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Title : **IDEAS – SMOS Public Monthly Report - April 2012**

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

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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
1	8 May 2012	N/A	First release

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1. EXECUTIVE SUMMARY

This is the 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 during April 2012.

The instrument health during April was found to be nominal. There were five 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 data quality during April 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.

The nominal data processing has been updated to the L2SM v551 for Level 2 on 24-Apr-2012. The details of the new processor are described in section 4.2.1.

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
ESL	Expert Science Laboratory
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
PMS	Power Measurement System
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 may have either not collected data or may have collected corrupt data which may not have been processed to higher levels. Table 4-5, Table 4-6 and Table 4-7 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
2 April 2012 23:46 Orbit 12704	3 April 2012 00:23 Orbit 12704	FOS-0145	Yes	OCM
7 April 2012 16:25 Orbit 12772	7 April 2012 16:46 Orbit 12772	FOS-0146	Yes	Collision Avoidance Manoeuvre (OCM)

17 April 2012 22:09 Orbit 12919	17 April 2012 00:35 Orbit 12919	FOS-0147	Yes	OCM
19 April 2012 02:47 Orbit 12936	19 April 2012 02:57 Orbit 12936	FOS-0148	No	CMN Unlock (B3)
27 April 2012 05:19 Orbit 13053	27 April 2012 05:29 Orbit 13053	FOS-0149	No	CMN Unlock (B3)

4. DATA SUMMARY

4.1 Reprocessing activities

The first SMOS mission reprocessing campaign has been completed and the data set is available to the SMOS user community.

Particularly, the processors used are the Level 1 Processor v504, the Level 2 Ocean Salinity processor v550 and the Level 2 Soil Moisture processor v501. The reprocessed period covers from 12-Jan-2010 to 22-Dec-2011 for the L1 and L2 Sea Surface Salinity data and from 12-Jan-2010 to 28-Nov-2011 for the L2 Soil moisture data.

The improvements and known caveats in the quality of the SMOS Level 1 and Level 2 data products are described in the data release notes available on the ESA web page:

https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/news/-/asset_publisher/8pPI/content/re-processed-smos-data-now-available?p_r_p_564233524_assetIdentifier=re-processed-smos-data-now-available&redirect=%2Fc%2Fportal%2Flayout%3Fp_l_id%3D65665

Data users are strongly encouraged to consult those notes before using SMOS data.

Next reprocessing campaign is actually foreseen by the end of 2012.

4.2 Processing changes

4.2.1 Processor updates

The L2 Soil Moisture Processor was transferred into operations on 24-Apr-2012. This processor provides a new dielectric model (Mironov) for the soil moisture retrieval.The processor improvements and other associated information are summarised in the news available in the ESA web page:

https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/smos/news/-/asset_publisher/8pPI/content/upgrade-of-l2-soil-moisture-operational-processor-in-smos-processing-chain?p_r_p_564233524_assetIdentifier=upgrade-of-l2-soil-moisture-operational-processor-in-smos-processing-chain&redirect=%2Fc%2Fportal%2Flayout%3Fp_l_id%3D65665

The start sensing time of the first product generated with the new processor baseline is 23/04/2012 at 08:35:17.

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	504 (L1a/L1b) 505 (L1c)

L2OS	550
L2SM	551

Table 4-2 Pre- and Post-processors status

Processor	Version
ECMWFP	315
VTECGN	309
LAI pre-processor	307
L2 Post-processors	400

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	300
MIR_SCSF1C	300
MIR_SCLF1C	300
MIR_BWSF1C	300
MIR_BWLF1C	300
MIR_SMUDP2	300
MIR_OSUDP2	300
AUX_ECMWF_	300

The schema packages are available from the anonymous ftp site:

ftp://dpgswebserver-1.smos.eo.esa.int/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_AUX_CNFSMD_20050101T000000_20500101T000000_001_009010_3

Dissemination date: 2012-04-24 09:57:00z

Start sensing time at L1 processor: N/A

Justification: Configuration file for the L2 SM processor v551. This file contains the parameters for the new dielectric model used by the processor (Mironov model). See SO-CS-ARR-GS-4405 (available at http://smos.array.ca/web/smos/documentation) for the details.

SM_OPER_AUX_CNFSMF_20050101T000000_20500101T000000_001_009010_3

Dissemination date: 2012-04-24 09:57:00z

Start sensing time at L1 processor: 2012-04-23 08:35:17z

Justification: Configuration file for the L2 SM processor v551. This file contains the parameters for the new dielectric model used by the processor (Mironov model). See SO-CS-ARR-GS-4405 (available at http://smos.array.ca/web/smos/documentation) for the details.

SM_OPER_AUX_BULL_B_20120202T000000_20120301T235959_120_001_3

Dissemination date: 2012-04-11 09:02:00z

Start sensing time at L1 processor: N/A

Justification: : Bulletin Update including values from March 2012 and the prediction for April 2012. It is usage is intended for reprocessing.

SM_OPER_AUX_BULL_B_20120202T000000_20500101T000000_120_001_3

Dissemination date: 2012-04-11 09:02:00z

Start sensing time at L1 processor: 2012-04-11 07:01:16z

Justification: Bulletin Update including values from March 2012 and the prediction for April 2012. It is usage is intended for the nominal production.

SM_OPER_AUX_OTT1D__20120401T000000_20500101T000000_550_001_3

Dissemination date: 2012-04-19 15:17:35z

Start sensing time at L1 processor: N/A

Justification: April update

SM_OPER_AUX_OTT1F__20120401T000000_20500101T000000_550_001_3

Dissemination date: 2012-04-19 15:17:35z

Start sensing time at L1 processor: 2012-04-19 06:10:51z

Justification: April update

SM_OPER_AUX_OTT2D__20120401T000000_20500101T000000_550_001_3

Dissemination date: 2012-04-19 15:17:35z

Start sensing time at L1 processor: N/A

Justification: April update

SM_OPER_AUX_OTT2F__20120401T000000_20500101T000000_550_001_3

Dissemination date: 2012-04-19 15:17:35z

Start sensing time at L1 processor: 2012-04-19 06:10:51z

Justification: April update

SM_OPER_AUX_OTT3D__20120401T000000_20500101T000000_550_001_3

Dissemination date: 2012-04-19 15:17:35z

Start sensing time at L1 processor: N/A

Justification: April update

SM_OPER_AUX_OTT3F__20120401T000000_20500101T000000_550_001_3

Dissemination date: 2012-04-19 15:17:35z

Start sensing time at L1 processor: 2012-04-19 06:10:51z

Justification: April update

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 only used in the nominal processing chain after the transfer into operations of the processing baseline v500.

Table 4-4 Calibration summary

Start	Finish	Calibration	Comments
2012-04-05 15:17:00z	2012-04-05 15:18:44z	Short Calibration	Nominal
2012-04-11	2012-04-11	NIR calibration	Nominal

03:32:53z	04:55:06z		Brightness temperature: 3.79 K RMS: 0.54 K Moon elevation: -61.48 deg Sun Elevation: 0.23 deg Right Ascension: 112.00 deg Declination: 21.94 deg
2012-04-12 01:48:40z	2012-04-12 02:42:00z	Long Calibration	Nominal
2012-04-12 03:27:40z	2012-04-12 04:21:00z	Long Calibration	Nominal
2012-04-19 14:32:44z	2012-04-19 14:34:28z	Short Calibration	Nominal
2012-04-25 02:54:53z	2012-04-25 04:17:06z	NIR Calibration	Nominal Brightness temperature: 3.80 K RMS: 0.54 K Moon elevation: 36.90 deg Sun Elevation: -0.76 deg Right Ascension: 122.93 deg Declination: -2.98 deg
2012-04-26 14:59:00z	2012-04-26 15:00:44z	Short Calibration	Nominal

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
2 April 2012 23:46 Orbit 12704	3 April 2012 00:23 Orbit 12704	L0 Nominal & NRT Production and higher levels	OCM (FOS-145)
7 April 2012 16:25 Orbit 12772	7 April 2012 16:46 Orbit 12772	L0 Nominal & NRT Production and higher levels	Collision Avoidance Manoeuvre (OCM) (FOS-146)
17 April 2012 22:09 Orbit 12919	17 April 2012 00:35 Orbit 12919	L0 Nominal & NRT Production and higher levels	OCM (FOS-147)

Table 4-6 Operational gaps summary

Start	Finish	Data Level	Comments
29 April 2012 08:55 Orbit 13084	29 April 2012 09:45 Orbit 13084	L1 & L2 Production	Gap in the data acquisition that was recovered in the next acquisition. Data pending to be processed.

4.5 Summary of degraded data

In April 2012, 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.

Table 4-7 Summary of degraded data

Start	Finish	Affected products	Problem Description
18/03/2012 00:00 Orbit 12474	20/03/2012 10:38 Orbit 12509	L1C and L2 products	The auxiliary file with the prediction of the Ionespheric Electron Content has not been updated during this period. The last available prediction has been used instead. The affected products are flagged with the ADF error

			flag.
19 April 2012 02:47 Orbit 12936	19 April 2012 02:57 Orbit 12936	L1 and L2 products	CMN unlock (FOS-0148)
27 April 2012 05:19 Orbit 13053	27 April 2012 05:29 Orbit 13053	L1 and L2 products	CMN unlock (FOS-0149)

4.6 Product Quality Disclaimers

The following product disclaimers affects the data generated in the reporting period:

Table 4-8 Summary of product quality disclaimers

Date	
21 March 2012	Due to a software anomaly in the L1OP V5.04 and V5.05 processor, the Sun Glint Flag available in the L1c Product is not correctly set. This flag aims to indicate measurements affected by Sun glint over ocean. The major impact of this anomaly is on the users who are using L1c data to retrieve Sea Surface Salinity. Those users need to discard the information provided by the Sun glint flag in their retrieval algorithms. This anomaly does not impact the ESA Level 2 Ocean salinity product because the Sun glint flag from L1c input data is not used by the retrieval algorithm. Information on Sun glint are directly computed by the L2 processor and used for the retrieval of the Sea Surface Salinity

5. LONG-TERM ANALYSIS

5.1 Calibration Analysis

The calibration parameters are under monitoring. During the reporting period, there have been NIR calibrations events on 11th and 25th April. 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.

With the NIR calibration on 25th April a new calibration sequences has been executed on-board to improve the PMS calibration by using deep sky measurements. This new calibration technique is currently under study by the Calibration team. Preliminary results are quite good showing improvements in the PMS calibration stability. Once approved by the quality working group this new PMS calibration will be implemented in the operational ground segment.

Also, a long calibration event has been conducted on 12th April to calibrate the PMS parameters, the correlator offsets and to monitor the Fringe Washing Function (FWF) shape. All these parameters are in the range specified by the routine calibration plan and therefore new PMS and correlator offset parameters have been used in the operational ground segment as per routine calibration plan.

The calibration on 25th April has also produced an additional set of correlator offset parameters that has been used in the operational ground segment. The differences between using the visibility offset correction from the long calibration on 12th April and the NIR calibration on 25th April have been assessed on a snapshot over the Pacific Ocean. The differences in X and Y polarization are in average 0.02 K with a maximum of 0.4 K (see Figure 1). On the other hand, the 3rd Stokes parameter presents a 0.006 K average difference with a maximum of 0.3 K (see Figure 2). The 4th Stokes presents 0.01 K average difference with a maximum of 0.3 K (see Figure 3).

No major anomalies have been detected in the reporting period.

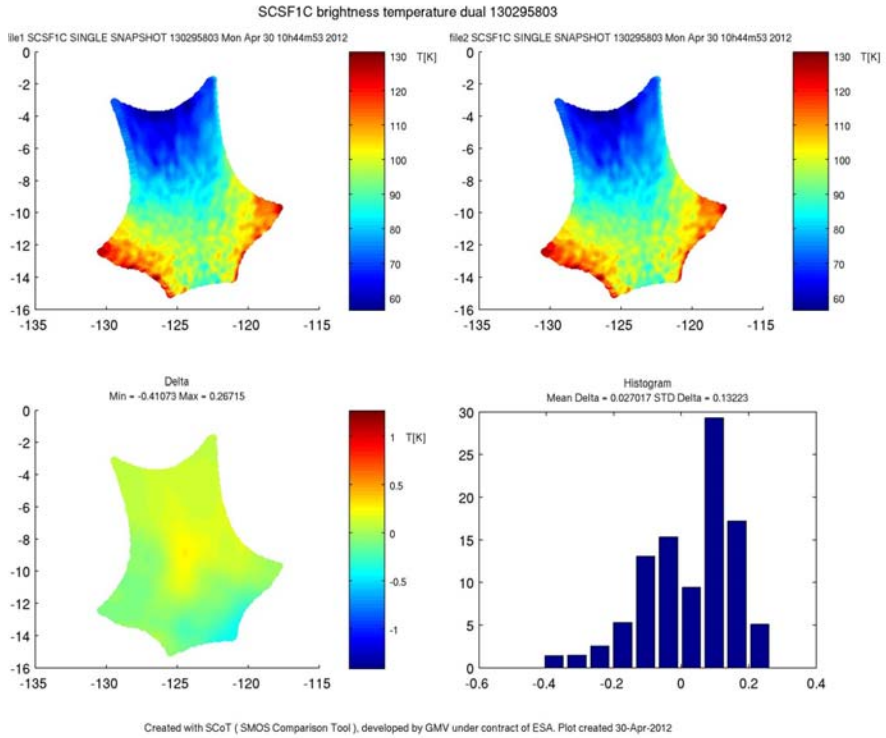


Figure 1 Differences in H-pol between using visibility offset correction from Long Calibration and NIR calibration (top left: snapshot computed using the Long Calibration visibility offsets, top right: snapshot computed using the NIR Calibration visibility offsets, bottom left: difference between the snapshots computed using the Long and NIR calibration, bottom right: statistics on the difference)

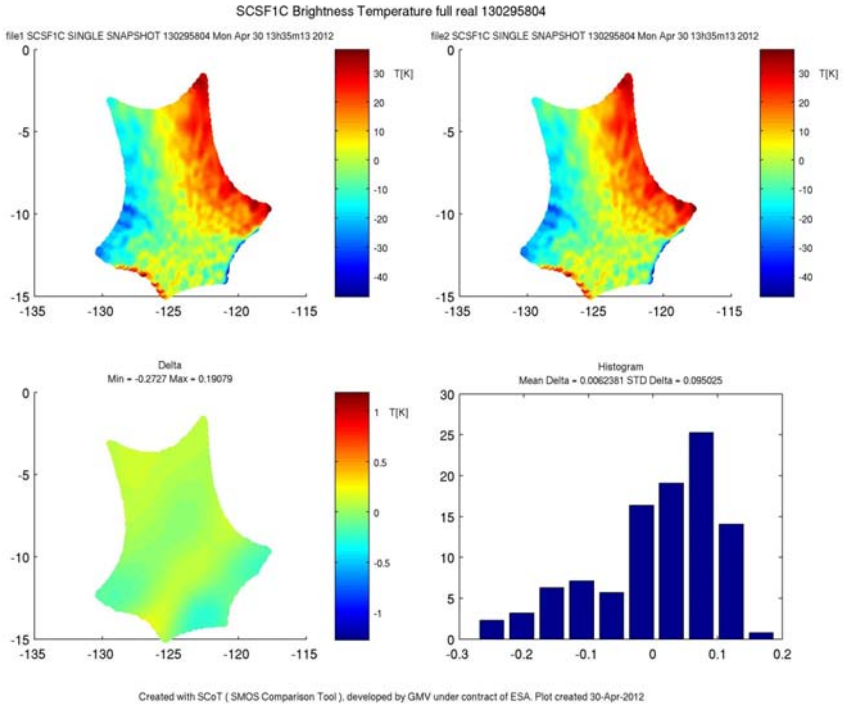


Figure 2 Differences in 3rd Stokes between using visibility offset correction from Long Calibration and NIR calibration (top left: snapshot computed using the Long Calibration visibility offsets, top right: snapshot computed using the NIR Calibration visibility offsets, bottom left: difference between the snapshots computed using the Long and NIR calibration, bottom right: statistics on the difference)

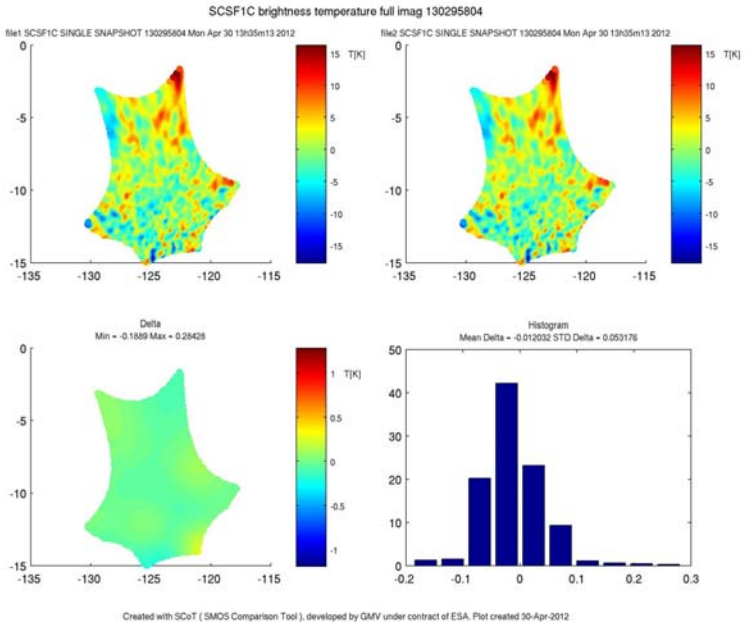


Figure 3 Differences in 4th Stokes between using visibility offset correction from Long Calibration and NIR calibration (top left: snapshot computed using the Long Calibration visibility offsets, top right: snapshot computed using the NIR

Calibration visibility offsets, bottom left: difference between the snapshots computed using the Long and NIR calibration, bottom right: statistics on the difference)

5.2 Product Quality Analysis

The data quality in the reporting period is nominal.

