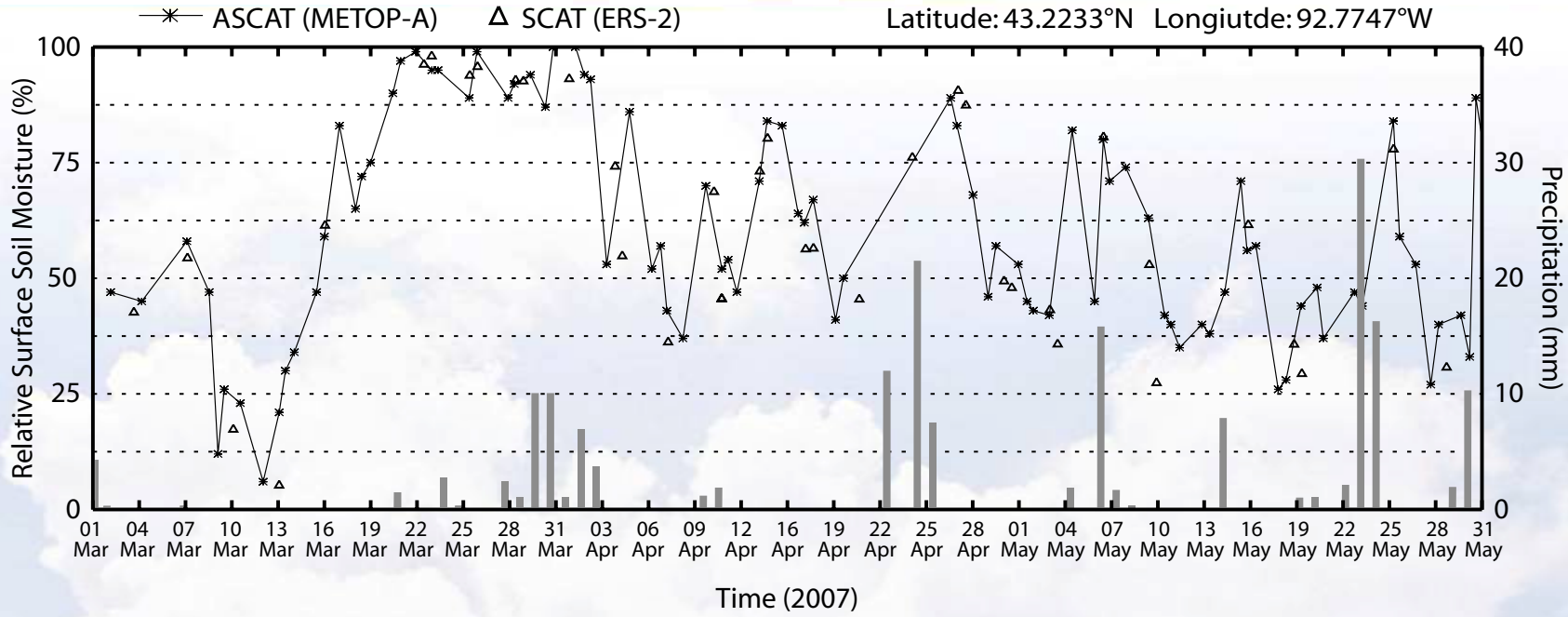
Need for dynamic implementation of s0 normalisation

ASCAT processor uses a static representation of power-to-s0 normalisation factors for a reference Metop orbit –> it is implicitly assumed that orbit height and satellite attitude are invariant from orbit to orbit and from cycle to cycle.

But orbit height and attitude do vary from orbit to orbit, up to about 500 m, which brings on a s0 error of +/-0.05 dB

Plans for dynamic generation of normalisation factors are underway, in order to make the best of the orbit information available on time, without significantly affecting the timeliness of the products. Implementation planned for April 2009

