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**Title** : IDEAS – SMOS Public Monthly Report - May 2011

**Abstract** : This document provides a summary of the status and performance of SMOS over the course of the reporting month.

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## TABLE OF CONTENTS

<b>1. EXECUTIVE SUMMARY .....</b>	<b>5</b>
<b>2. INTRODUCTION .....</b>	<b>6</b>
2.1 Structure of the Document .....	6
2.2 Definitions of Terms .....	6
<b>3. INSTRUMENT STATUS .....</b>	<b>9</b>
3.1 Instrument health .....	9
3.2 Instrument unavailabilities and anomalies .....	9
<b>4. DATA SUMMARY .....</b>	<b>11</b>
4.1 Reprocessing activities.....	11
4.2 Processing changes .....	11
4.2.1 Processor updates .....	11
4.2.2 Processor status .....	11
4.2.3 Schema updates .....	12
4.2.4 Schema status .....	12
4.2.5 Aux file updates .....	12
4.3 Calibration Events Summary .....	13
4.4 Data Coverage Summary .....	14
4.5 Summary of degraded data .....	15
4.6 Product Quality Disclaimers .....	16
<b>5. LONG-TERM ANALYSIS .....</b>	<b>17</b>
5.1 Calibration Analysis.....	17
5.2 Product Quality Analysis .....	17
<b>6. ADF CONFIGURATION AT THE END OF THE REPORTING PERIOD .....</b>	<b>22</b>



## AMENDMENT POLICY

This document shall be amended by releasing a new edition of the document in its entirety. The Amendment Record Sheet below records the history and issue status of this document.

### AMENDMENT RECORD SHEET

ISSUE	DATE	DCI No	REASON
A	08 June 2011	N/A	Initial Draft Issue
1	28 June 2011	N/A	First issue
2	19 August 2011	N/A	Classification of gaps in permanent and temporary. Added section for schema updates and schema status. Added information on the pre-processors status. Description of the external manoeuvre for the NIRs have been added in Table 4-4



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## **1. EXECUTIVE SUMMARY**

This is the first routine Soil Moisture and Ocean Salinity (**SMOS**) Monthly Public Report containing a summary of the instrument health, product quality status and, important updates to SMOS processing and AUX files.

The instrument health during May was found to be nominal. There were 5 unavailabilities reported during the reporting period that translate into time intervals with data loss or degraded data. The list of unavailabilities is included in the section 3.2.

The processing was updated during May. The L2 Soil Moisture processor and the ECMWF pre-processor have been updated to the version 401 and version 313, respectively. The major change in both processors is the usage of the Volumetric Soil Water at L1 that will improve the soil moisture retrievals. See section 4.2 for further details on the changes in the processing chain.

The data quality during May was found to be nominal except in the time intervals listed in the section 4.4. The degradation of the data has been induced either by instrument anomalies or by the unavailability of the dynamic auxiliary files.

## 2. INTRODUCTION

### 2.1 Structure of the Document

After this introduction, the document is divided into a number of major sections that are briefly described below:

1 Executive summary

The executive summary covers the main findings from the report.

2 Introduction

A list of referenced documents and definitions of terms are available.

3 Instrument status

This section covers the instrument health and unavailabilities from this reporting period.

4 Data Summary

This section covers reprocessing, updates to processors and aux files as well as a data coverage summary.

5 Long-term Analysis

Long-term analysis of the instrument calibration and data quality are provided in this section.

### 2.2 Definitions of Terms

The following terms have been used in this report with the meanings shown.

Term	Definition
CMN	Control and Monitoring Node, responsible for commanding the receivers, reading their physical temperatures and telemetry and the generation of the synchronization signal (local oscillator tone) among receivers.
CCU	Correlator and Control unit, instrument computer on-board
DPGS	Data Processing Ground Segment
IDEAS	Instrument Data quality Evaluation and Analysis Service, reporting to the ESA Data Quality and Algorithms Management Office (EOP-GQ), responsible for quality of data provided to users including the data calibration and validation, the data processing algorithms, and the routine instrument and processing chain performances.
IPF	Instrument Processor Facility
L2SM	Level 2 Soil Moisture



OCM	Orbit Correction Manoeuvre
RFI	Radio Frequency Interference
N/A	Not Applicable



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### 3. INSTRUMENT STATUS

#### 3.1 Instrument health

The current instrument status is that all the instrument subsystems are working correctly. The current configuration of the instrument is that the arm A and the arm B are working in nominal side and arm C is in the redundant side.

**Table 3-1 History of instrument problems and mode changes**

Start	Stop	Description
11 January 2010 12:07z Orbit 1013	N/A	Arm A changes from redundant to nominal side. That operation is to avoid the malfunction of one of the redundant CMNs of the arm.
12 January 2011 09:15z Orbit 6278	N/A	Arm B changes from redundant to nominal side. That operation is to avoid the malfunction of one of the redundant CMNs of the arm.