The L1 production is nominal as no artefacts are observed in the Stokes maps in Figure 4 to Figure 39. The figures plot the Stokes parameter computed at 42.5 deg from the L1C Browse products. 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 can be observed mainly in Europe and Asia.

The L2 Soil Moisture and Ocean Salinity production is nominal in the reporting period. Figure 46 shows the evolution of the soil moisture retrievals. Those values present significant differences with the Volumetric Soil Water at L1 (see Figure 47) provided by ECMWF, mainly for the ascending passes. The Level 2 ESL has pointed out that the possible cause is that the predicted precipitation event might not actually occur. An important lack of soil moisture retrievals in the selected area that are polluted by the presence of RFI and frozen soil that do not allow soil moisture retrieval. For more detail on Soil Moisture retrieval algorithm see the L2 Soil Moisture Algorithm Theoretical Baseline Document:

(https://earth.esa.int/c/document_library/get_file?folderId=127856&name=DLFE-506.pdf).

Figure 4 1st Stokes evolution over land during the reporting period (week 13)

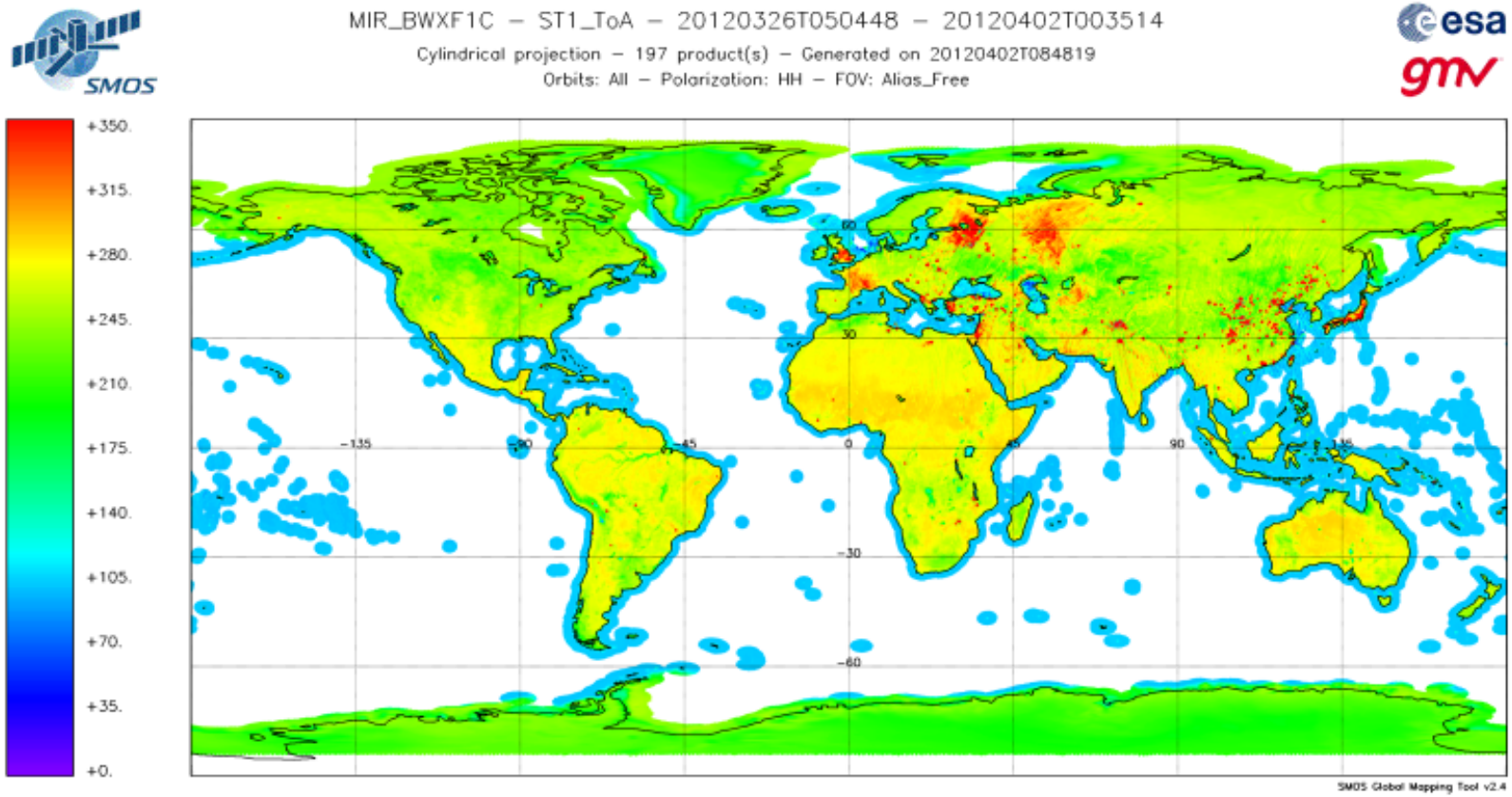


Figure 5 1st Stokes evolution over land during the reporting period (week 14)

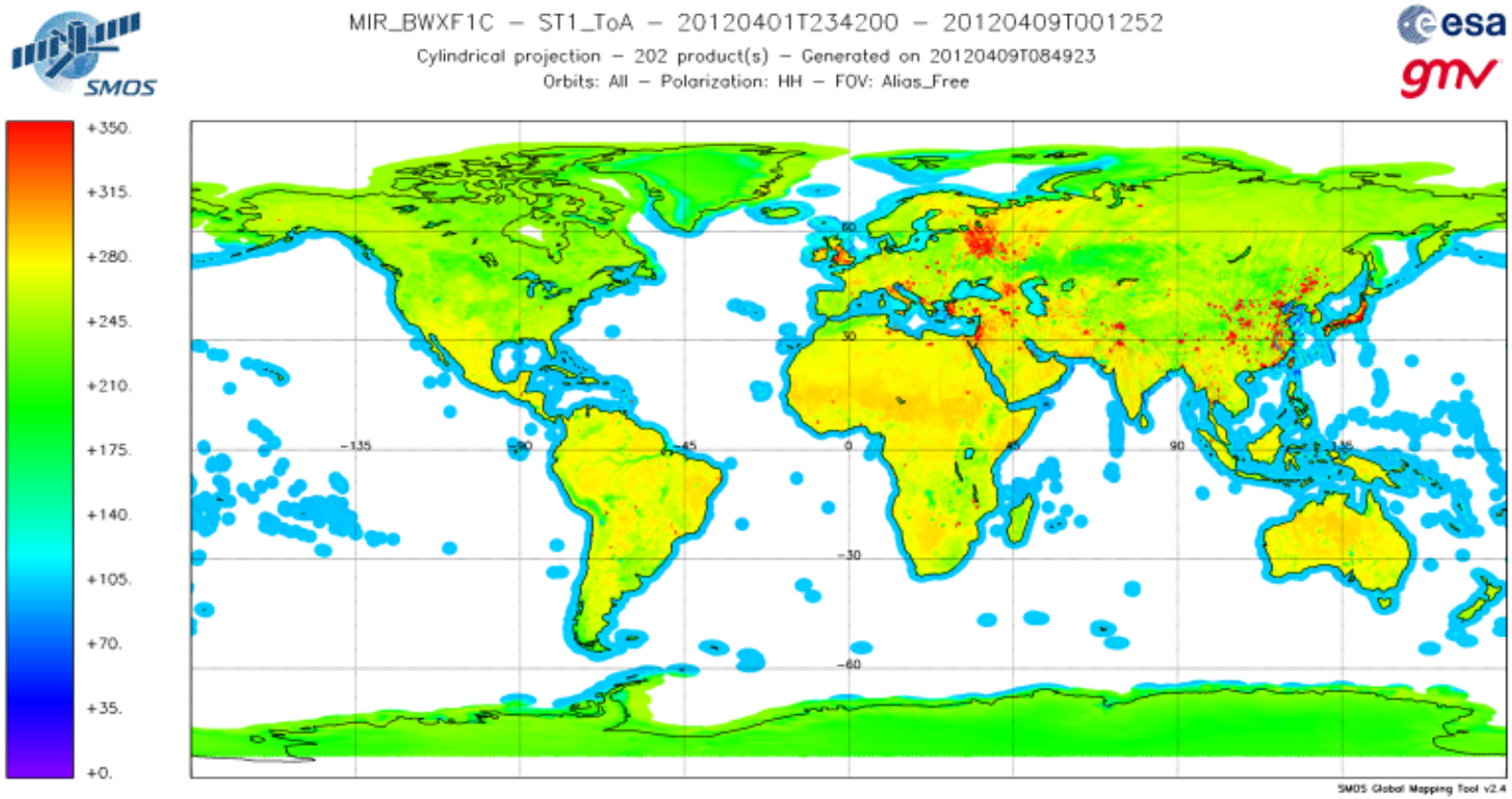


Figure 6 1st Stokes evolution over land during the reporting period (week 15)

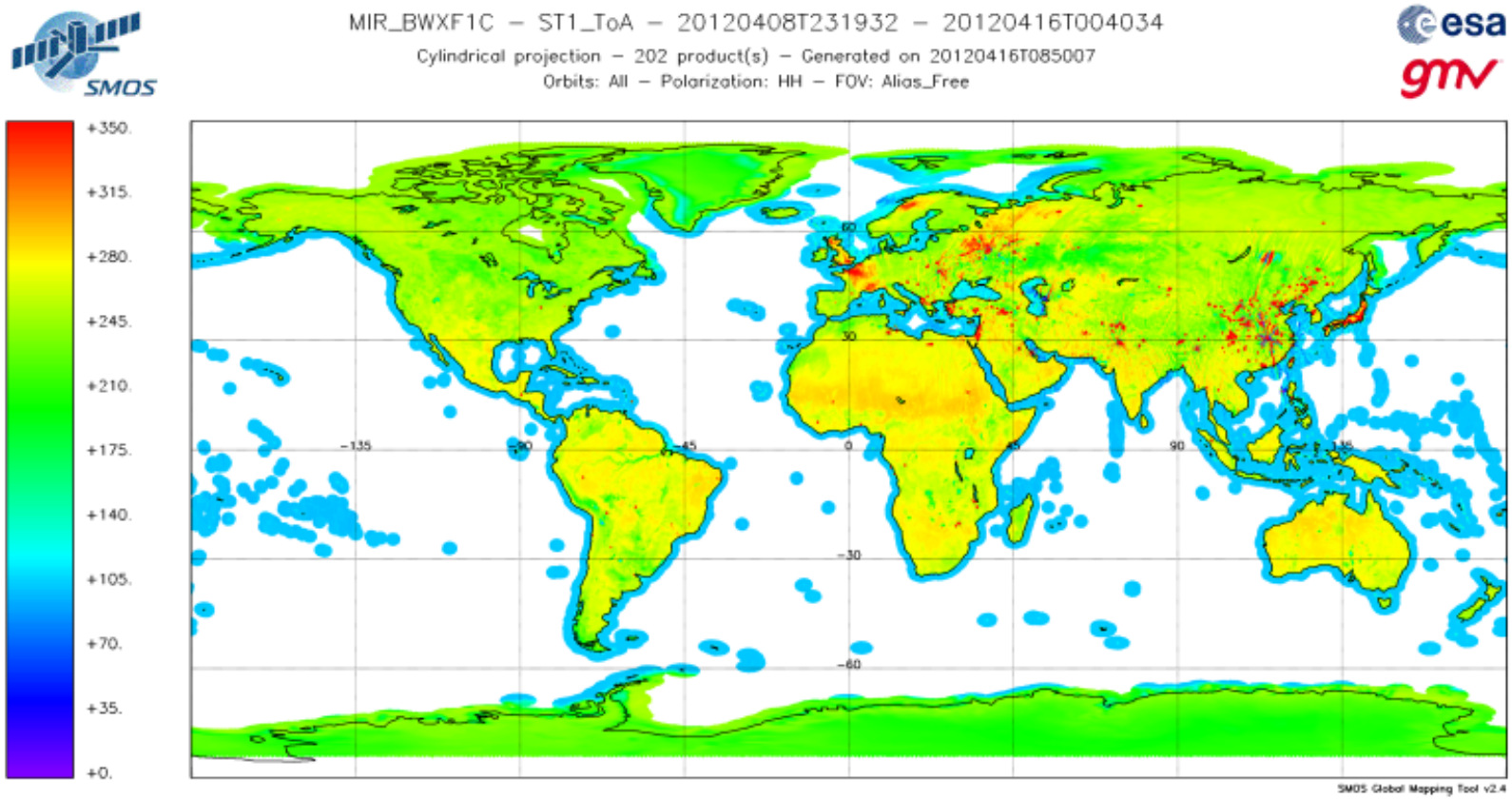


Figure 7 1st Stokes evolution over land during the reporting period (week 16)

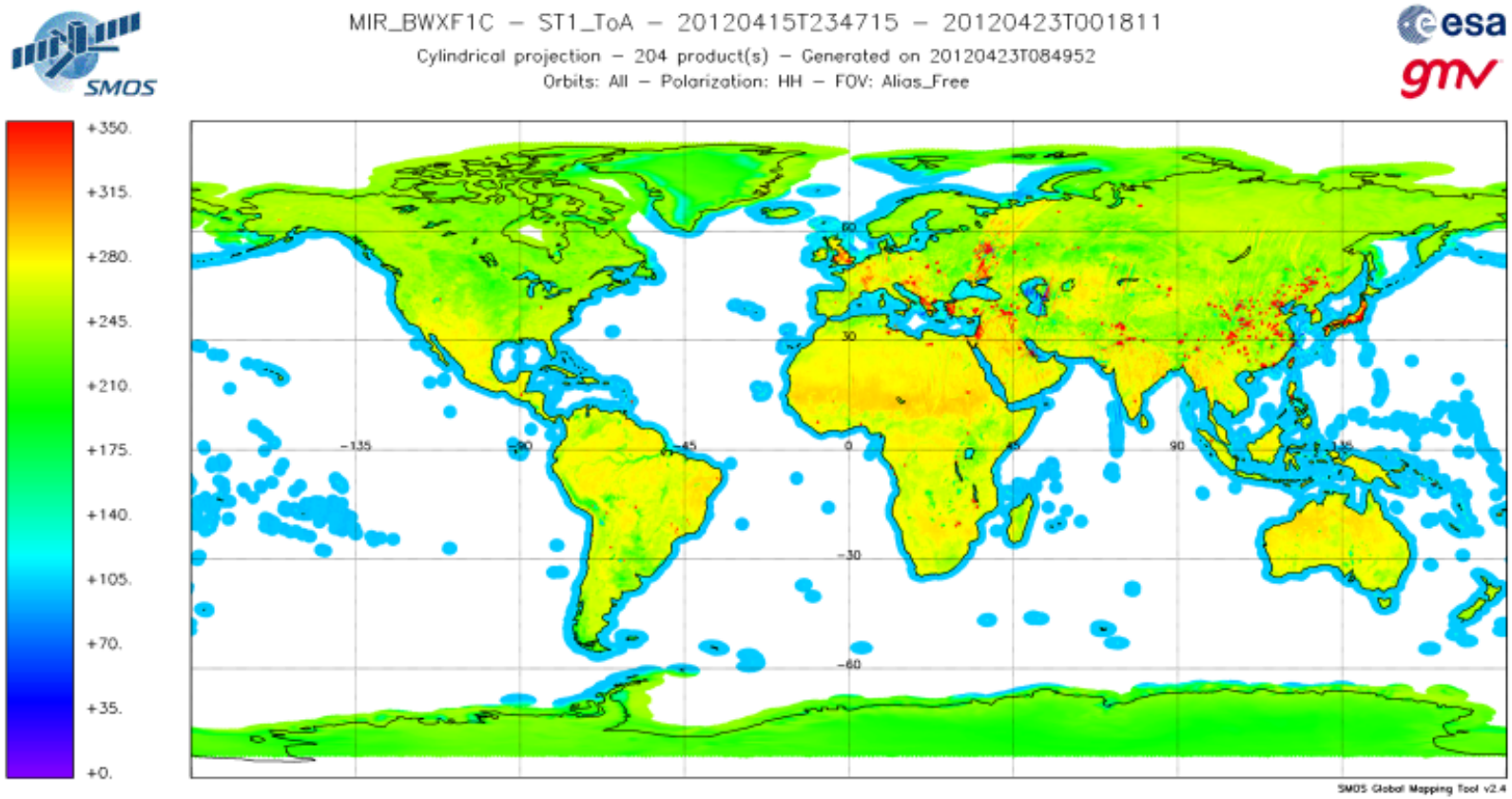


Figure 8 1st Stokes evolution over land during the reporting period (week 17)

