

1. MISSION STATUS: DATA AVAILABILITY
2. REPROCESSING
3. NRT LIGHT PRODUCT
4. RFI

DATA AVAILABILITY

ACQUISITION AND PROCESSING



Acquisition → not really a limiting factor

From 1 April 2010 till 11 Sept 2011

	Acquired/Planned	Acquired/Planned (excl failure on-board)
ESAC	97.2	97.9
Svalbard	98.0	99.5
Average	97.8	99.1

But – due to 2-orbit overlap between ESAC and Svalbard - no data gap, i.e. all data acquired by SMOS are ingested in the DPGS at ESAC

Processing → limits due to processor performance, 5-6% max

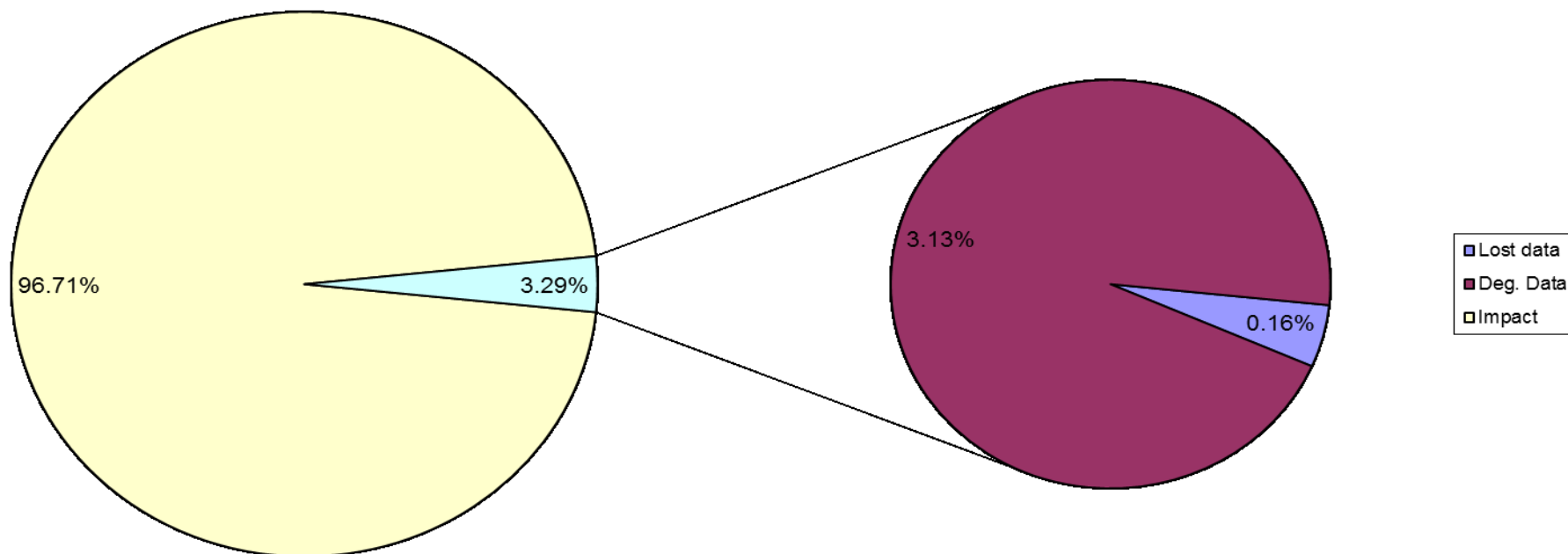
[%]	April-Dec 2010	Q1/2011	Q2/2011	Average
Level 0	98.5	91	98.7	96.1
Level 1	95.9	88.9	98.7	94.5
Level 2 SM	95.4	88.7	98.6	94.2
Level 2 OS	95.8	88.7	98.6	94.4
NRT-P	96.6	90	98.7	95.1
Delivery NRT within 165min	62.9	85.2	82.9	77.0