#### 3.2 Instrument unavailabilities and anomalies

The unavailabilities and anomalies listed in Table 3-2 occurred during the reporting period. A full list of unavailabilities can be found in the Mission Status section on the SMOS Earthnet website (<http://earth.esa.int/object/index.cfm?fobjectid=7060>).

During these unavailabilities and anomalies the instrument has either not collected data or may have collected corrupt data which may not have been processed to higher levels. and provide details of the data which has been affected by gaps and quality degradation respectively.

**Table 3-2 SMOS unavailability list**

Start	Stop	Unavailability Report Reference	Planned	Description
11 May 2011 13:34:00 Orbit 7993	11 May 2011 13:40:00 Orbit 7993	FOS-0081	Yes	Mass Memory Latchup Recovery
17 May 2011 05:28:00 Orbit 8074	17 May 2011 05:38:00 Orbit 8074	FOS-0082	No	CMN Unlock



18 May 2011 00:35:00 Orbit 8086	18 May 2011 08:35 Orbit 8090	FOS-0083	No	CCU reset
24 May 2011 01:30:00 Orbit 8173	24 May 2011 03:15:00 Orbit 8174	FOS-0084	Yes	OCM
25 May 2011 00:15:00 Orbit 8186	25 May 2011 00:25:00 Orbit 8186	FOS-0085	No	CMN unlock

## 4. DATA SUMMARY

### 4.1 Reprocessing activities

The level 0 reprocessing of the sensing data corresponding to the regenerated AUX\_ORBPRES (from 2010-11-23 to 2011-03-22) was completed on 2011-05-09.

### 4.2 Processing changes

#### 4.2.1 Processor updates

A new L2SM processor version was transferred into operations on 18-May-2011. The L2SM v401 has provided improvements, including a new formulation of the GQX (Goodness of fit), a new formulation for computing forest tau, the usage of Bulletin B information through auxiliary files for geolocation purposes and the usage of the Scaled Volumetric Soil Water L1 parameter from the ECMWF forecasts. Those changes improve the Soil Moisture retrievals.

A new ECMWF processor version was transferred into operations on 18-May-2011. The ECMWF v313 has been updated to provide the Scaled Volumetric Soil Water L1 parameter to the L2 SM processor.

#### 4.2.2 Processor status

At the end of the reporting period, the Processing Facility is using the following processors:

**Table 4-1 Instrument Processors status**

Processor	Version
L1OP	346
L2OS	317
L2SM	401

**Table 4-2 Pre- and Post-processors status**

Processor	Version
ECMWFP	313
VTECGN	309
LAI pre-processor	307
L2 Post-processors	307

### 4.2.3 Schema updates

No schema changes have been conducted during the reporting period

### 4.2.4 Schema status

At the end of the reporting period, the schema version of the datablock of the products generated and distributed through EOLI is:

**Table 4-3 Schema version status**

Product type	Version
MIR_SC_F1B	200
MIR_SCSF1C	201
MIR_SCLF1C	201
MIR_BWSF1C	200
MIR_BWLF1C	200
MIR_SMUDP2	202
MIR_OSUDP2	200
AUX_ECMWF_	201

The schema packages are available from the anonymous ftp site:

<ftp://131.176.251.163/smos/schemas>

### 4.2.5 Aux file updates

The following quasi-static AUX files were disseminated to the processing stations this reporting period. The status of the quasi-static AUX files at the end of the reporting period is in the section 6.

**SM\_OPER\_MPL\_ORBSCT\_20091102T031142\_20500101T000000\_350\_003\_1**

Dissemination date: 2011-05-11 07 :49 :31z

Justification: Bulletin Update including values from November 2010 until January 2011

**SM\_OPER\_AUX\_CNFSMF\_20050101T000000\_20500101T000000\_001\_006\_3.EEF**

Dissemination date: 2011-05-18 15:24:00z

Justification: Configuration file updated for compatibility with the L2SM v401

**SM\_OPER\_AUX\_CNFSMD\_20050101T000000\_20500101T000000\_001\_006\_3.EEF**

Dissemination date : 2011-05-18 15:24:00z



Justification: Configuration file updated for compatibility with the L2SM v401

**SM\_OPER\_AUX\_DFFLMX\_20050101T000000\_20500101T000000\_001\_004\_3**

Dissemination date : 2011-05-18 15:24:00z

Justification: Regenerated LAI Max values for new forest tau formulation to support the new forest tau formulation of the L2SM v401

**SM\_OPER\_AUX\_LANDCL\_20050101T000000\_20500101T000000\_001\_002\_3.EEF**

Dissemination date : 2011-05-18 15:24:00z

Justification: Parametes updated to support the new forest tau formulation of the L2SM v401

### 4.3 Calibration Events Summary

The following table summarizes the major calibration activities conducted during the reporting period. The Local Oscillator calibration is not included in the table since occurs periodically every 10 minutes. The short calibration are acquired since 24 March 2011 but are not used in the nominal processing chain.