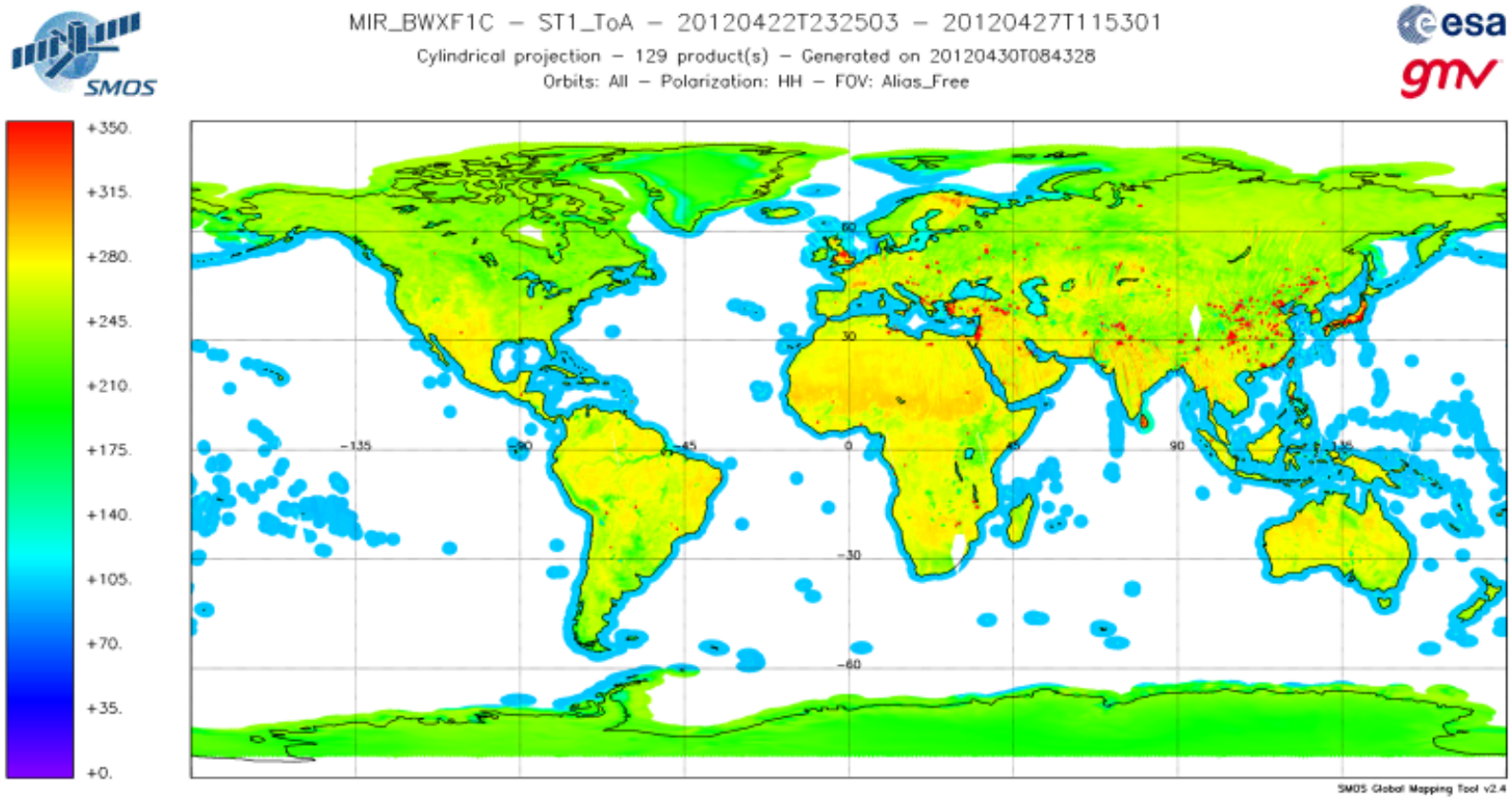


Figure 9 1st Stokes evolution over land during the reporting period (week 18)

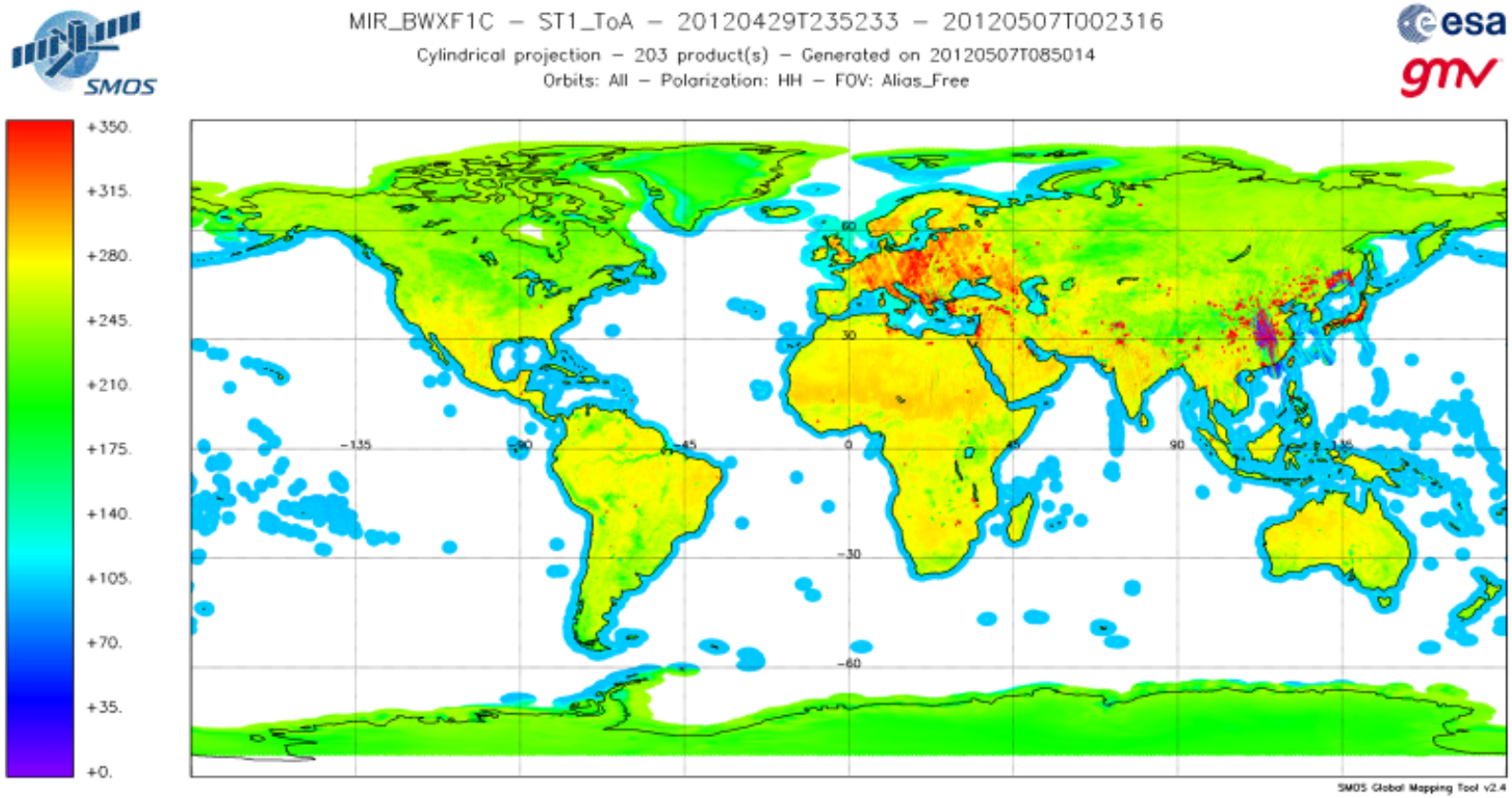


Figure 10 Real Part of the XY Brightness temperature evolution over land during the reporting period (week 13)

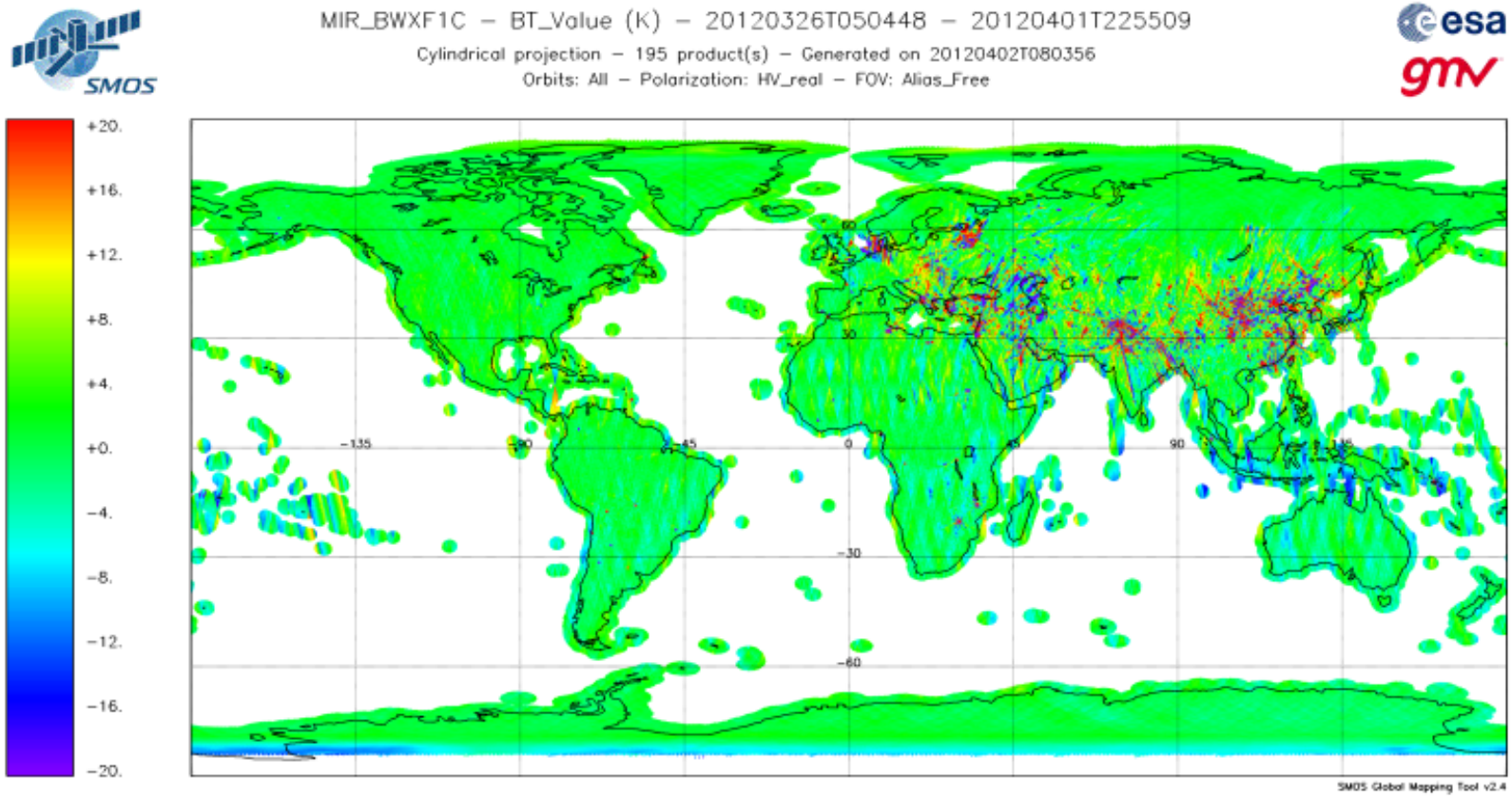


Figure 11 Real Part of the XY Brightness temperature evolution over land during the reporting period (week 14)

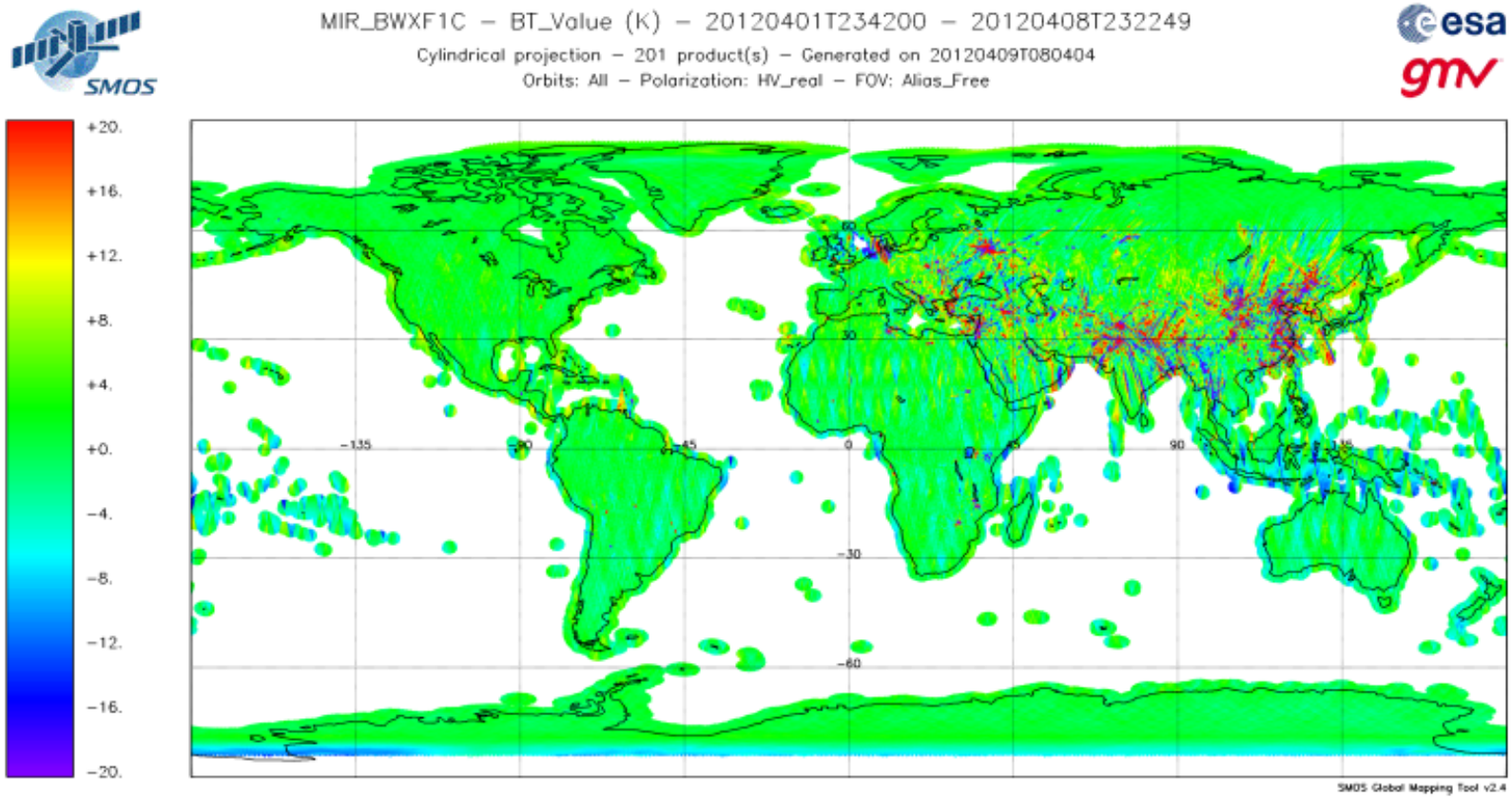


Figure 12 Real Part of the XY Brightness temperature evolution over land during the reporting period (week 15)