DATA AVAILABILITY CALIBRATION

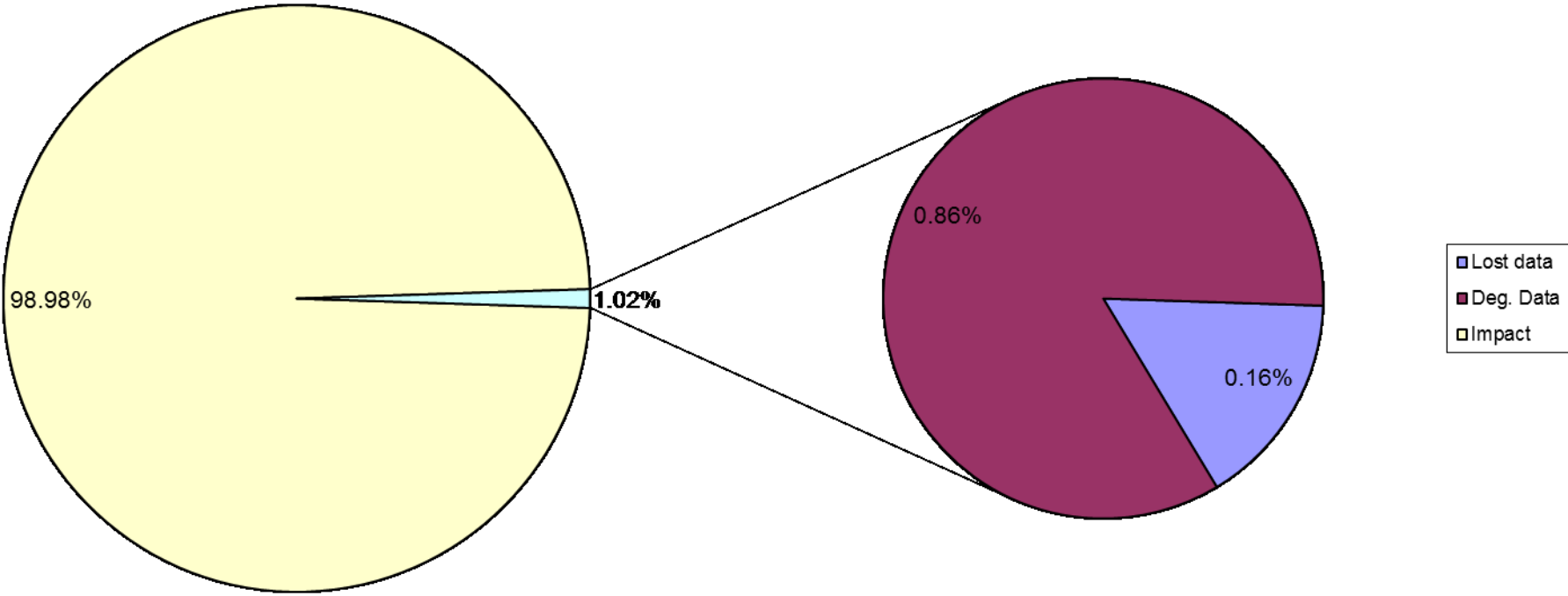


Calibration activity	What it does	Impact on availability data
Flat Target Acquisition (6 months)	Measurement of Flat Target Response (antenna errors)	0.038 %
Long Calibration (8 weeks)	Measurement of receiver and correlator errors	0.132 %
Cold Sky Calibration (2 weeks)	Measurement of Noise Injection Radiometer gain-offset	0.496 %
Short Calibration (1 week)	Measurement of detector offset	0.017 %
Local Oscillator (10 minutes)	Measurement of local oscillator phase	1 %
	Total of time spent on calibration activities on acquired data	1.68 %