**Table 4-4 Calibration summary**

Start	Finish	Calibration	Comments
2011-05-04 02:57:53z	2011-05-04 4:20:06z	NIR Calibration	Nominal  Brightness temperature: 3.88 K  RMS: 0.65 K  Moon elevation: 0.37 deg  Sun Elevation: -3.92 deg  Right Ascension: 127.45 deg  Declination: -25.62 deg
2011-05-05 01:03:40z	2011-05-05 01:57:01z	Long calibration	Nominal
2011-05-05 02:36:45z	2011-05-05 03:30:06z	Long Calibration	Nominal
2011-05-12 15:21:57z	2011-05-12 15:23:41z	Short Calibration	Nominal
2011-05-18 02:12:53z	2011-05-18 03:35:06z	NIR Calibration	Nominal  Brightness temperature: 3.90 K  RMS: 0.79 K



			Moon elevation: -1.51 deg Sun Elevation: -5.60 deg Right Ascension: 141.21 deg Declination: -25.60 deg
2011-05-19 15:53:00z	2011-05-19 15:54:44z	Short Calibration	Nominal
2011-05-26 14:37:00z	2011-05-26 14:38:44z	Short Calibration	Nominal
2011-05-31 02:03:53z	2011-05-31 03:26:06z	NIR Calibration	Nominal Brightness temperature: 3.84 K RMS: 0.49 K Moon elevation: -24.72 deg Sun Elevation: -4.05 deg Right Ascension: 155.79 deg Declination: -15.08 deg

#### 4.4 Data Coverage Summary

Where instrument unavailabilities or anomalies have occurred during this reporting period, gaps in data coverage may have occurred. A list of the gaps due to a permanent data loss is given in Table 4-5 by product level. On the other hand, a list of gaps due to operational problems is given in Table 4-6. The latter gaps may be recovered when the problem is fixed.

The science data gaps due to the execution of calibration activities are not listed in this section.

**Table 4-5 Data loss summary**

Start	Finish	Data Level	Comments
2011-05-11 13:40z	2011-05-11 13:46z	L0 Nominal & NRT Production and higher levels	Invalid data section due to MM latch-up recovery (FOS-0081)
2011-05-18 00:35z	2011-05-18 03:54z	L0 Nominal & NRT Production and higher levels	Gap due to unplanned CCU reset (FOS-0083)



2011-05-24 01:33:29z	2011-05-24 03:14:19z	L0 Nominal & NRT and above	Planned gaps due to the gyro calibration performed on-board (FOS-0084)
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**Table 4-6 Operational gaps summary**

Start	Finish	Data Level	Comments
N/A	N/A	N/A	N/A

#### 4.5 Summary of degraded data

In May 2011 SMOS data was affected by the following instrument and processing anomalies which have had a detrimental effect on the data quality.

The CMN unlocks produced short intervals (10 min) of degraded data. On the other hand, the autonomous CCU reset produced a 4 min data gap and about 6 hours of degraded dual polarization data. Also, a planned CCU reset was conducted as part of the procedure of the Mass Memory Latchup recovery producing a 6 min data gap. Finally, the OCM produced about 100 minutes of degraded data due to the instrument was not in nominal pointing.

**Table 4-7 Summary of degraded data**

Start	Finish	Affected products	Problem Description
12 May 2011 00:00:00  Orbit 7999	16 May 2011 10:16:00  Orbit 8063	L1C and L2 products	The auxiliary file with the prediction of the Ionospheric Electron Content has not been updated during this period.
17 May 2011 05:28:00  Orbit 8074	17 May 2011 05:38:00  Orbit 8074	All products	Wrong instrument calibration due to the CMN unlock (FOS-0082)
18 May 2011 00:35:00  Orbit 8086	18 May 2011 08:35  Orbit 8090	L2 products	Wrong instrument calibration and dual polarization instrument mode due to an autonomous CCU reset. (FOS-0083)
25 May 2011 00:15:00  Orbit 8186	25 May 2011 00:25:00  Orbit 8186	All products	Wrong instrument calibration due to the CMN unlock (FOS-0085)



## **4.6 Product Quality Disclaimers**

In May 2011, no quality disclaimers were issued.





## 5. LONG-TERM ANALYSIS

### 5.1 Calibration Analysis

The calibration parameters are under monitoring. No anomalies have been detected in the reporting period. During the reporting period, there have been NIR calibration events on 4 May and 31 May. The NIR calibration events have been monitored and the noise injection levels of the NIR diodes are inside the range defined in the routine calibration plan.