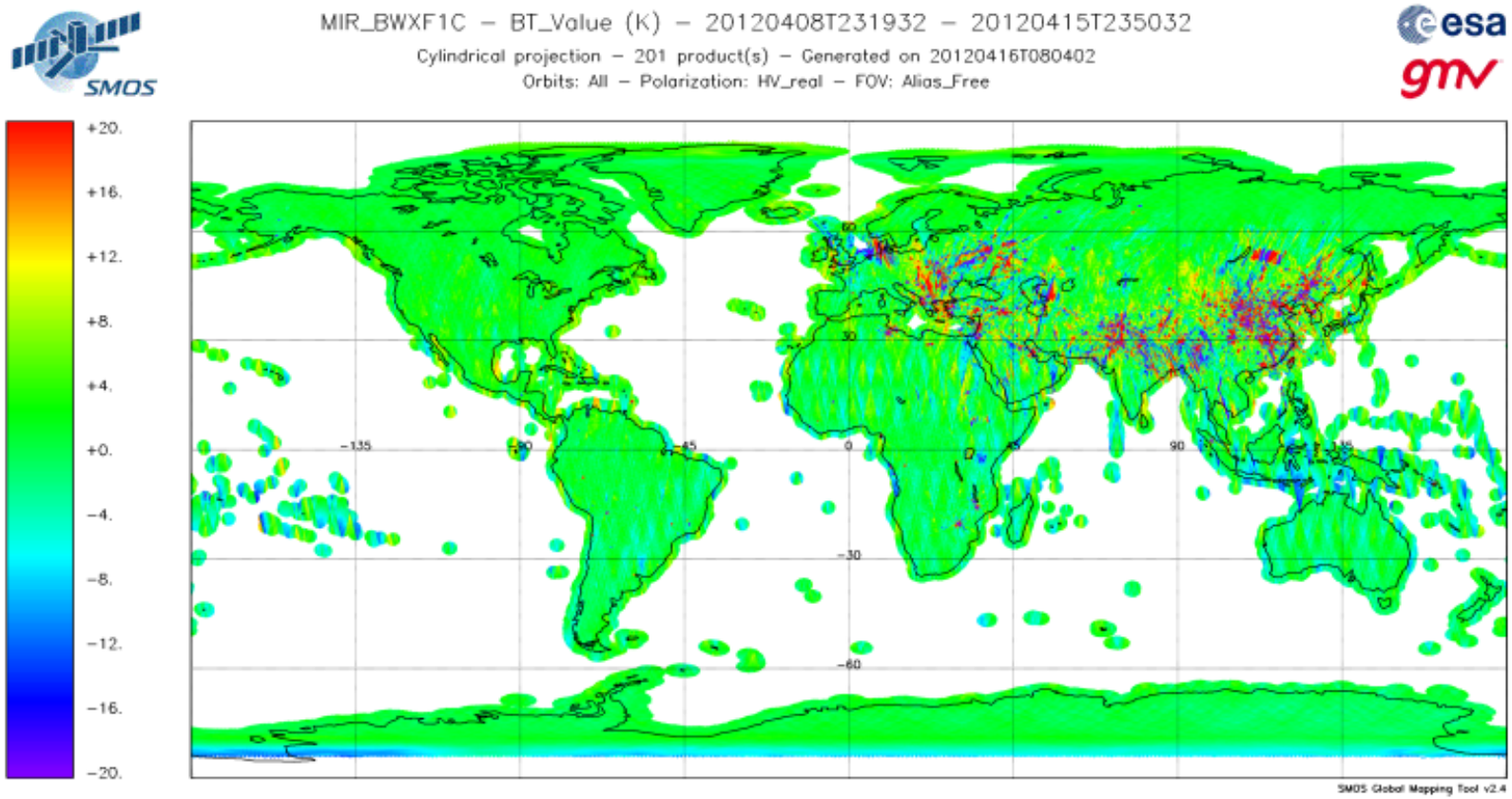


Figure 13 Real Part of the XY Brightness temperature evolution over land during the reporting period (week 16)

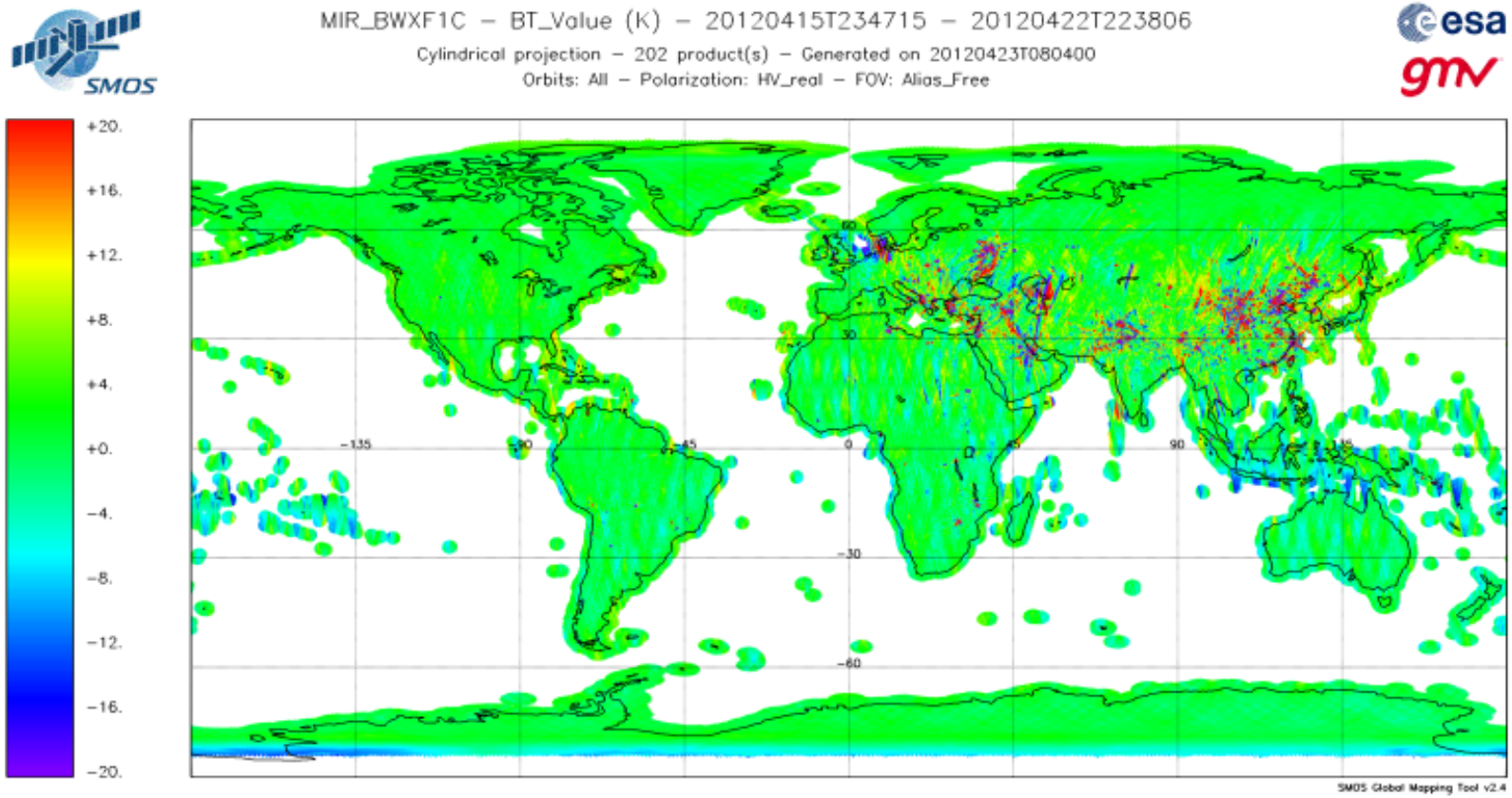


Figure 14 Real Part of the XY Brightness temperature evolution over land during the reporting period (week 17)

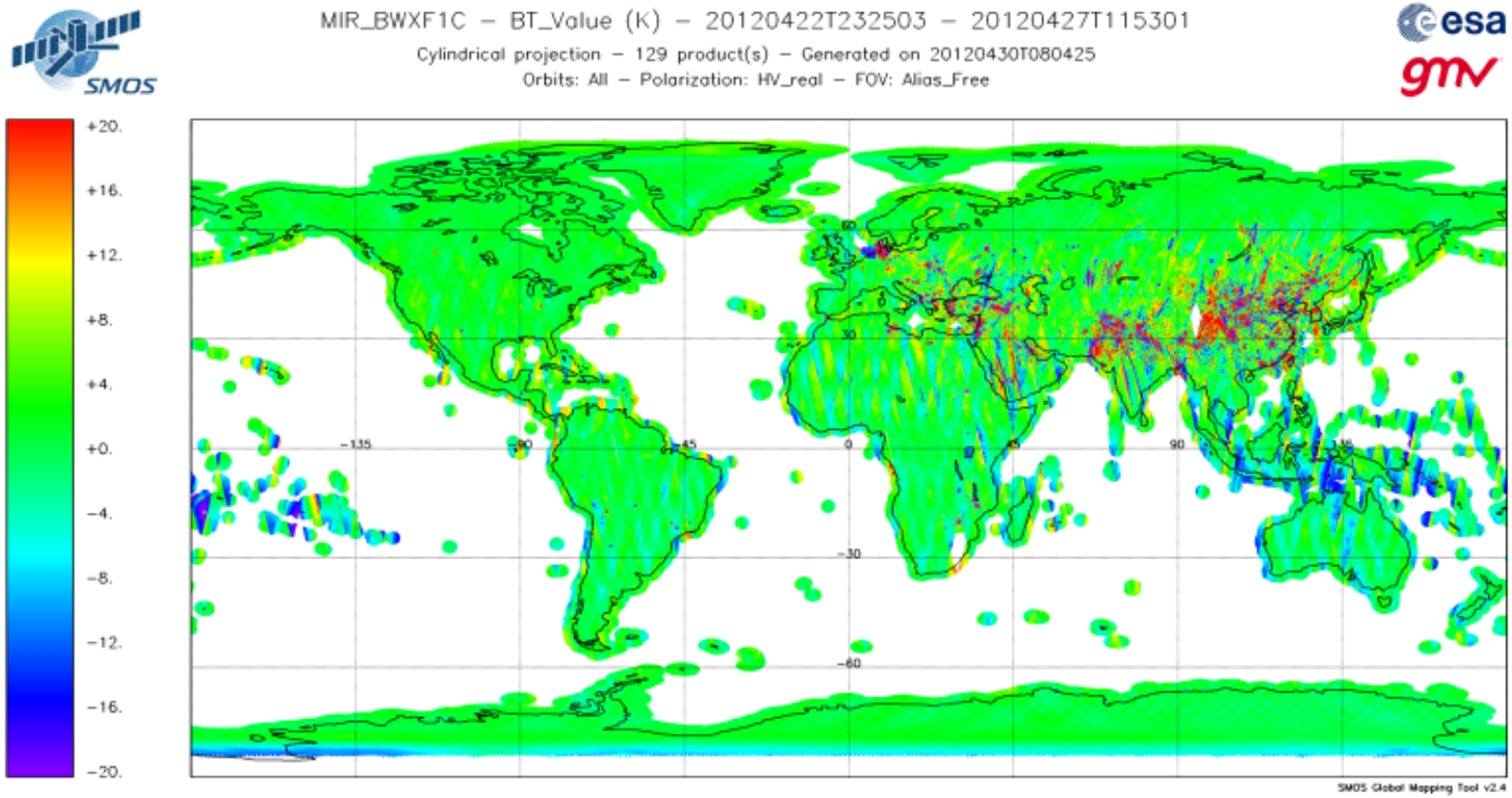


Figure 15 Real Part of the XY Brightness temperature evolution over land during the reporting period (week 18)

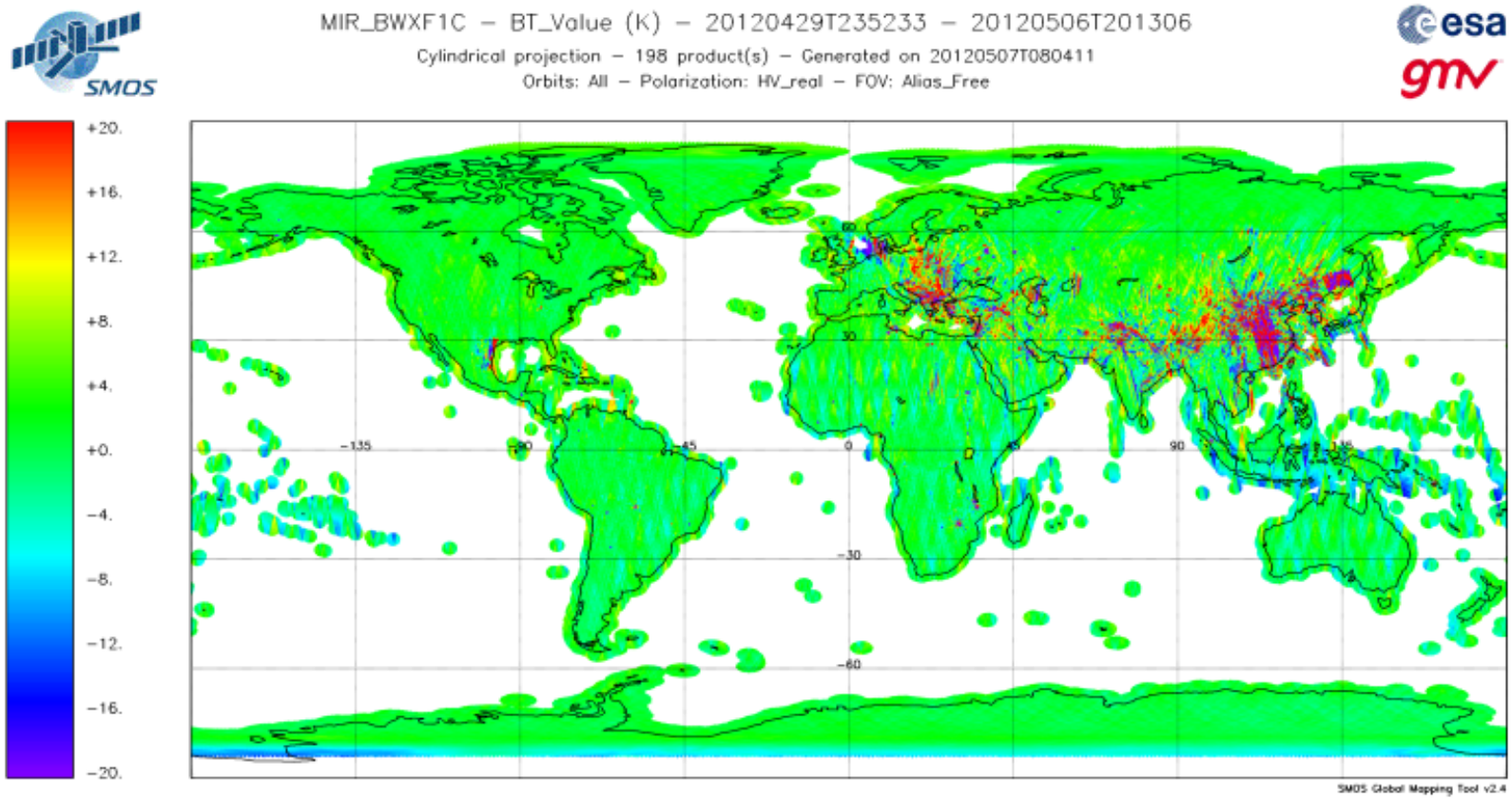


Figure 16 Imaginary Part of the XY Brightness temperature evolution over land during the reporting period (week 13)