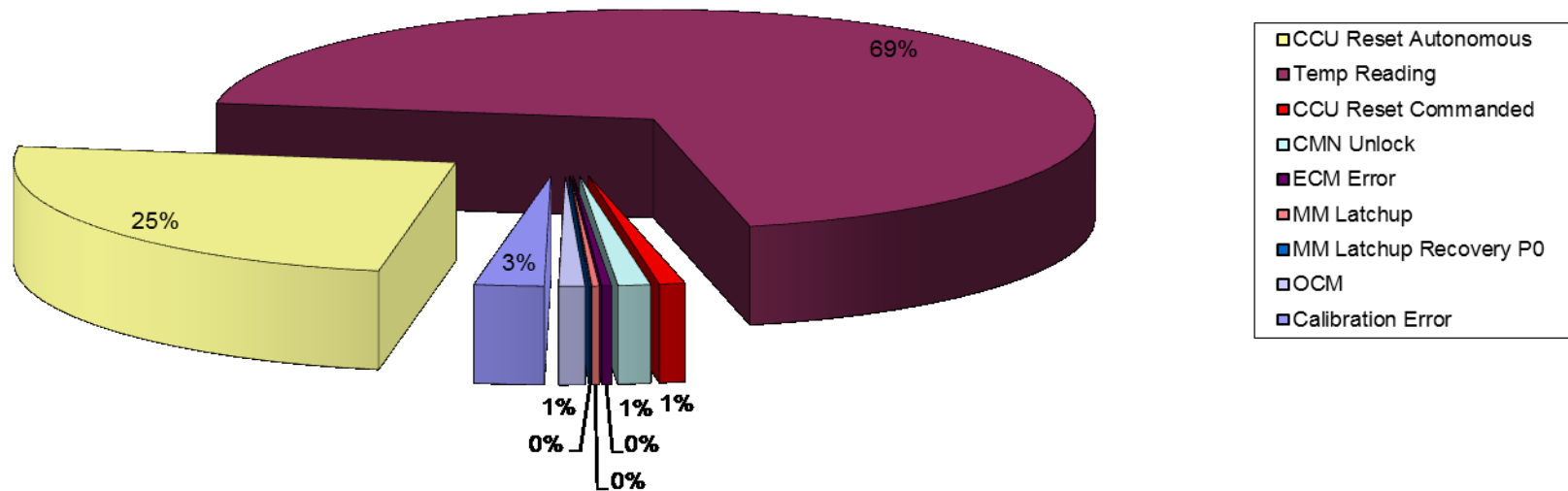
DATA AVAILABILITY ANOMALIES



DATA AVAILABILITY ANOMALIES



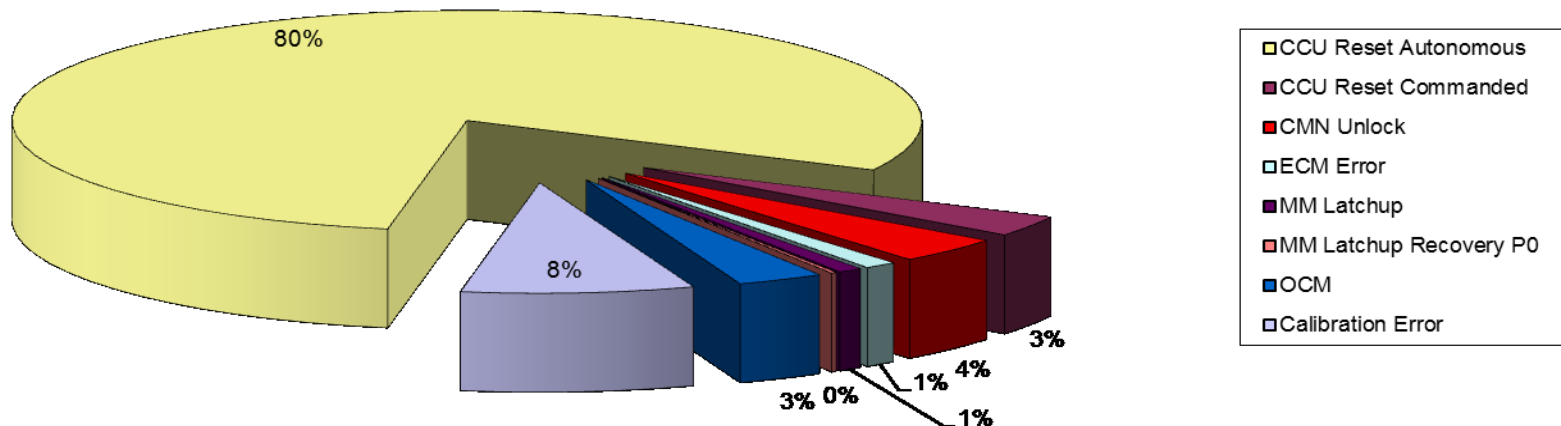
Unavailability Per Event (all) Total time = 395h58'



Contributors to Unavailability (10.0 months of data)

ECMWF, PM 7 November 2011

Unavailability Per Event (No B1 event) Total time = 123h17'

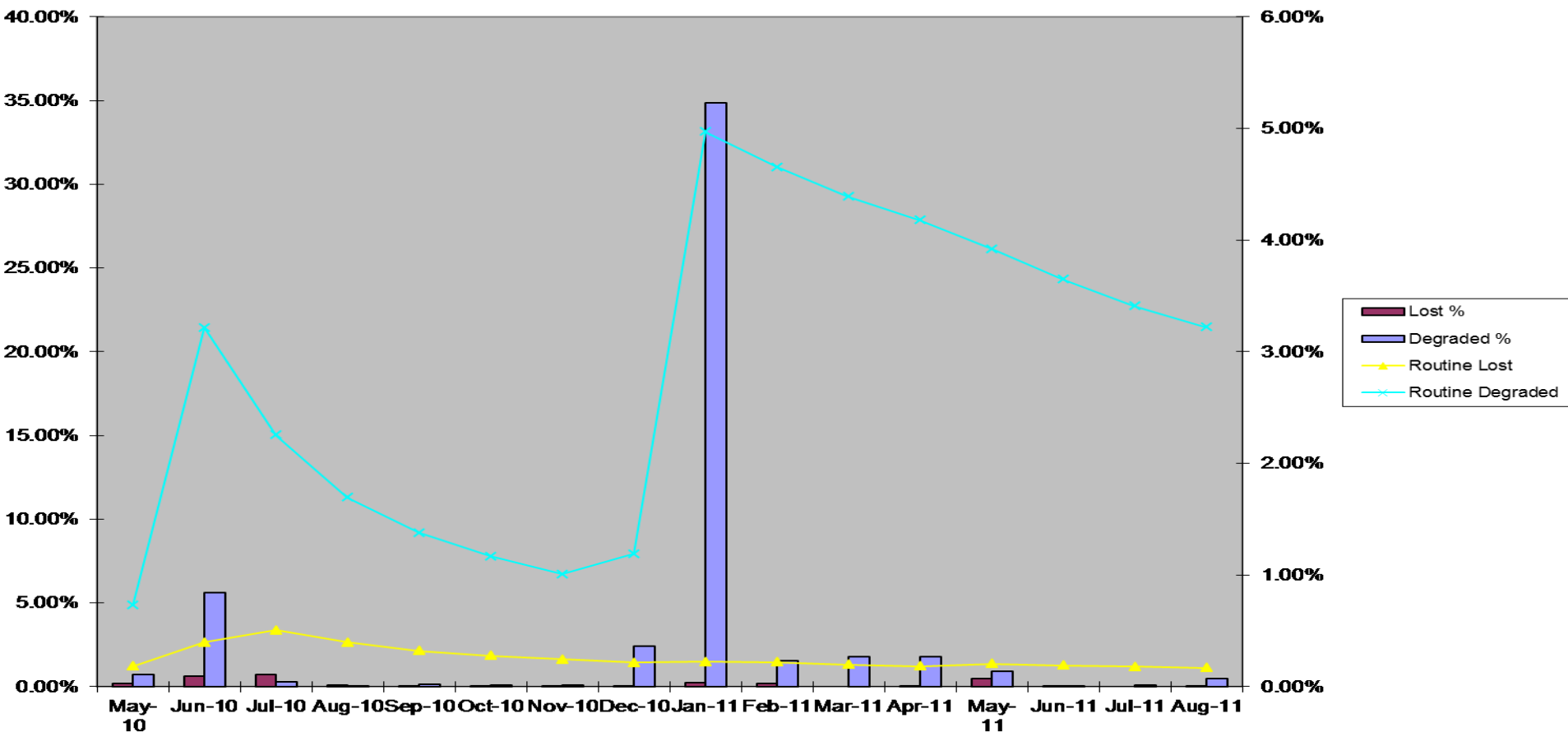


Contributors to Unavailability, No B1 (10.5 months of data)