Also, a long calibration event has been conducted on 5 May to calibrate the PMS parameters, the FWF functions and the correlator offsets. All these parameters are monitored and in the range specified by the routine calibration plan.

### 5.2 Product Quality Analysis

The data quality in the reporting period is nominal except in the time intervals reported in 4.5. The degradations in this period are due to CMN unlocks and the availability of the Ionospheric Electron Content. The former impacts in the instrument phase calibration affecting the radiometric accuracy of the measurements. The latter reduces the accuracy in the L2 retrievals degrading the quality of the soil moisture and sea surface salinity.

The L1 production is nominal as no artefacts are observed in the 1<sup>st</sup> Stokes maps in Figure 1 and Figure 2. All the artificial patterns in the images can be explained by the presence of RFIs. The impact of the RFI in the brightness temperature measurements over land (see Figure 1) can be observed mainly in Europe and Asia. During the reporting period, it can be observed an important RFI at Ohio and Indiana (EEUU) on the second week of the month which reduces the number of successful soil moisture retrievals during that period.

The L2 Soil Moisture and Ocean Salinity production is nominal in the reporting period. Figure 4 shows the evolution of the soil moisture retrievals. Those values present a correlation with the Volumetric Soil Water at L1 (see Figure 5) provided by ECMWF. Some differences between the ECMWF forecast and the soil moisture retrieved are observed in the ascending passes. That behaviour will be monitored and in case of any problem, it will be reported in the next Monthly report.