L2 Soil moisture – validation



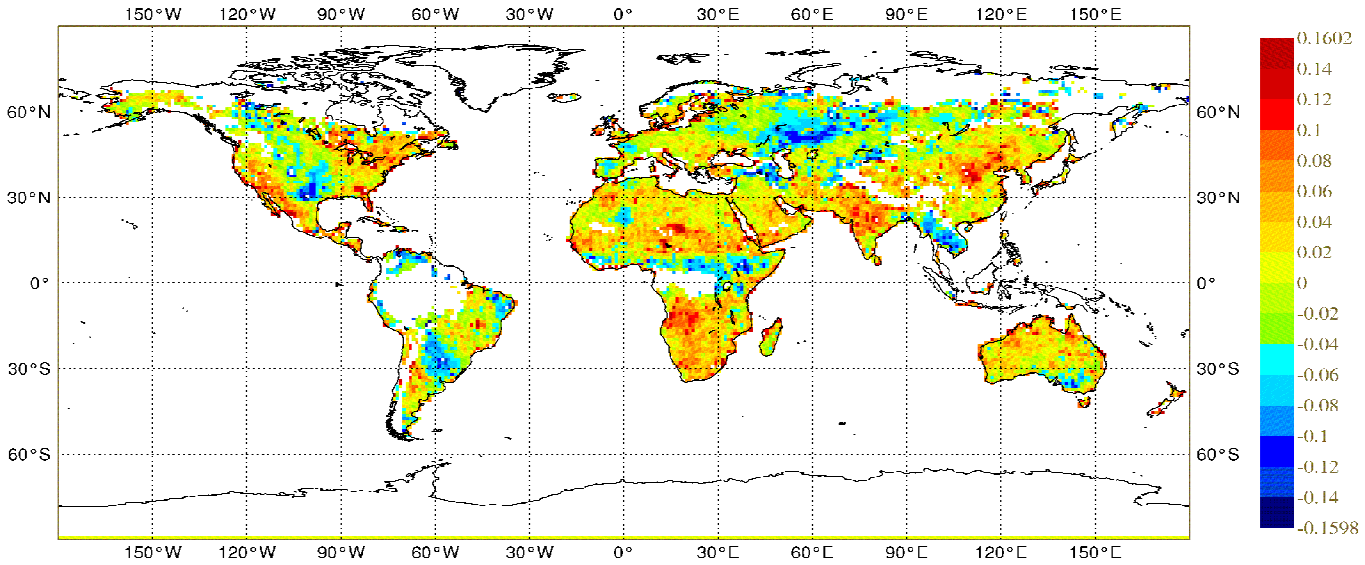
Correlation with rainfall events

Northern Iowa, USA, precipitation data indicated as grey bars.

Courtesy of TUWien from the paper “ASCAT Soil Moisture: An Assessment of the Data Quality and Consistency with the ERS Scatterometer Heritage” by Naeimi V., Bartalis Z., Wagner W., accepted by JHM, 2008

L2 Soil moisture – validation

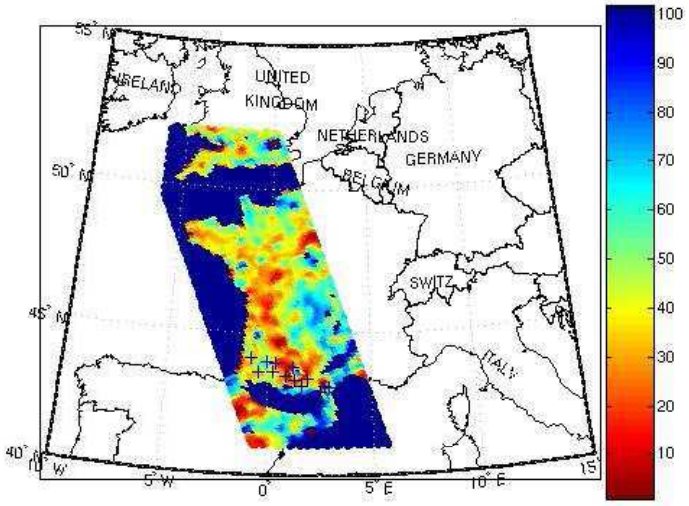
ASCAT SOIL MOISTURE
MEAN ANALYSIS DEPARTURE (OBS-ANA)
DATA PERIOD = 2007050100 - 2007052000
EXP = ez49
Min: -0.480544 Max: 0.521605 Mean: 0.012312