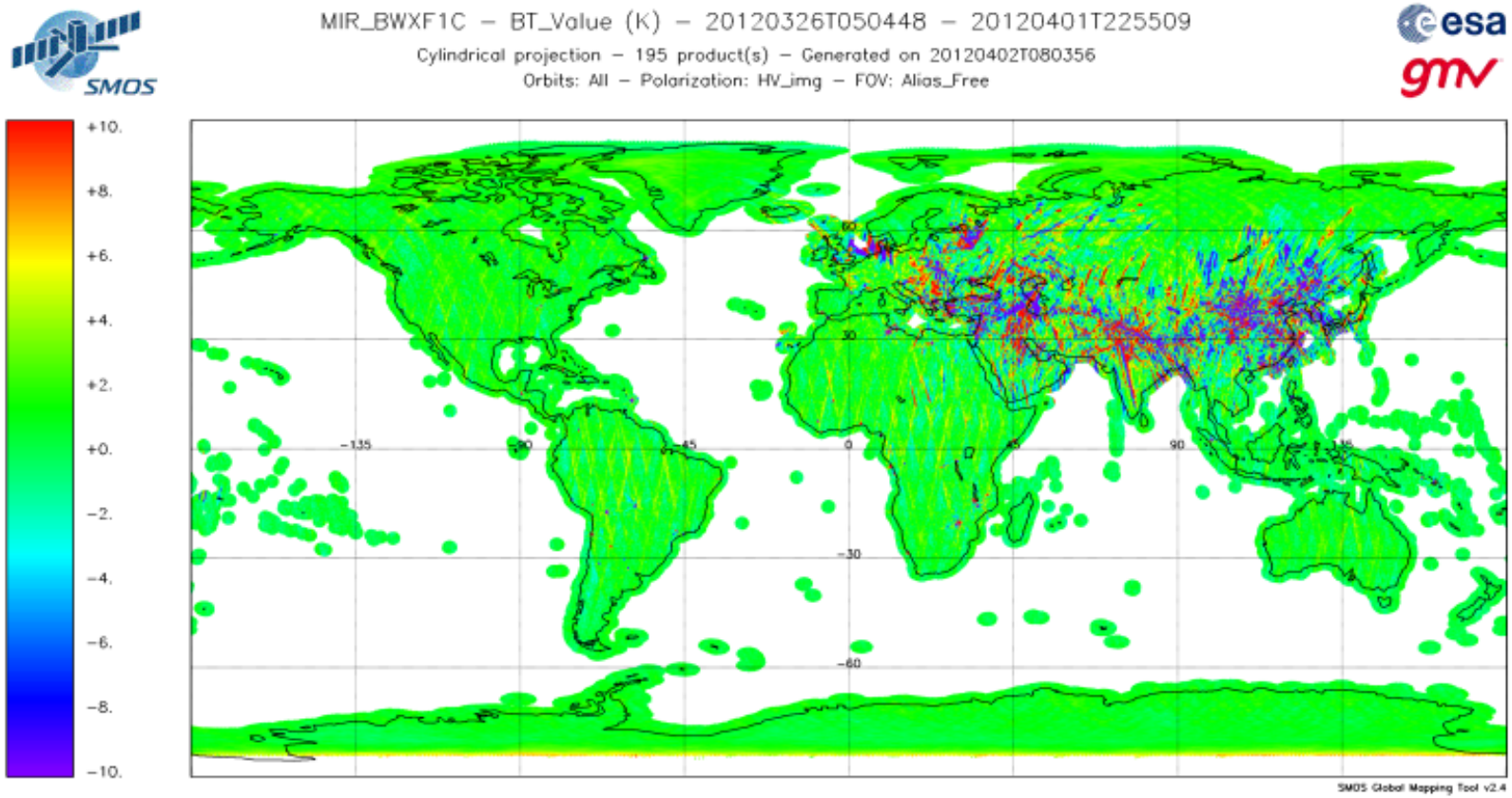


Figure 17 Imaginary Part of the XY Brightness temperature evolution over land during the reporting period (week 14)

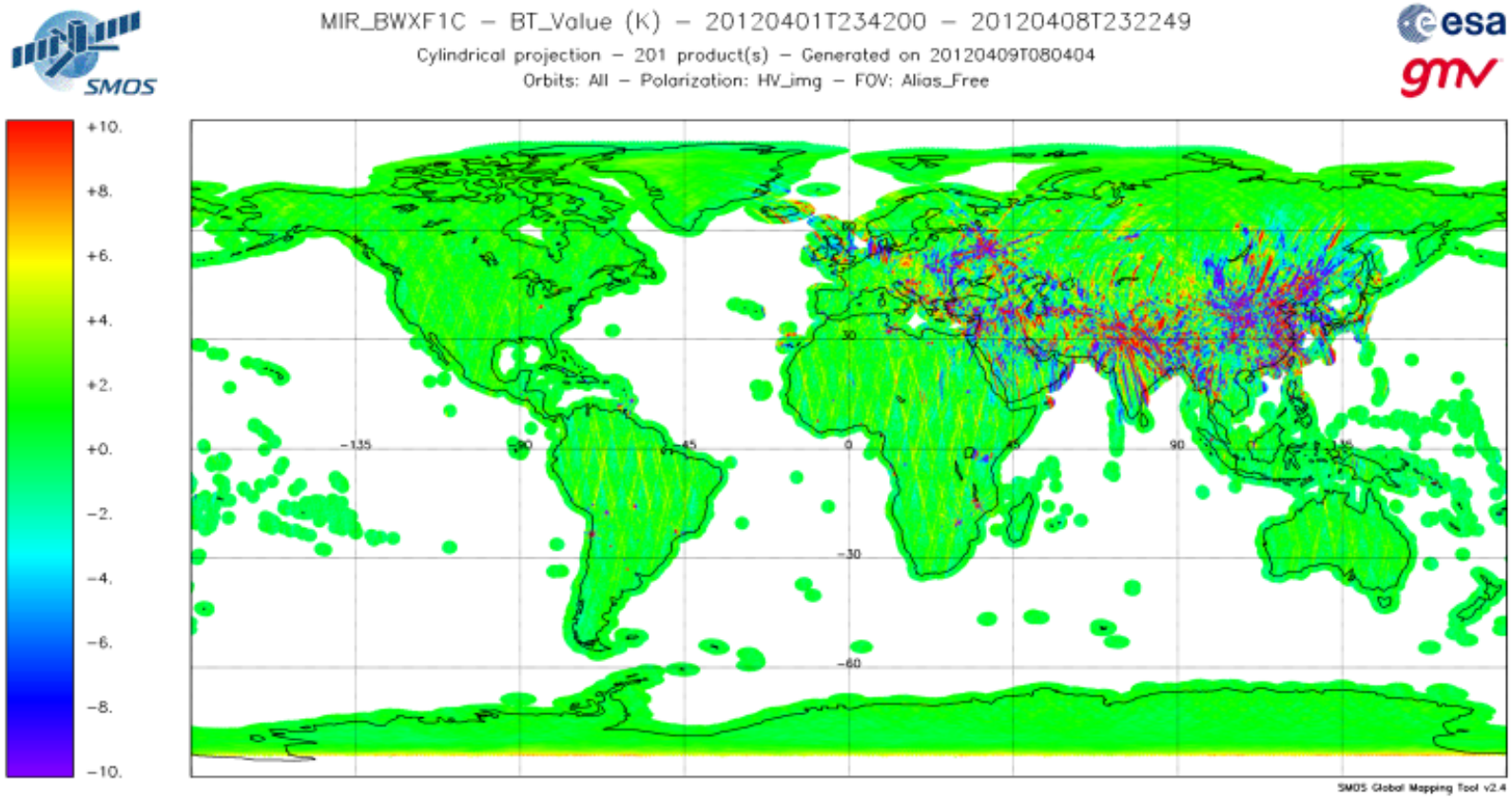


Figure 18 Imaginary Part of the XY Brightness temperature evolution over land during the reporting period (week 15)

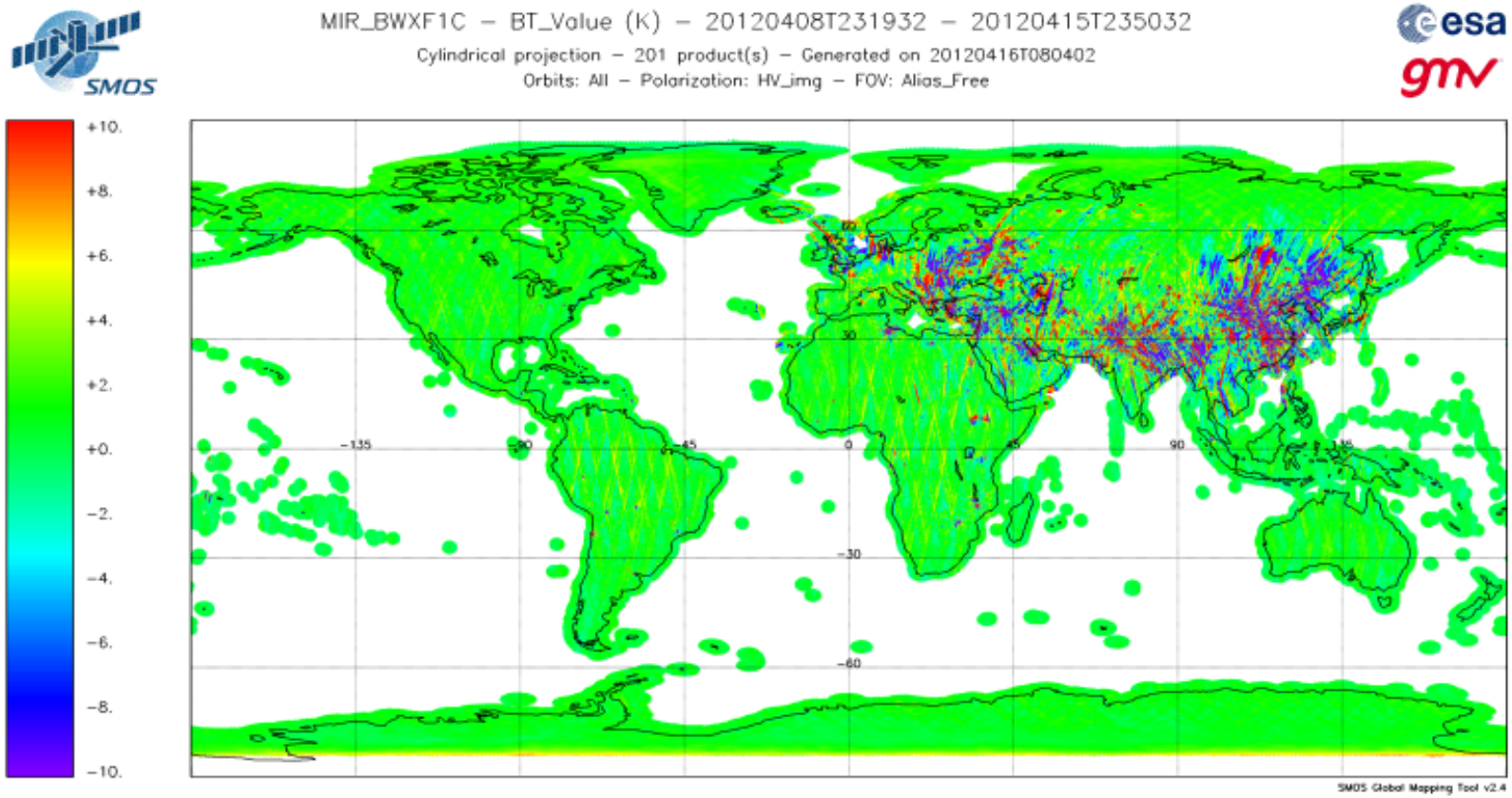


Figure 19 Imaginary Part of the XY Brightness temperature evolution over land during the reporting period (week 16)

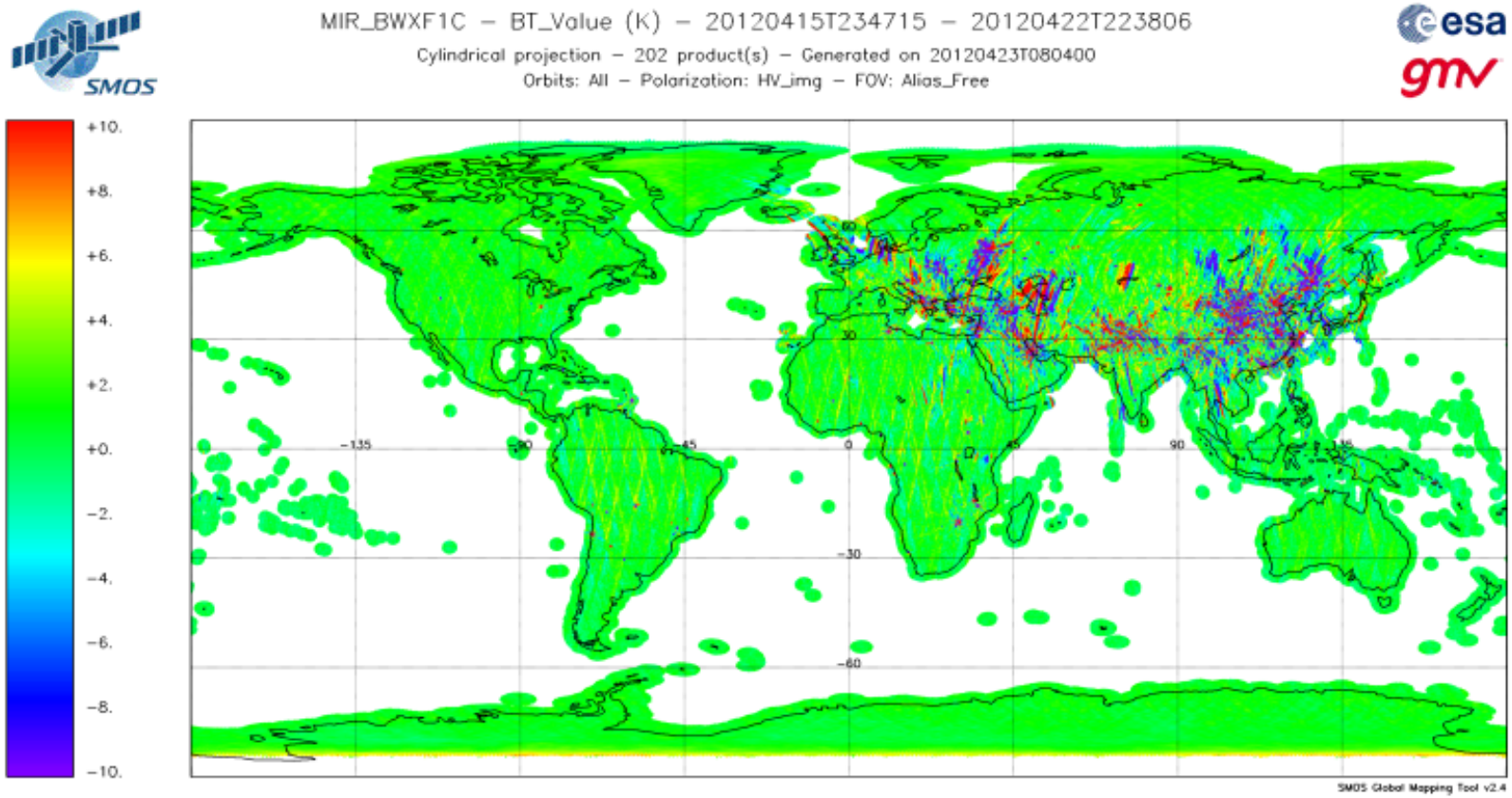


Figure 20 Imaginary Part of the XY Brightness temperature evolution over land during the reporting period (week 17)