Figure 1 1st Stokes evolution over land during the reporting period

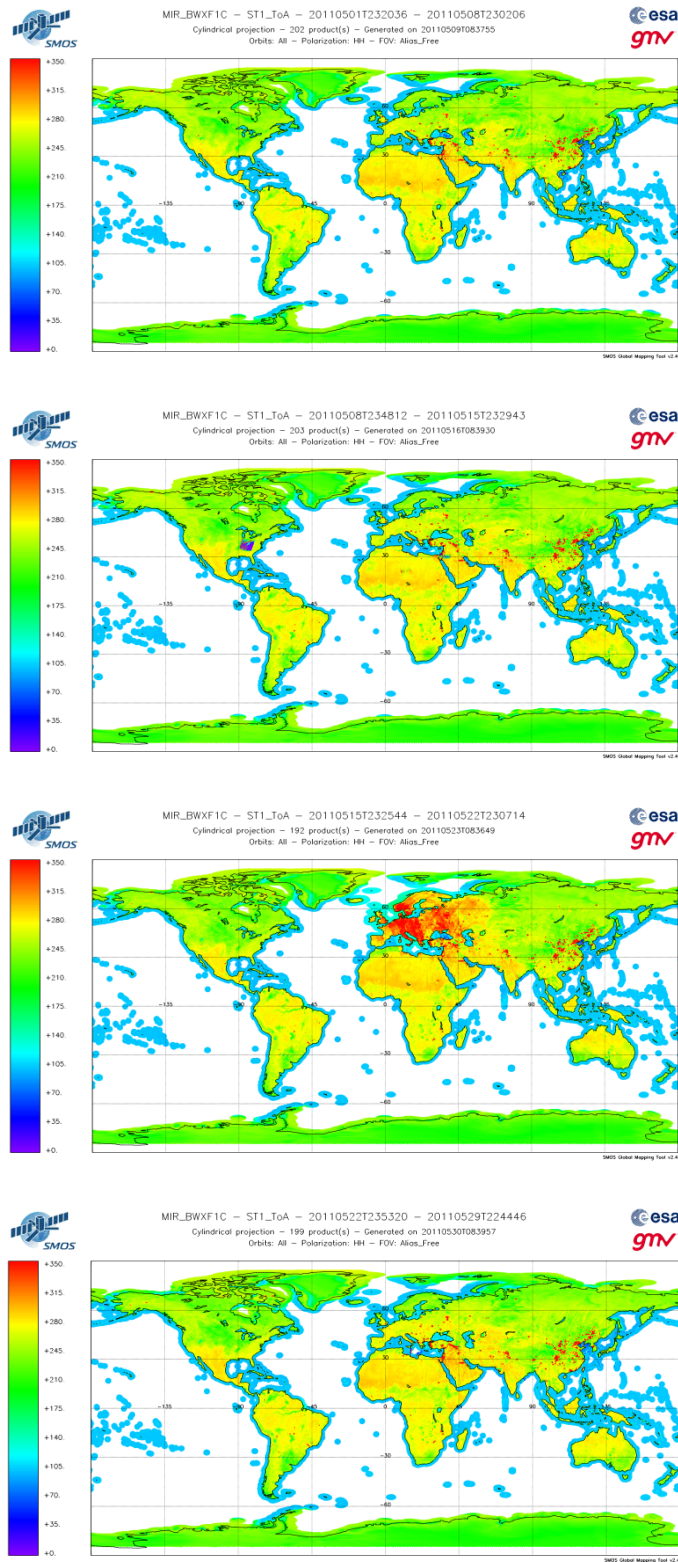


Figure 2 1st Stokes evolution over sea during the reporting period

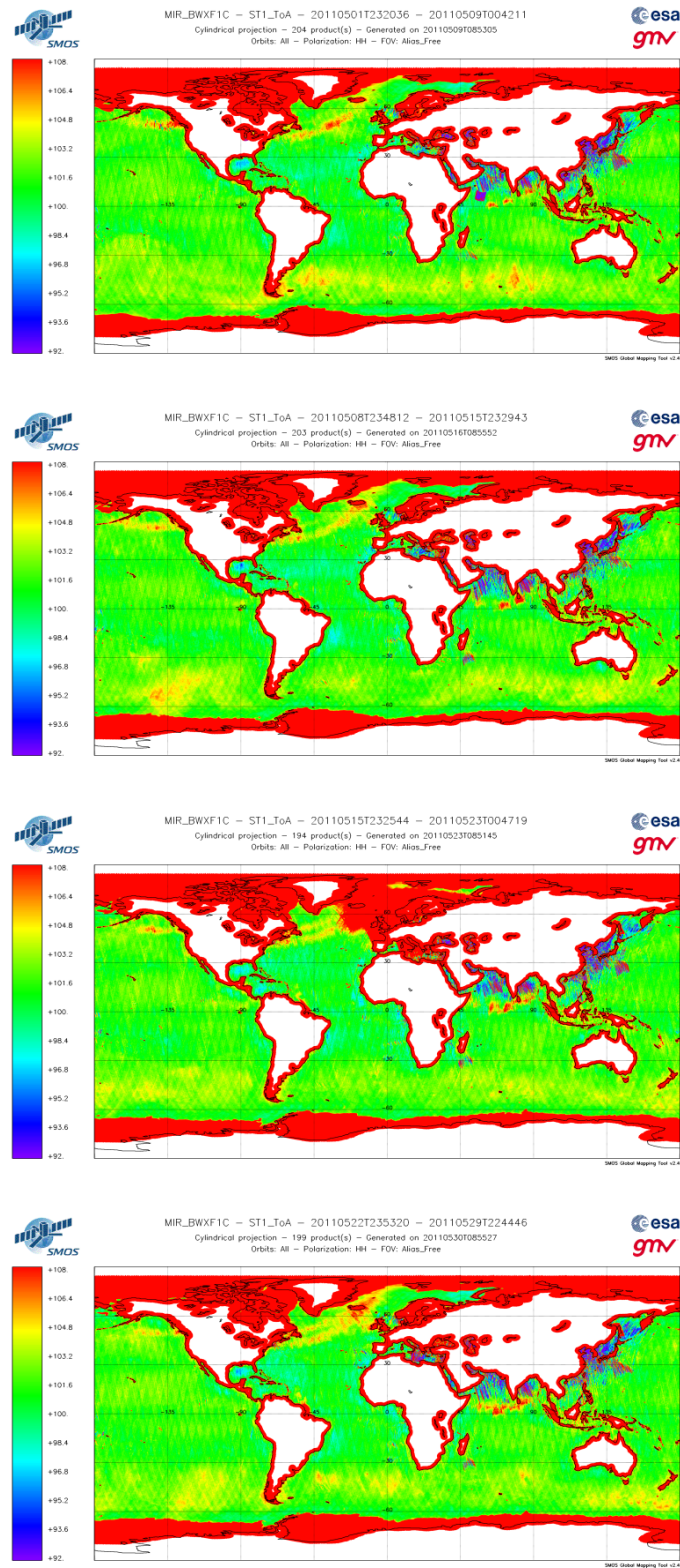


Figure 3 Soil moisture evolution during the reporting period

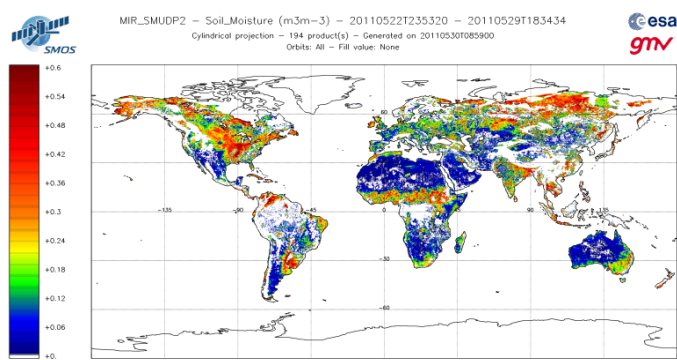