ECMWF, PM 7 November 2011

European Space Agency

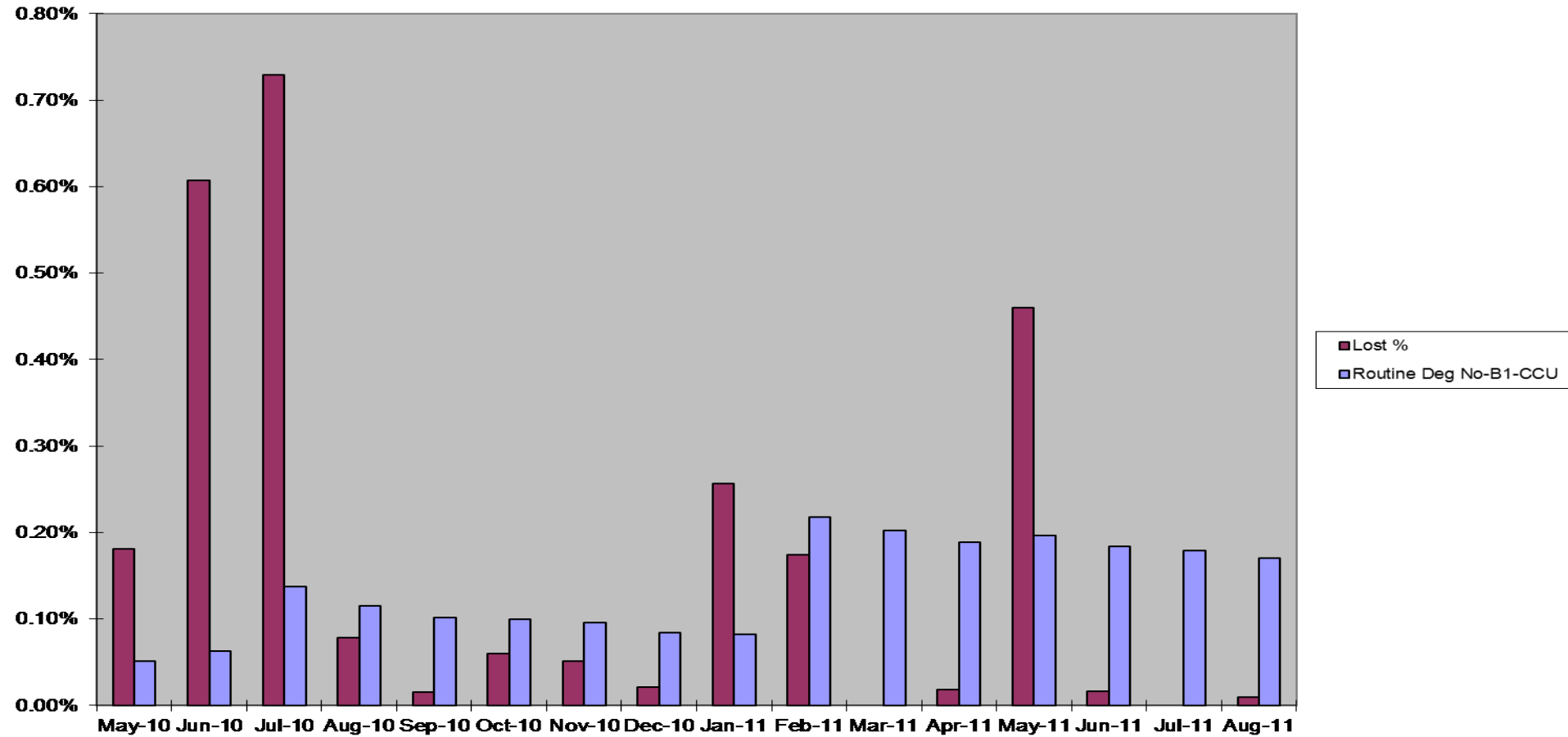
DATA AVAILABILITY ANOMALIES



Monthly Evolution of Unavailability

ECMWF, PM 7 November 2011

DATA AVAILABILITY ANOMALIES



Monthly Evolution of Unavailability without B1 and CCU reset degradation

Summary for **ANOMALIES**

- 1. Availability (Degraded + Lost) is above around 3.3%**
- 2. However, biggest contributor for degraded data was B1 anomaly, not likely to re-occur**
- 3. Not taking this into account, the availability for 16.5 months after commissioning is around 1%.**
- 4. Still, biggest contributor in that figure is the instrument miss-configuration after CCU reset. Without it, total unavailability would be around 0.33%.**
- 5. Work in progress (patch to the ASW) to set a valid configuration after reset, to be implemented in October 2011. Will avoid degradation.**
- 6. Unavailability now takes into account any calibration not reflected in the Routine Calibration Plan.**

100% SCIENCE DATA AVAILABLE

- 1. ACQUISITION:** no data loss due to overlap of 2 orbits so far
- 2. CALIBRATION:** 1.68%
- 3. ANOMALIES:** 0.16% loss of data, 3.13% degraded data
(without TB1 anomaly: 0.16% loss of data, 0.86% degraded data)
- 1. DATA PROCESSING:** up to 5.8% of data unavailable for science data
(no time requirement for delivery); after improvements to NRT chain
16% of data not delivered in NRT (includes also network).