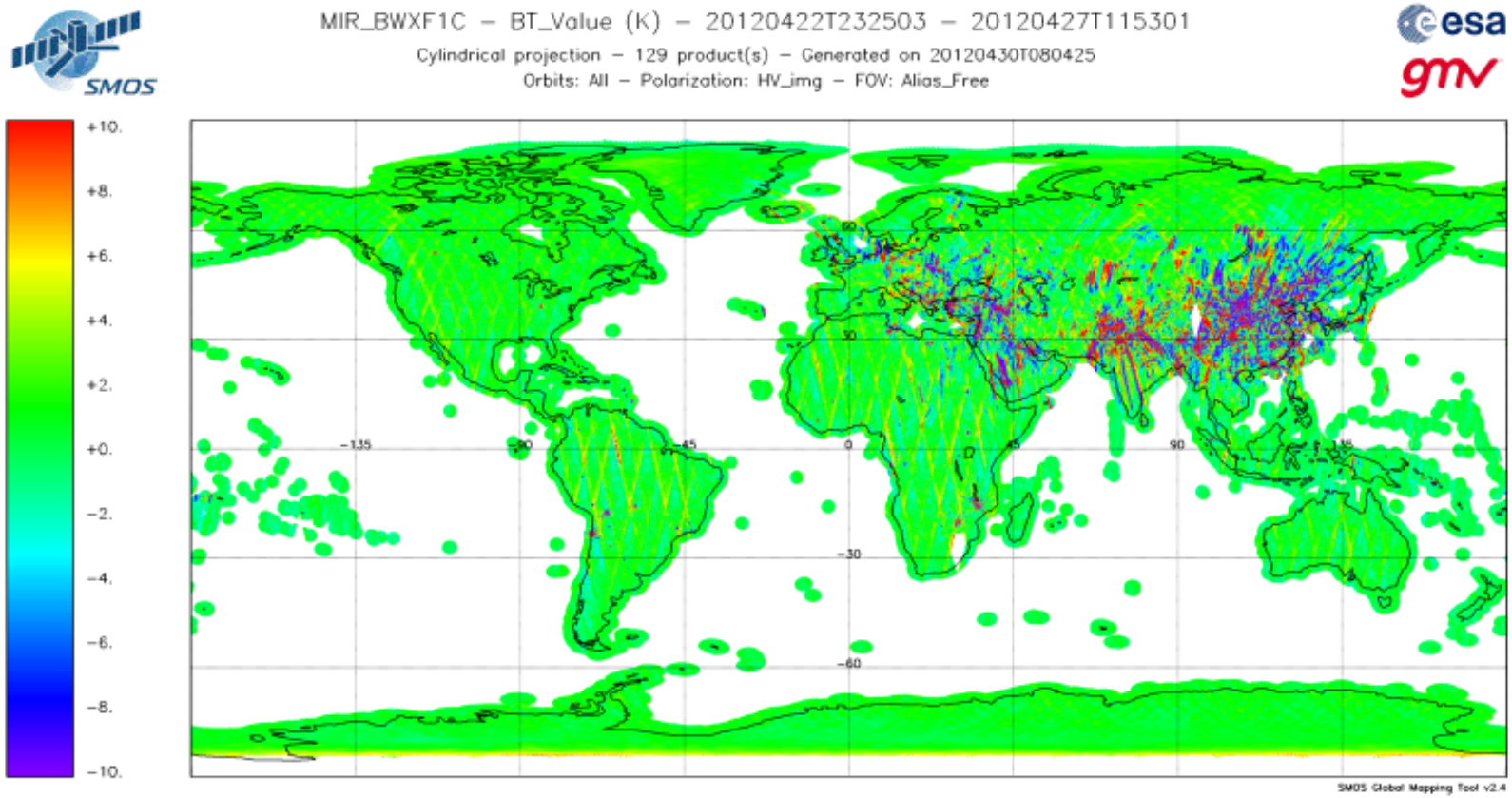


Figure 21 Imaginary Part of the XY Brightness temperature evolution over land during the reporting period (week 18)

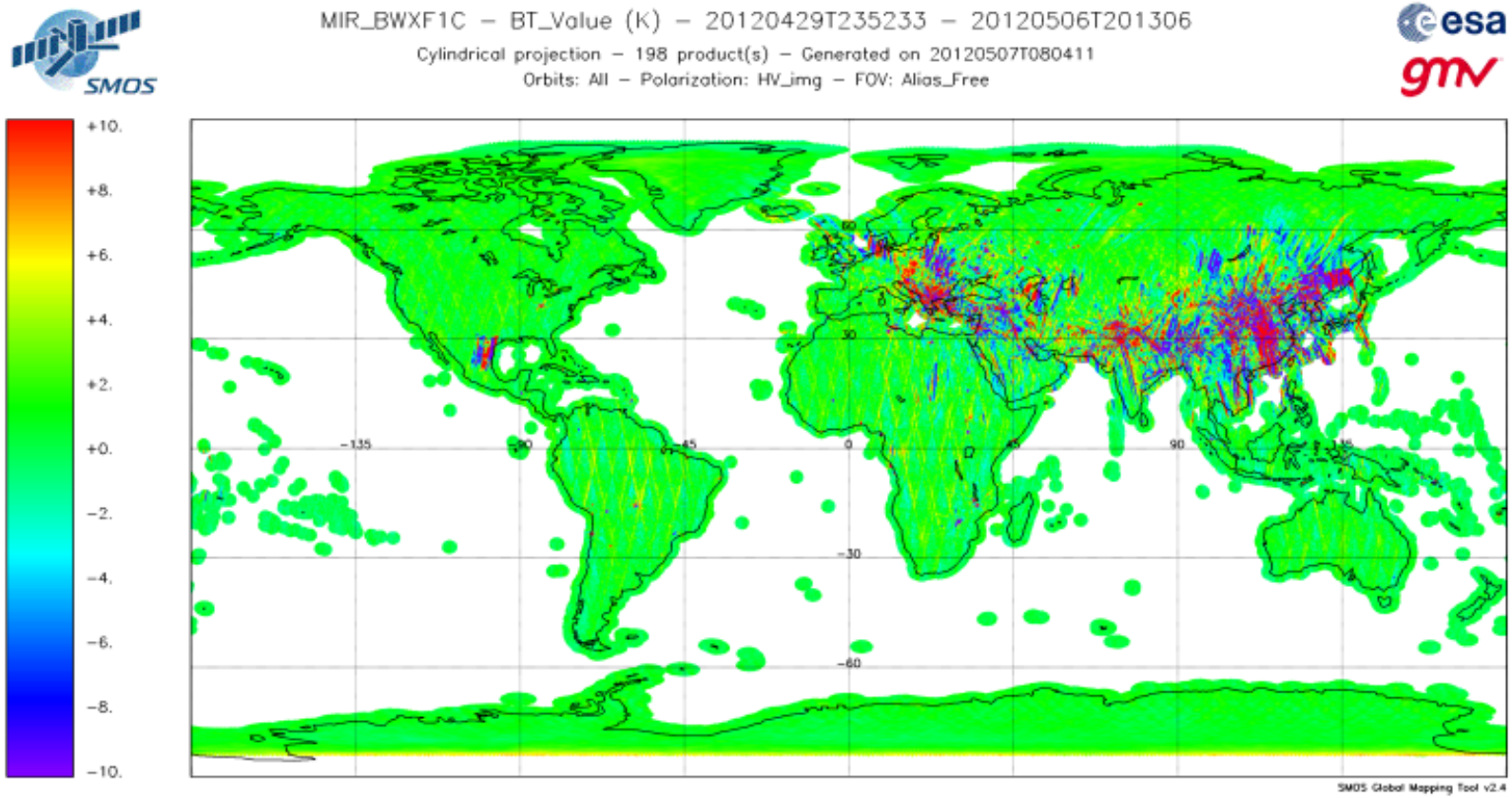


Figure 22 1st Stokes evolution over sea during the reporting period (week 13)

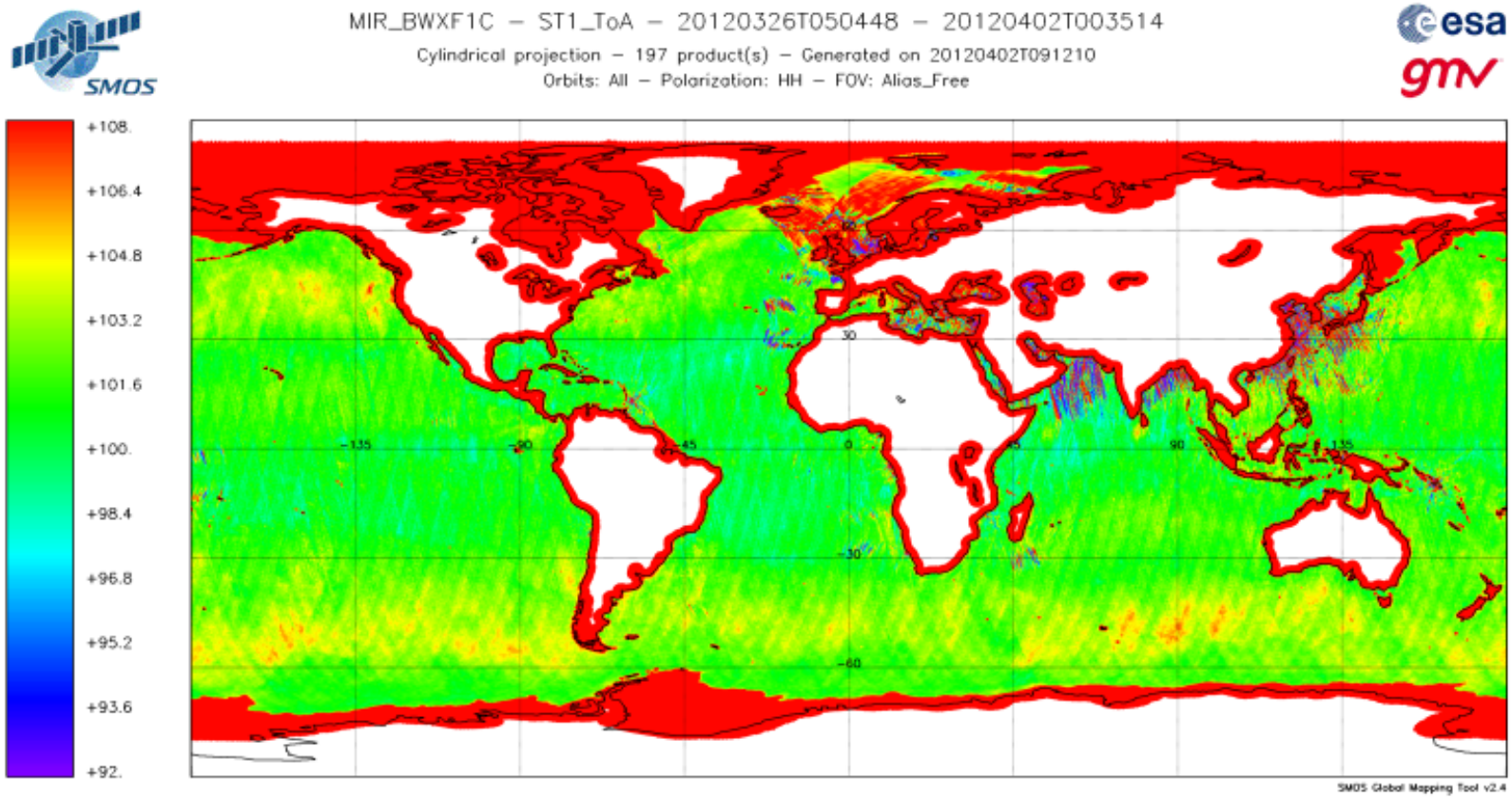


Figure 23 1st Stokes evolution over sea during the reporting period (week 14)

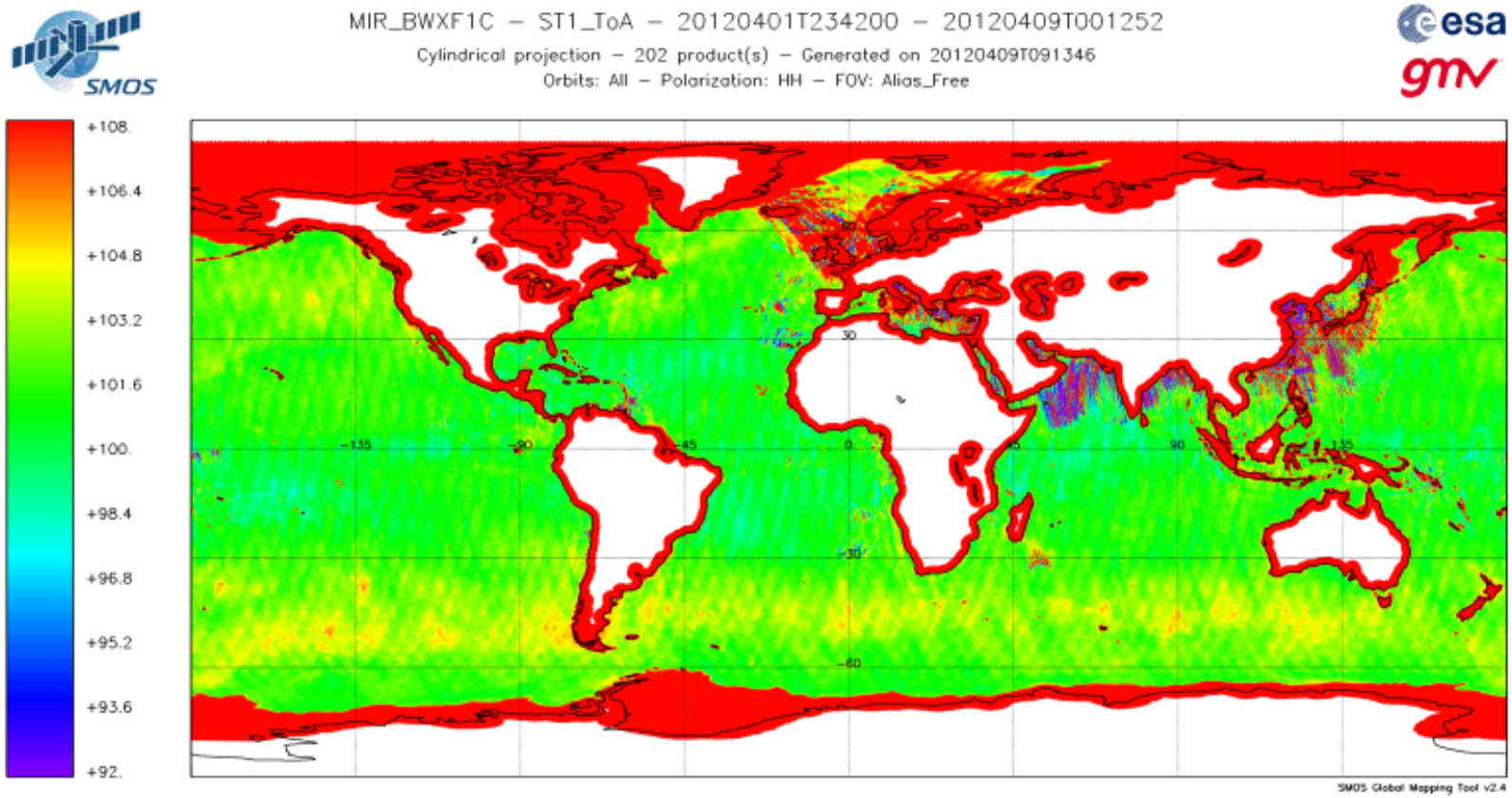


Figure 24 1st Stokes evolution over sea during the reporting period (week 15)

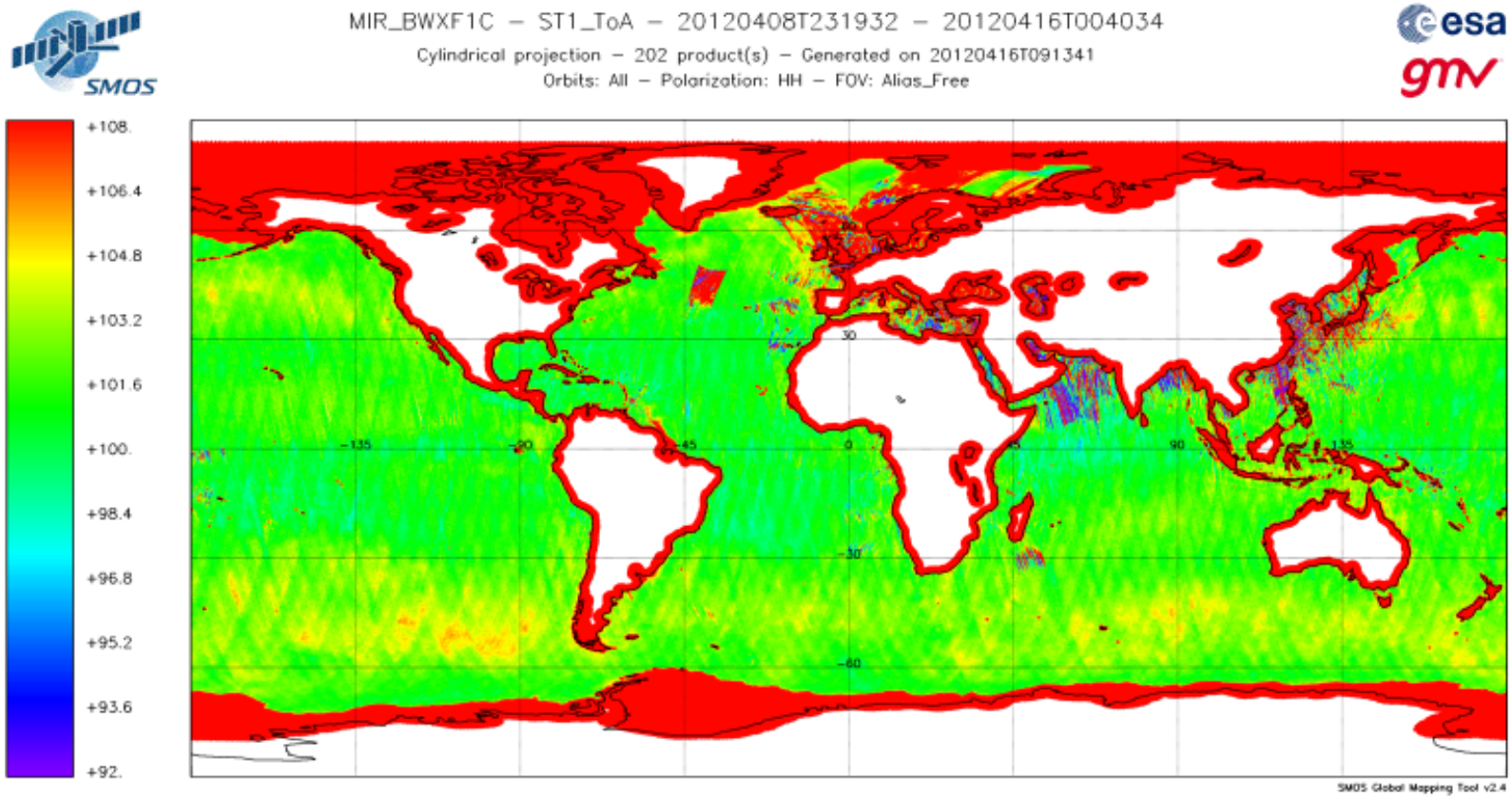


Figure 25 1st Stokes evolution over sea during the reporting period (week 16)