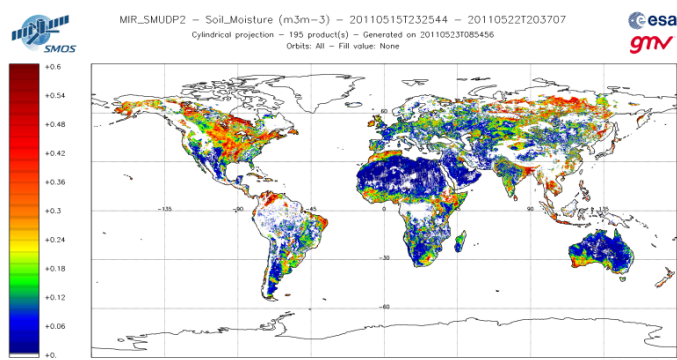
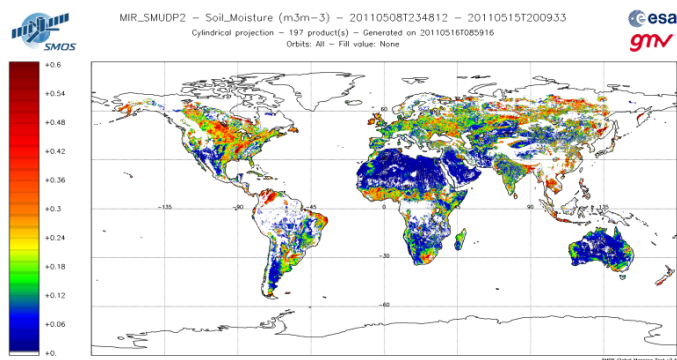
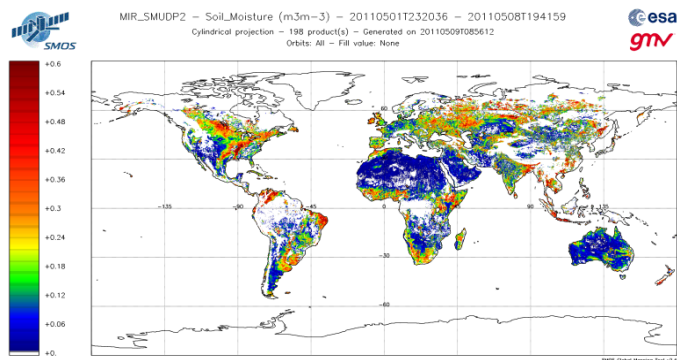




Figure 4 Soil moisture on Taklamakan desert during the reporting period: SM in ascending passes (left) and SM in descending passes (right)

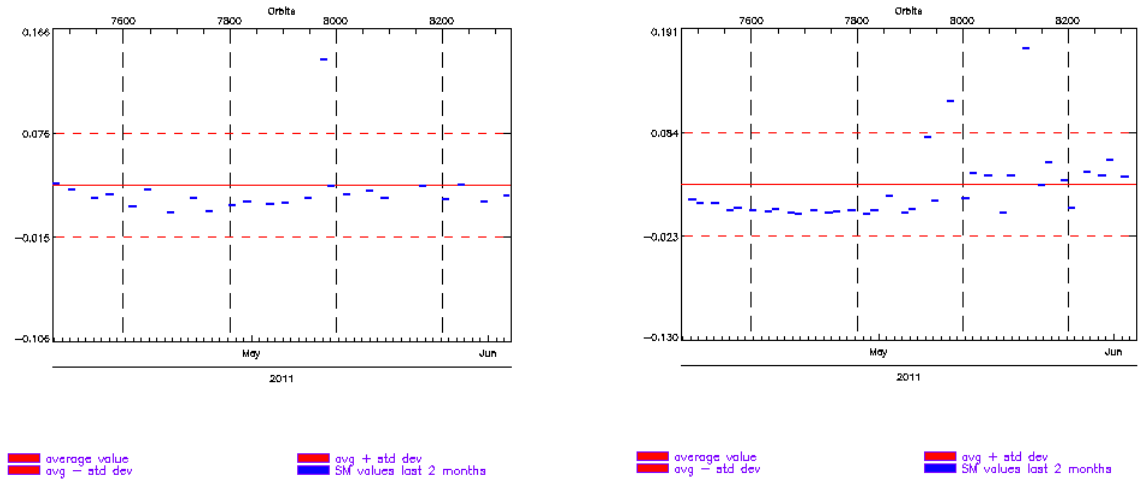
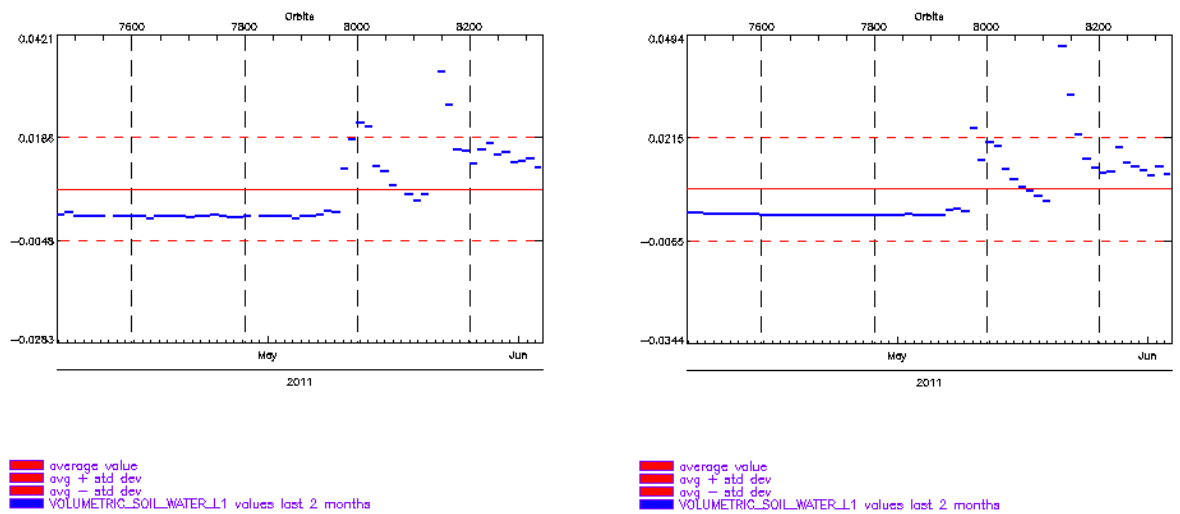