DATA PROCESSING & DISTRIBUTION

REPROCESSING



“Validation” reprocessing to test processor improvements etc = several months of data with different processor settings

- Test bed for processors
- L1v450 and L2SM v500 ready to be used
- L1 V502 to be installed
- L2OS v500 ready in Sept 2011

“Commissioning” reprocessing to create consistent data set for commissioning period until Jan 2011

DONE

- L1OP v346 with fixed cal
- NRT conversion of L1C data for L1OP v346 with fixed cal (full data set)
- L2SM v400 based on L1OP v346 fixed cal

Annual baseline change = reprocessing of entire data set

- reprocess complete data set for processor versions L1OP v502, L2OS v500 by ESA and L2SM v500 (multi-thread) by CNES
- to start for L1 end of Oct; first delivery of L1 data to CNES end of Nov
- ALL reprocessed data released Feb 2012
- Distribution via Brockmann cal&val portal (geographically limited) and hard disks (global data sets)

NB: Deployment of L1OP v504, L2OS v500 and L2SM v500 in DPSG mid Oct = next baseline

DATA PROCESSING & DISSEMINATION

NRT PRODUCT & DISSEMINATION



- reprocessed (=converted) NRT data available since July 2011, delivered to ECMWF
- Timeliness for delivery of NRT product has improved to, on average, 85% for delivery within 165 min
- NRT “light” product → proposal has been approved and work started, first data sent to UK Metoffice last week, final acceptance end Nov
- UK Metoffice will distribute NRT light product via GTS network, making it accessible to further operational agencies mainly
- Possible interest of Eumetcast to distribute NRT light product on ESA’s behalf

DATA PROCESSING & DISSEMINATION

SMOS NRT "LIGHT" PRODUCT: DISSEMINATION

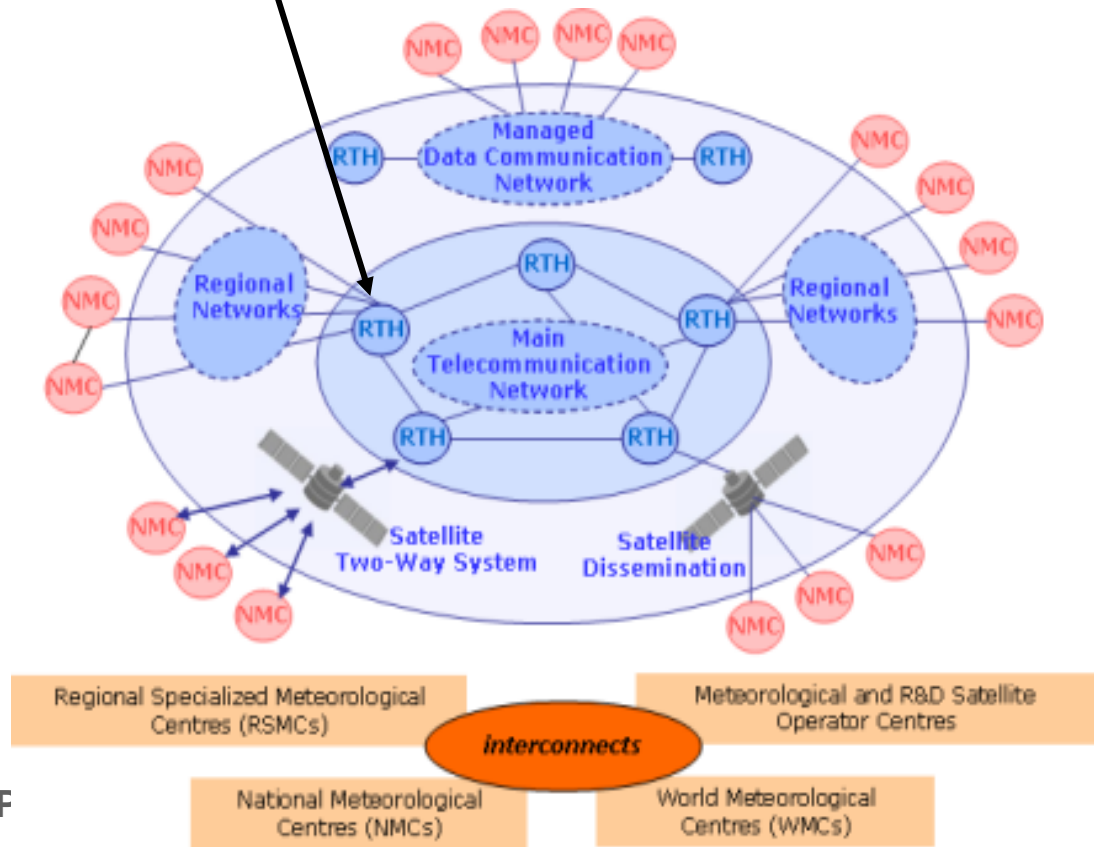


→
"light" NRT
BUFR product

UK Met Office

Requirements:

- WMO standard format
- reduced size of less than 30 MB / half orbit



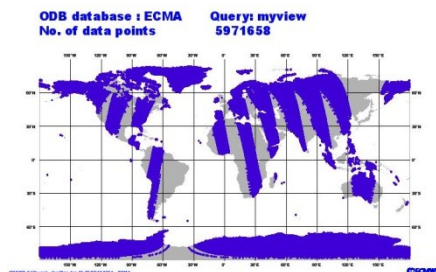
DATA PROCESSING & DISSEMINATION

SMOS NRT "LIGHT" PRODUCT: SPECIFICATION



Scientific Requirements / QWG Recommendations:

- full angular resolution
- no averaging of TBs in the antenna reference frame
- regular grid
- land coverage



ECMWF reduced Gaussian Grid	Number of nodes	% of DGG grid	% of DGG over land (threshold = 50%)
T511	348.528 (100%)	13.3%	101.197 (3.9%)
T799	843.490 (100%)	32.2%	244.428 (9.32%)

Specifications:

- T511 spectral resolution / N265 reduced Gaussian Grid
- land points only
- no interpolation, processor will use a "light" NRT AUX_DGG file

SMOS RADIO-FREQUENCY INTERFERENCE



RFI – Degradation of SMOS brightness temperature observations through interfering active sources emitting in same spectral band.

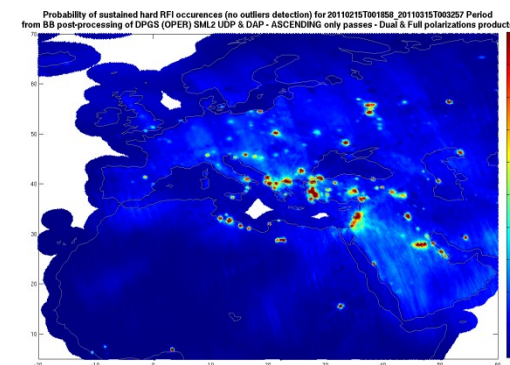
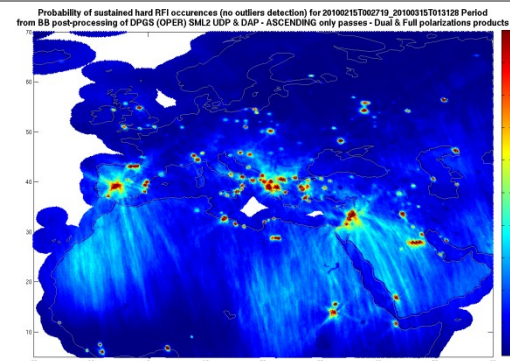
RFI impacts data over land and ocean.

ITU and WRC resolutions were adopted to protect the passive L-Band (1400-1427 MHz) and prohibit all emissions in this band.

Nevertheless strong interference sources have been detected worldwide, especially in Southern Europe, China, Southern Asia and the Middle East.

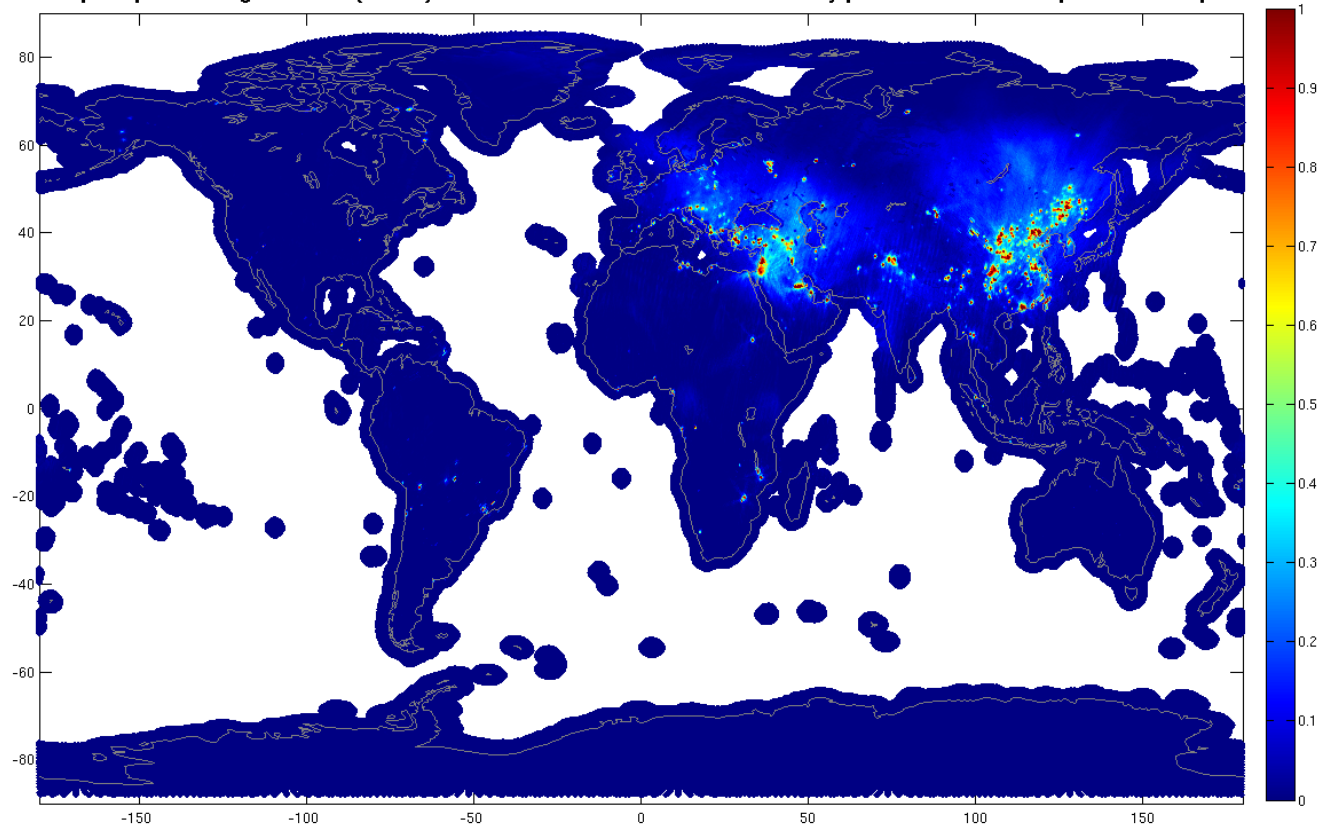
ESA's and the SMOS scientists' instant reaction to the RFI occurrence has significantly improved the overall situation