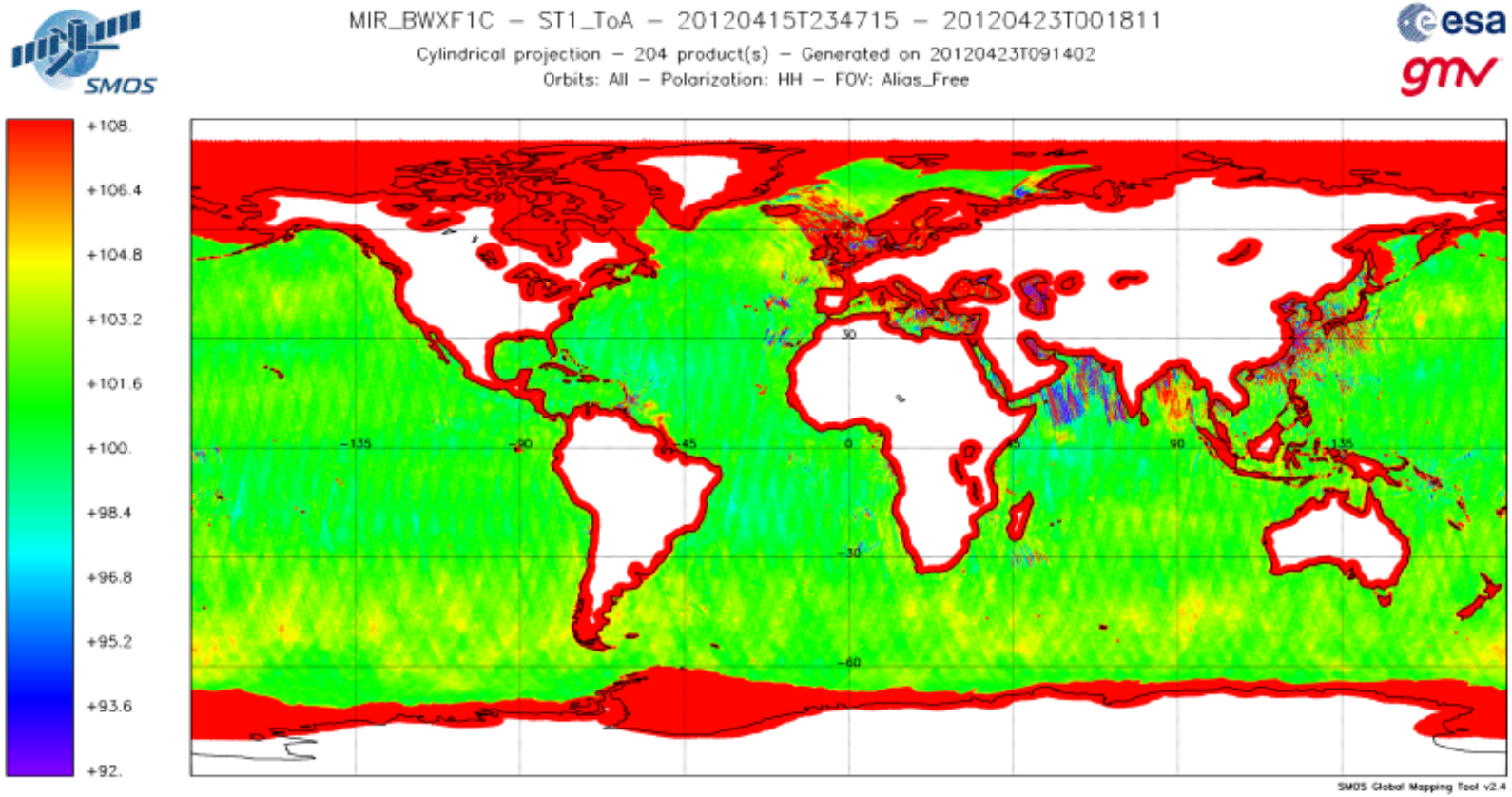


Figure 26 1st Stokes evolution over sea during the reporting period (week 17)

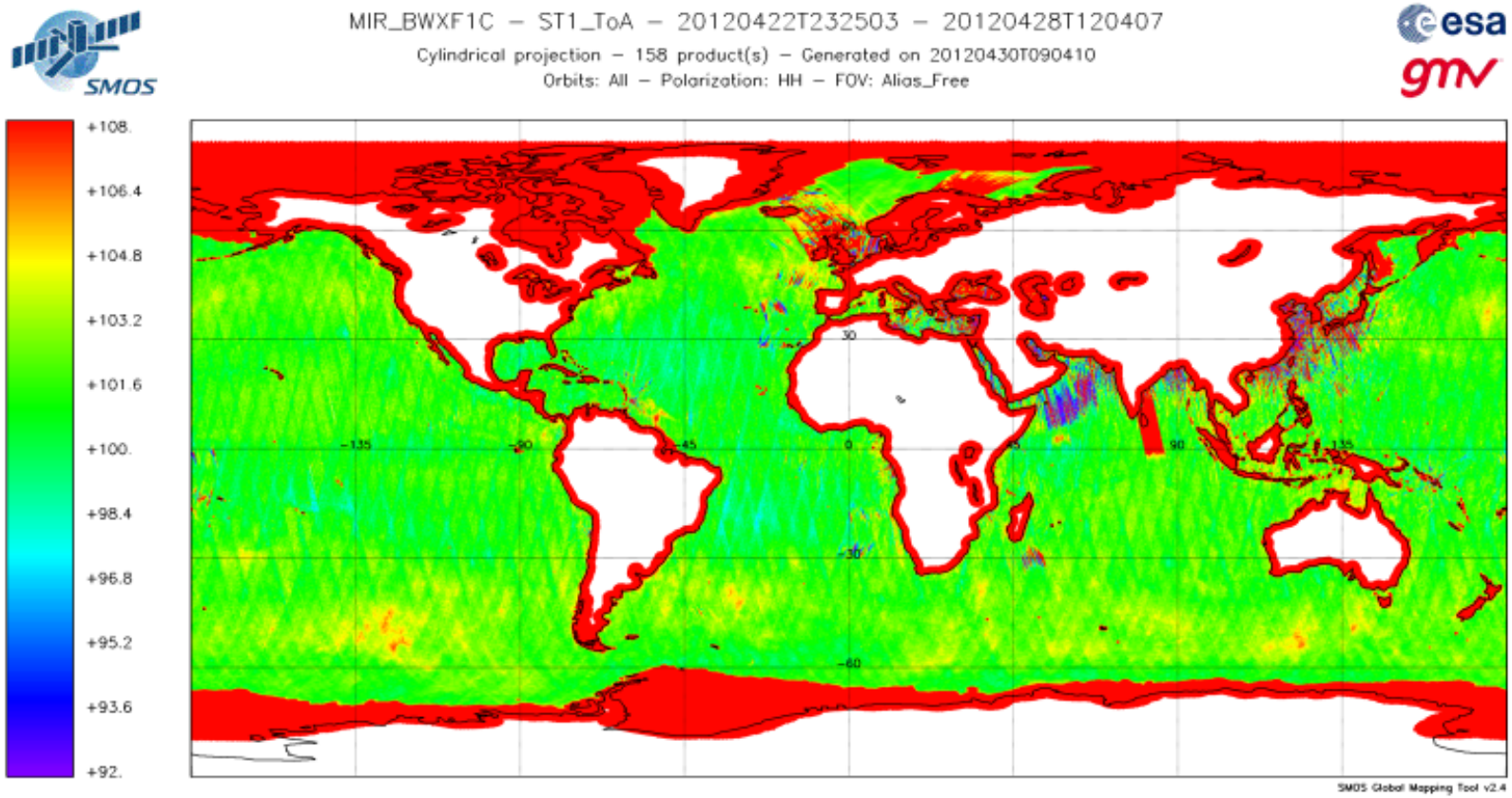


Figure 27 1st Stokes evolution over sea during the reporting period (week 18)

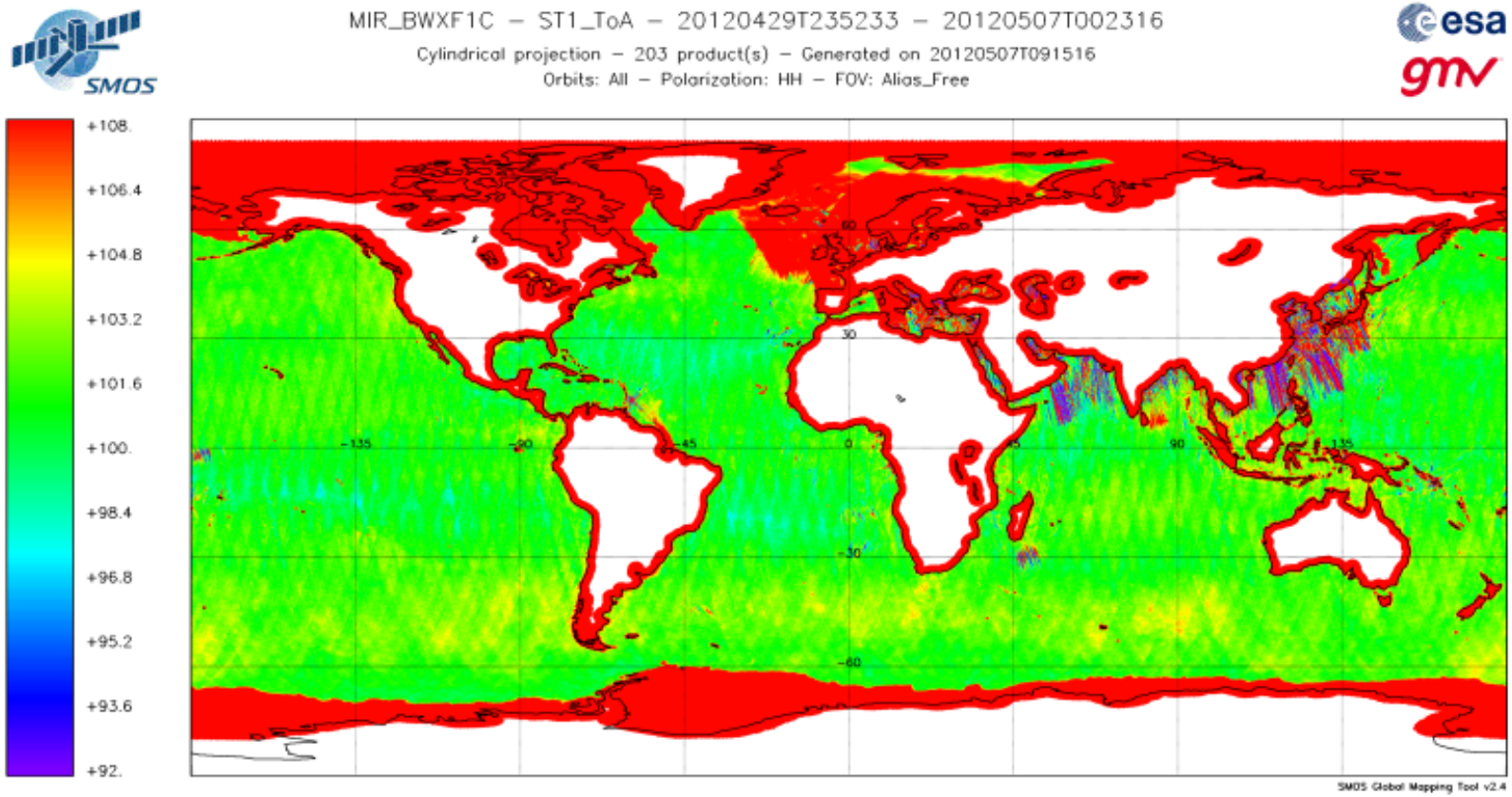


Figure 28 Real Part of the XY Brightness temperature evolution over sea during the reporting period (week 13)

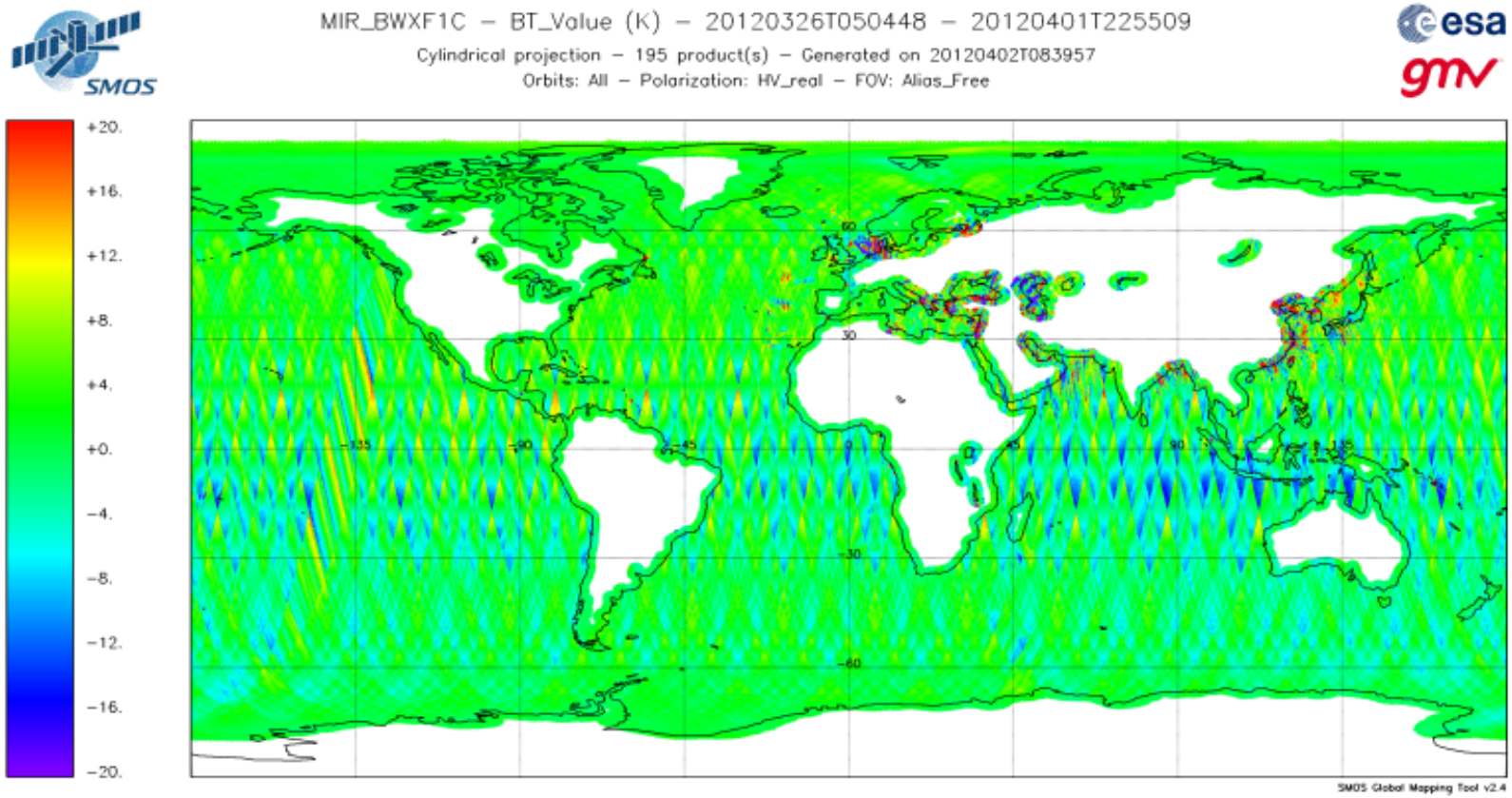


Figure 29 Real Part of the XY Brightness temperature evolution over sea during the reporting period (week 14)