Figure 5 Volumetric Soil Water L1 provided by ECMWF on Taklamakan desert during the reporting period: ascending passes (left) and descending passes (right)





## 6. ADF CONFIGURATION AT THE END OF THE REPORTING PERIOD

ADF File Type	Operational ADF Version (DPGS Baseline)	Updated
AUX_APDL	SM_OPER_AUX_APDL_20050101T000000_20500101T000000_300_001_4.EEF	No
AUX_APDNRT	SM_OPER_AUX_APDNRT_20050101T000000_20500101T000000_207_001_6.EEF	No
AUX_APDS	SM_OPER_AUX_APDS_20050101T000000_20500101T000000_300_001_4.EEF	No
AUX_ATMOS	SM_OPER_AUX_ATMOS_20050101T000000_20500101T000000_001_010_8.EEF	No
AUX_BFP	SM_OPER_AUX_BFP_20050101T000000_20500101T000000_340_002_3.EEF	No
AUX_BNDLST	SM_OPER_AUX_BNDLST_20050101T000000_20500101T000000_300_001_3	No
AUX_BSCAT	SM_OPER_AUX_BSCAT_20050101T000000_20500101T000000_300_002_3	No
AUX_BWGHT	SM_OPER_AUX_BWGHT_20050101T000000_20500101T000000_340_004_3.EEF	No
AUX_CNFFAR	SM_OPER_AUX_CNFFAR_20050101T000000_20500101T000000_100_002_3.EEF	No
AUX_CNFL0P	SM_OPER_AUX_CNFL0P_20050101T000000_20500101T000000_001_005_3.EEF	No
AUX_CNFL1P	SM_OPER_AUX_CNFL1P_20100413T000000_20500101T000000_346_013_3.EEF	No
AUX_CNFNRT	SM_OPER_AUX_CNFNRT_20050101T000000_20500101T000000_341_008_3.EEF	No
AUX_CNFOSD	SM_OPER_AUX_CNFOSD_20050101T000000_20500101T000000_001_016_3.EEF	No
AUX_CNFOSF	SM_OPER_AUX_CNFOSF_20050101T000000_20500101T000000_001_016_3.EEF	No
<b>AUX_CNFSMD</b>	<b>SM_OPER_AUX_CNFSMD_20050101T000000_20500101T000000_001_006_3.EEF</b>	<b>Yes</b>
<b>AUX_CNFSMF</b>	<b>SM_OPER_AUX_CNFSMF_20050101T000000_20500101T000000_001_006_3.EEF</b>	<b>Yes</b>
AUX_DFFFRA	SM_OPER_AUX_DFFFRA_20050101T000000_20500101T000000_001_003_3	No
<b>AUX_DFFLMX</b>	<b>SM_OPER_AUX_DFFLMX_20050101T000000_20500101T000000_001_004_3</b>	<b>Yes</b>
AUX_DFFXYZ	SM_OPER_AUX_DFFXYZ_20050101T000000_20500101T000000_001_002_3	No
AUX_DGG	SM_OPER_AUX_DGG_20050101T000000_20500101T000000_300_002_4	No
AUX_DGGXYZ	SM_OPER_AUX_DGGXYZ_20050101T000000_20500101T000000_001_003_3	No
AUX_DISTAN	SM_OPER_AUX_DISTAN_20050101T000000_20500101T000000_001_011_3	No
AUX_ECOLAI	SM_OPER_AUX_ECOLAI_20050101T000000_20500101T000000_305_006_3	No
AUX_FAIL	SM_OPER_AUX_FAIL_20050101T000000_20500101T000000_300_001_4.EEF	No
AUX_FLTSEA	SM_OPER_AUX_FLTSEA_20050101T000000_20500101T000000_001_010_8.EEF	No
AUX_FOAM	SM_OPER_AUX_FOAM_20050101T000000_20500101T000000_001_011_3	No
AUX_GAL_OS	SM_OPER_AUX_GAL_OS_20050101T000000_20500101T000000_001_010_8	No
AUX_GAL_SM	SM_OPER_AUX_GAL_SM_20050101T000000_20500101T000000_001_001_9	No
AUX_GAL2OS	SM_OPER_AUX_GAL2OS_20050101T000000_20500101T000000_001_013_3	No
AUX_GALAXY	SM_OPER_AUX_GALAXY_20050101T000000_20500101T000000_300_002_4	No
AUX_GALNIR	SM_OPER_AUX_GALNIR_20050101T000000_20500101T000000_300_001_3	No
<b>AUX_LANDCL</b>	<b>SM_OPER_AUX_LANDCL_20050101T000000_20500101T000000_001_002_3.EEF</b>	<b>Yes</b>
AUX_LCF	SM_OPER_AUX_LCF_20110112T091500_20500101T000000_340_009_3.EEF	No
AUX_LSMASK	SM_OPER_AUX_LSMASK_20050101T000000_20500101T000000_300_002_4	No
AUX_MASK	SM_OPER_AUX_MASK_20050101T000000_20500101T000000_300_001_4	No
AUX_MISP	SM_OPER_AUX_MISP_20050101T000000_20500101T000000_300_002_3.EEF	No
AUX_MN_WEF	SM_OPER_AUX_MN_WEF_20050101T000000_20500101T000000_001_001_9	No
AUX_MOONT	SM_OPER_AUX_MOONT_20050101T000000_20500101T000000_300_001_4	No
AUX_NIR	SM_OPER_AUX_NIR_20050101T000000_20500101T000000_340_003_3.EEF	No
AUX_NRTMSK	SM_OPER_AUX_NRTMSK_20050101T000000_20500101T000000_207_001_6	No
AUX_OTT1D	SM_OPER_AUX_OTT1D_20050101T000000_20500101T000000_001_006_3	No
AUX_OTT1F	SM_OPER_AUX_OTT1F_20050101T000000_20500101T000000_001_007_3	No
AUX_OTT2D	SM_OPER_AUX_OTT2D_20050101T000000_20500101T000000_001_006_3	No
AUX_OTT2F	SM_OPER_AUX_OTT2F_20050101T000000_20500101T000000_001_007_3	No
AUX_OTT3D	SM_OPER_AUX_OTT3D_20050101T000000_20500101T000000_001_006_3	No