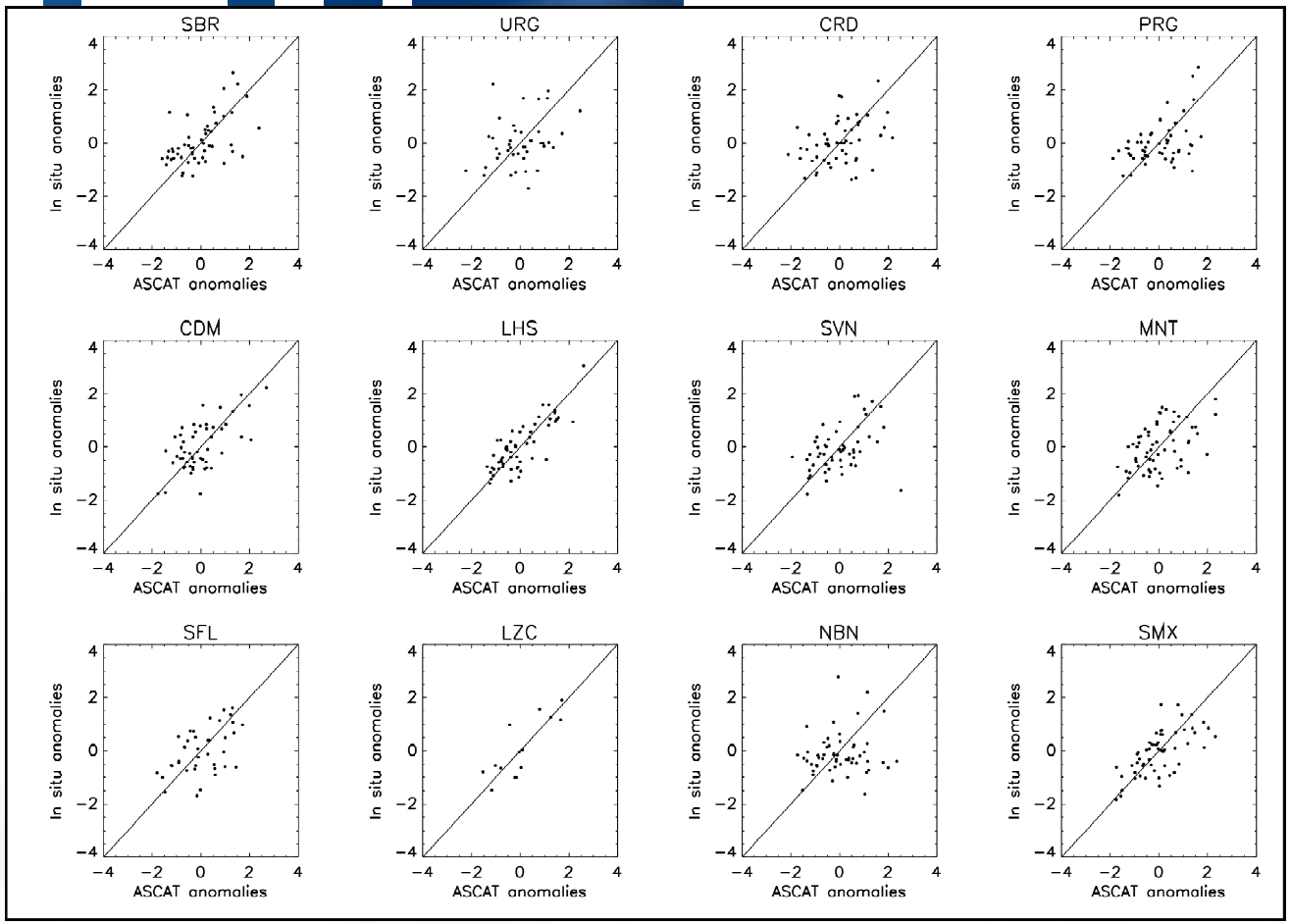
Comparisons with ECMWF mode surface soil moisture

Provided by ECMWF

L2 Soil moisture – validation



ASCAT surface soil moisture swath over France: "+" symbol are for the twelve stations of the SMOSMANIA network and SMOSREX



In-situ anomalies as a function of ASCAT anomalies for descending orbits between 1 April and 30 September 2007
Provided by Meteo-France

L2 Soil moisture – algorithm limitations

Limitations

Dense Vegetation (backscatter saturates, no penetration)

Snow and ice (backscatter “unpredictable”, can be high or low depending on water content, surface thaw and roughness)

Frost (backscatter from frozen soil similar to that of dry soil)

Azimuthal effects (orientational topography, constructive interference at wavelength scale)