- ESA is in contact with European and International National Frequency Management Authorities to investigate the RFI sources and initiate actions to cancel (or mitigate) these interferences.
- Major improvement of RFI situation over Europe: From March to Dec 2010, 48 interferers were successfully located and switched-off.
- In parallel ESA in collaboration with scientists addresses detection, mitigation or flagging of RFI in the SMOS data (NB: Decision to operate SMOS in full - as opposed to dual - polarisation mode at the end of commissioning was also inspired by scientists' wish for RFI detection based on full pol capability



Probability of RFI occurrences over Europe in March 2010 (top) and March 2011 (bottom), showing effect of switching OFF several strong interferers. Strong RFI sources can contaminate large areas of SMOS data - A single interferer over Spain could contaminate about 75% of Western Africa!

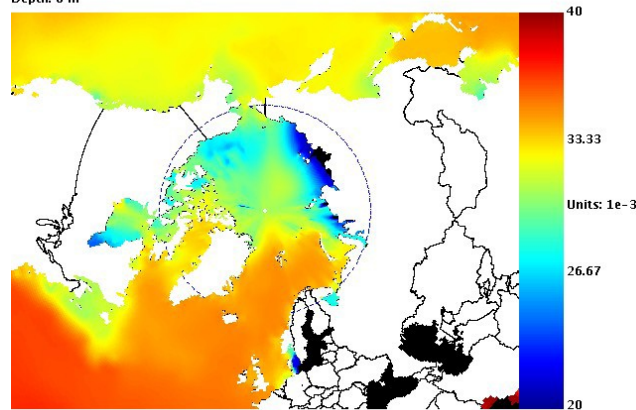
Probability of sustained hard RFI occurrences (no outliers detection) for 20110801T001817_20110831T150530 Period (881 half orbits) from BB post-processing of DPGS (OPER) SML2 UDP & DAP - DESCENDING only passes - Dual & Full polarizations products



RFI contamination probability map for the period 1st to 31st August 11, *Credits: CESBIO (France)*

RFI OVER OCEANS

My ncWMS server > Hadoop Test > sea_water_salinity
 Time: 2010-01-15T00:00:00.000Z
 Depth: 0 m

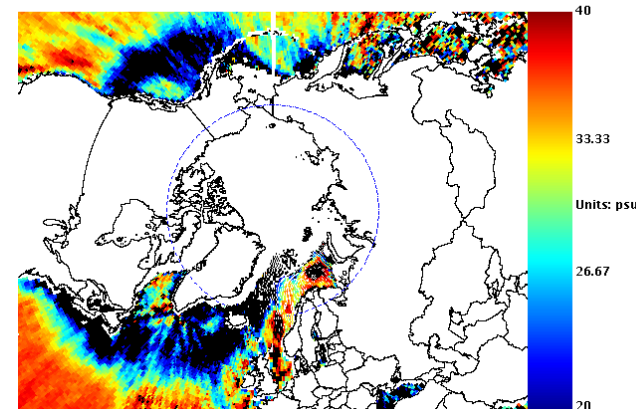


In-situ

1. Largest contamination → Northern hemisphere high latitude, particularly over the North Pacific and Atlantic oceans and during ascending passes
2. How is the RFI impact seen? Quasi-circumpolar belt of high brightness levels (+30 K wrt ocean brightness temperature) polluting data acquired north of 40°N latitude

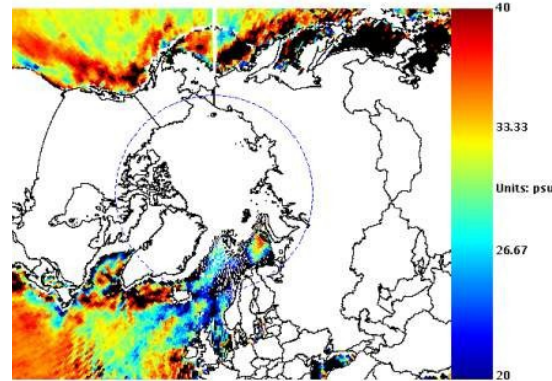
➤ RFI source: compatible with radar systems in Northern America and Southern tip of