AUX_OTT3F_	SM_OPER_AUX_OTT3F_20050101T000000_20500101T000000_001_007_3	No
AUX_PATT_	SM_OPER_AUX_PATT_20050101T000000_20500101T000000_320_002_3	No
AUX_PLM_	SM_OPER_AUX_PLM_20050101T000000_20500101T000000_300_006_3.EEF	No
AUX_PMS_	SM_OPER_AUX_PMS_20050101T000000_20500101T000000_340_009_3.EEF	No
AUX_RFI_	SM_OPER_AUX_RFI_20050101T000000_20500101T000000_300_002_3	No
AUX_RGHNS1	SM_OPER_AUX_RGHNS1_20050101T000000_20500101T000000_001_014_3	No
AUX_RGHNS2	SM_OPER_AUX_RGHNS2_20050101T000000_20500101T000000_001_013_3	No
AUX_RGHNS3	SM_OPER_AUX_RGHNS3_20050101T000000_20500101T000000_001_013_3	No
AUX_SGLINT	SM_OPER_AUX_SGLINT_20050101T000000_20500101T000000_001_011_3	No
AUX_SOIL_P	SM_OPER_AUX_SOIL_P_20050101T000000_20500101T000000_001_001_9	No
AUX_SPAR_	SM_OPER_AUX_SPAR_20110112T091500_20500101T000000_340_003_3.EEF	No
AUX_SSS_	SM_OPER_AUX_SSS_20050101T000000_20500101T000000_001_011_3	No
AUX_SUNT_	SM_OPER_AUX_SUNT_20050101T000000_20500101T000000_300_001_4	No
AUX_WEF_	SM_OPER_AUX_WEF_20050101T000000_20500101T000000_001_001_9	No
<b>MPL_ORBSCT</b>	<b>SM_OPER_MPL_ORBSCT_20091102T031142_20500101T000000_350_003_1</b>	<b>Yes</b>



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