My ncWMS server > SMOS L2OSUDP Monthly 025x025 Asc > theoretical uncertainty computed for SSS2
 Time: 2010-03-31T00:00:00.000Z



April ascending

WMS server > SMOS L2OSUDP Monthly 025x025 Desc > theoretical uncertainty computed for SSS2
 2010-03-01T00:00:00.000Z



April descending

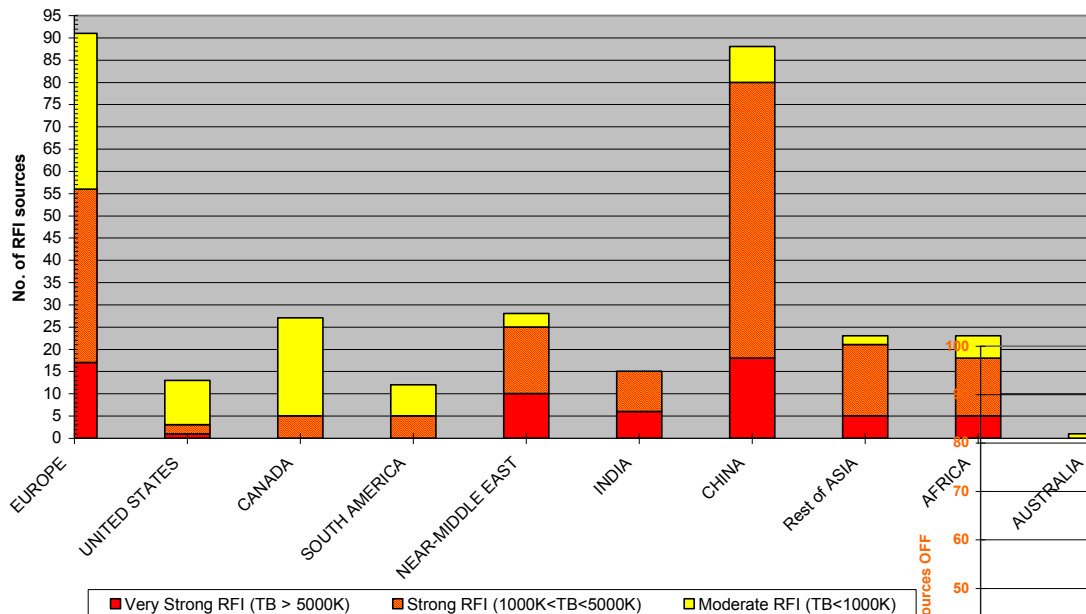
Greenland

Sea Surface Salinity (SSS) → Measurements of approx 32-38 psu over open ocean (practical salinity unit) with 0.1-0.2 psu accuracy after 1 month of data aggregation as requirement

- Variation of 1 K ~ 1-2 psu
- Permanent RFI-induced signal > 0.1 K for 1 month is critical

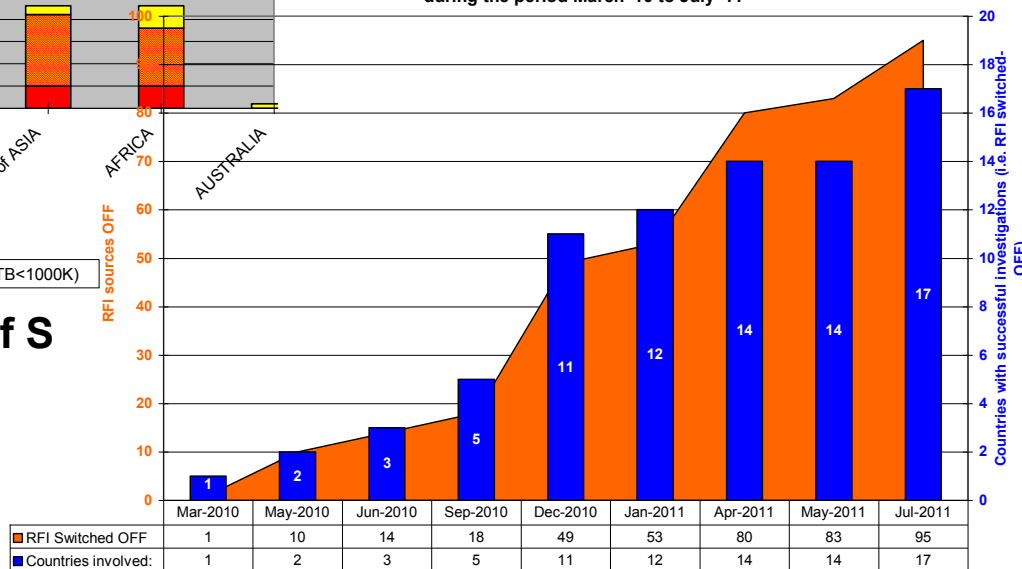
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SMOS RFI scenario worldwide by July 2011:
Distribution of sources per area, with indication of the interference strength



Overview of the progress of SMOS RFI investigations over Europe

Progress of SMOS RFI investigations in EUROPEAN COUNTRIES
during the period March '10 to July '11



Status of worldwide distribution of SMOS RFI (July 2011)