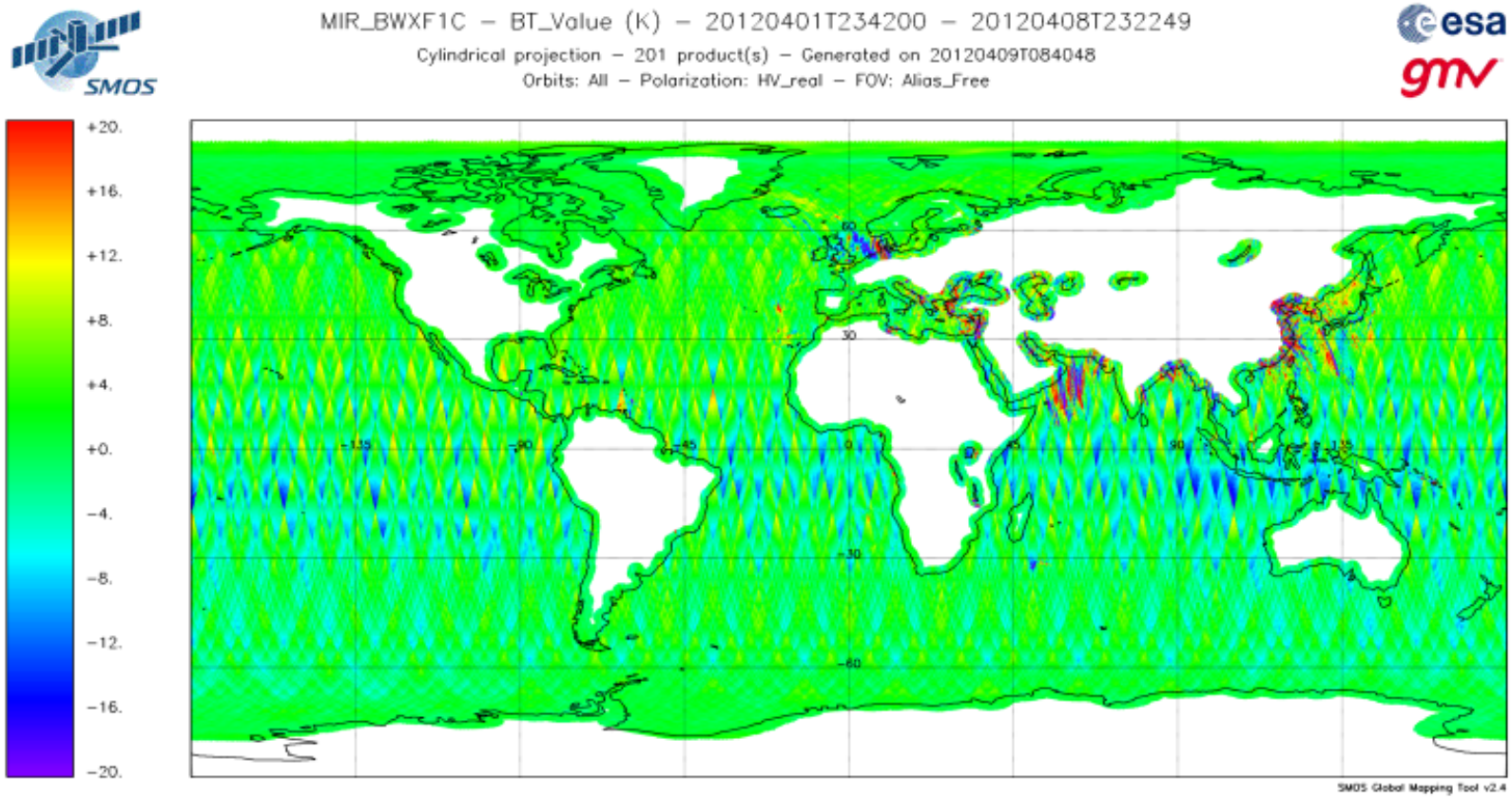


Figure 30 Real Part of the XY Brightness temperature evolution over sea during the reporting period (week 15)

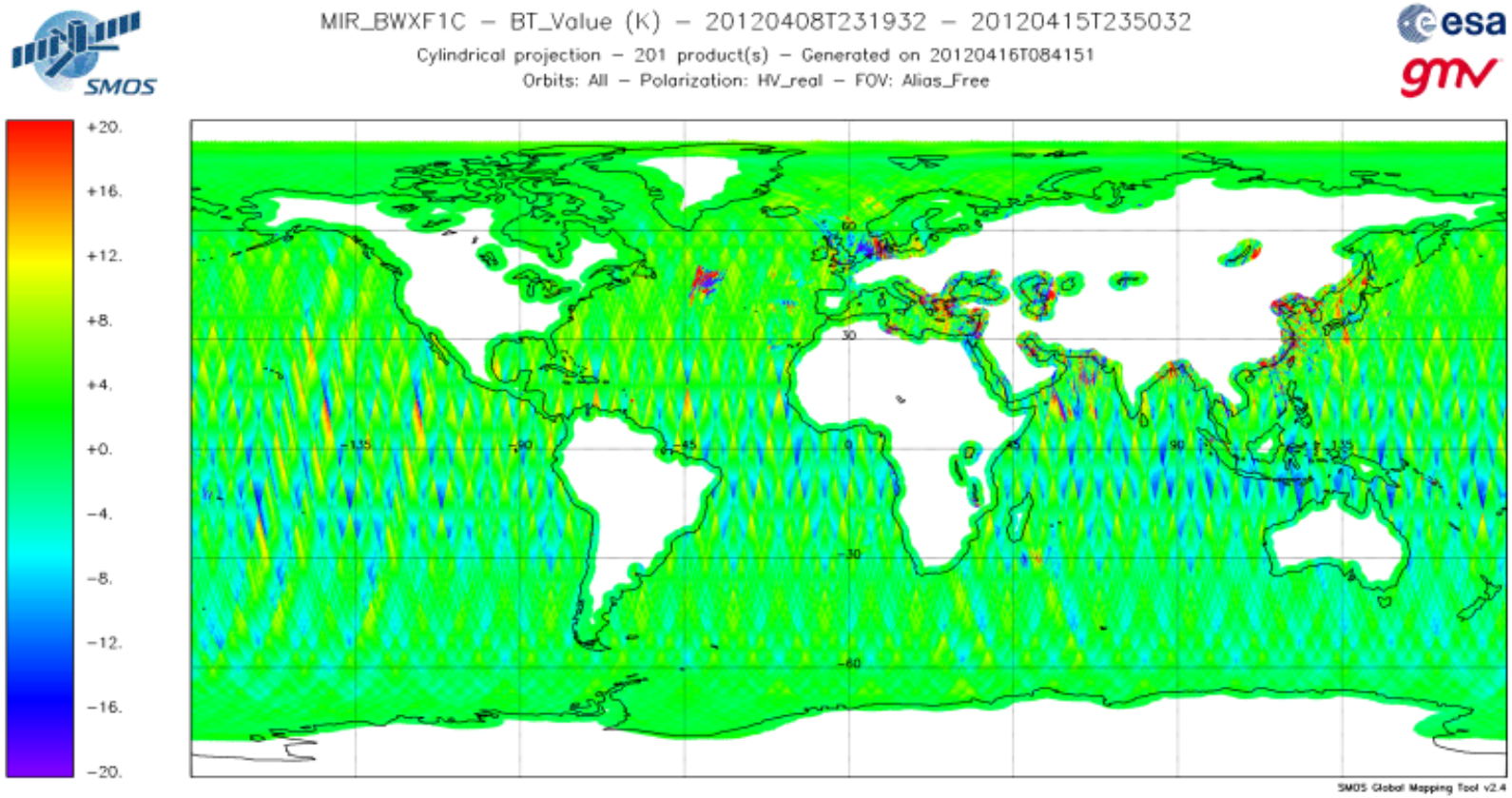


Figure 31 Real Part of the XY Brightness temperature evolution over sea during the reporting period (week 16)

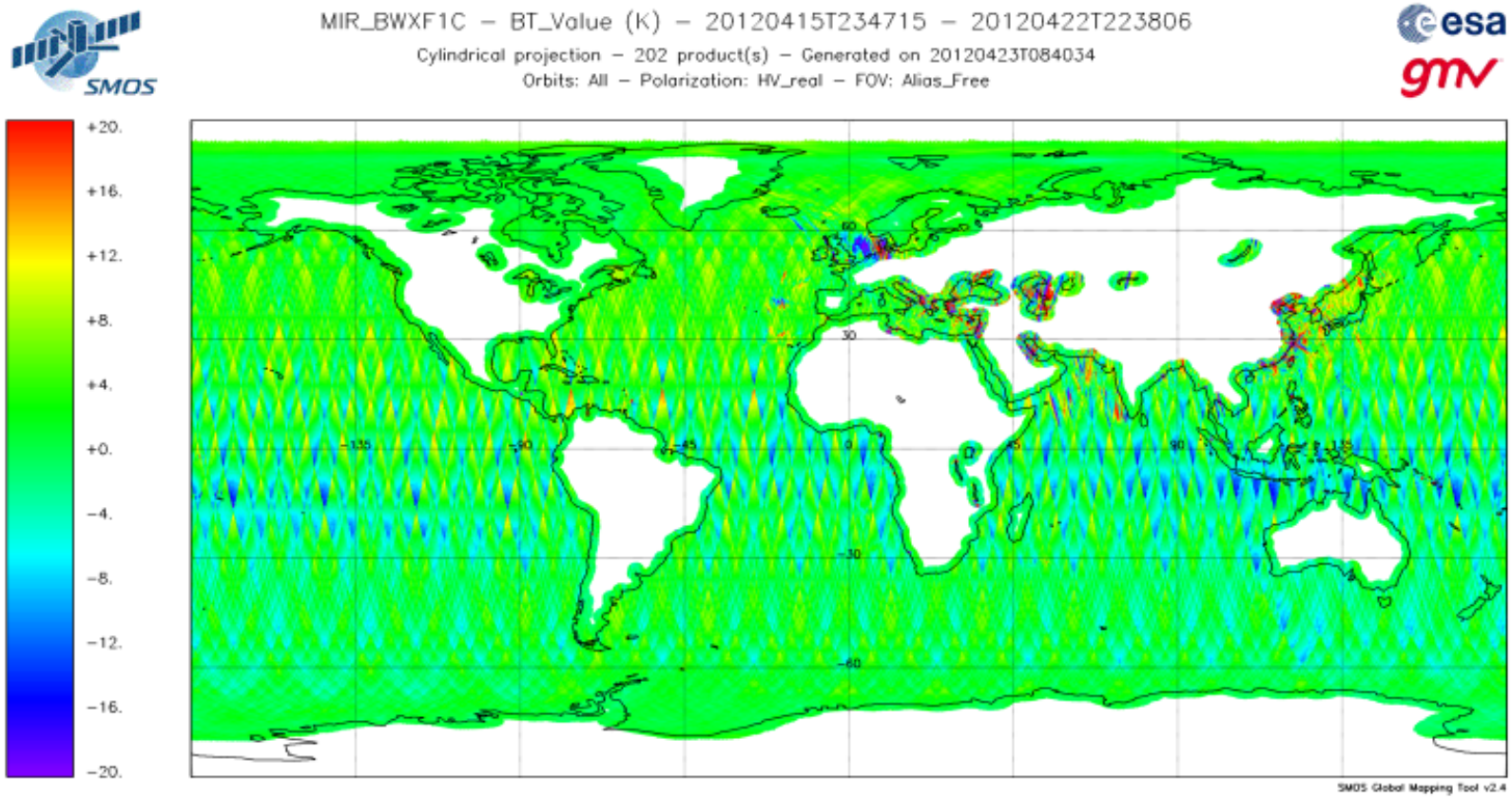


Figure 32 Real Part of the XY Brightness temperature evolution over sea during the reporting period (week 17)

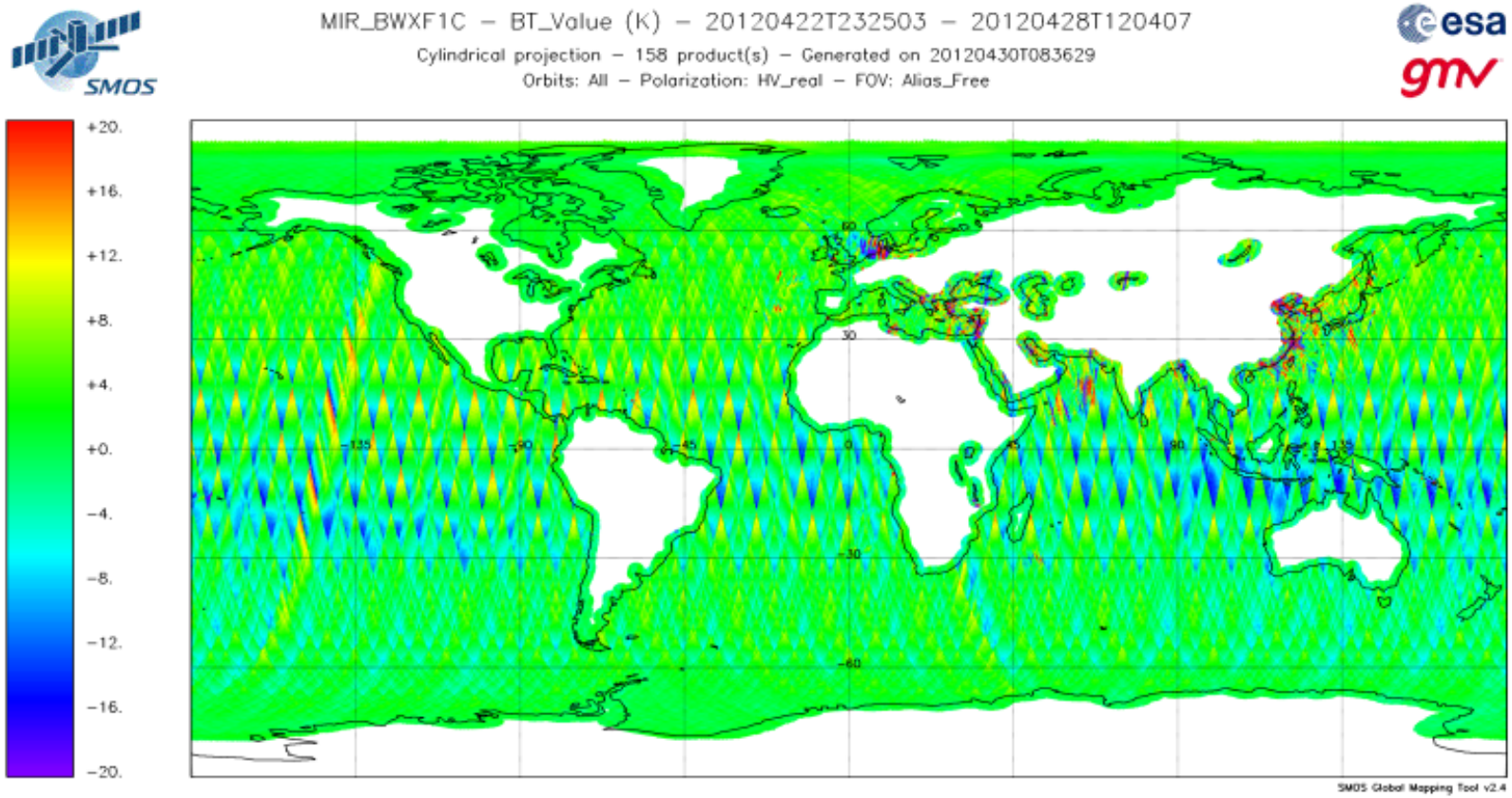


Figure 33 Real Part of the XY Brightness temperature evolution over sea during the reporting period (week 18)

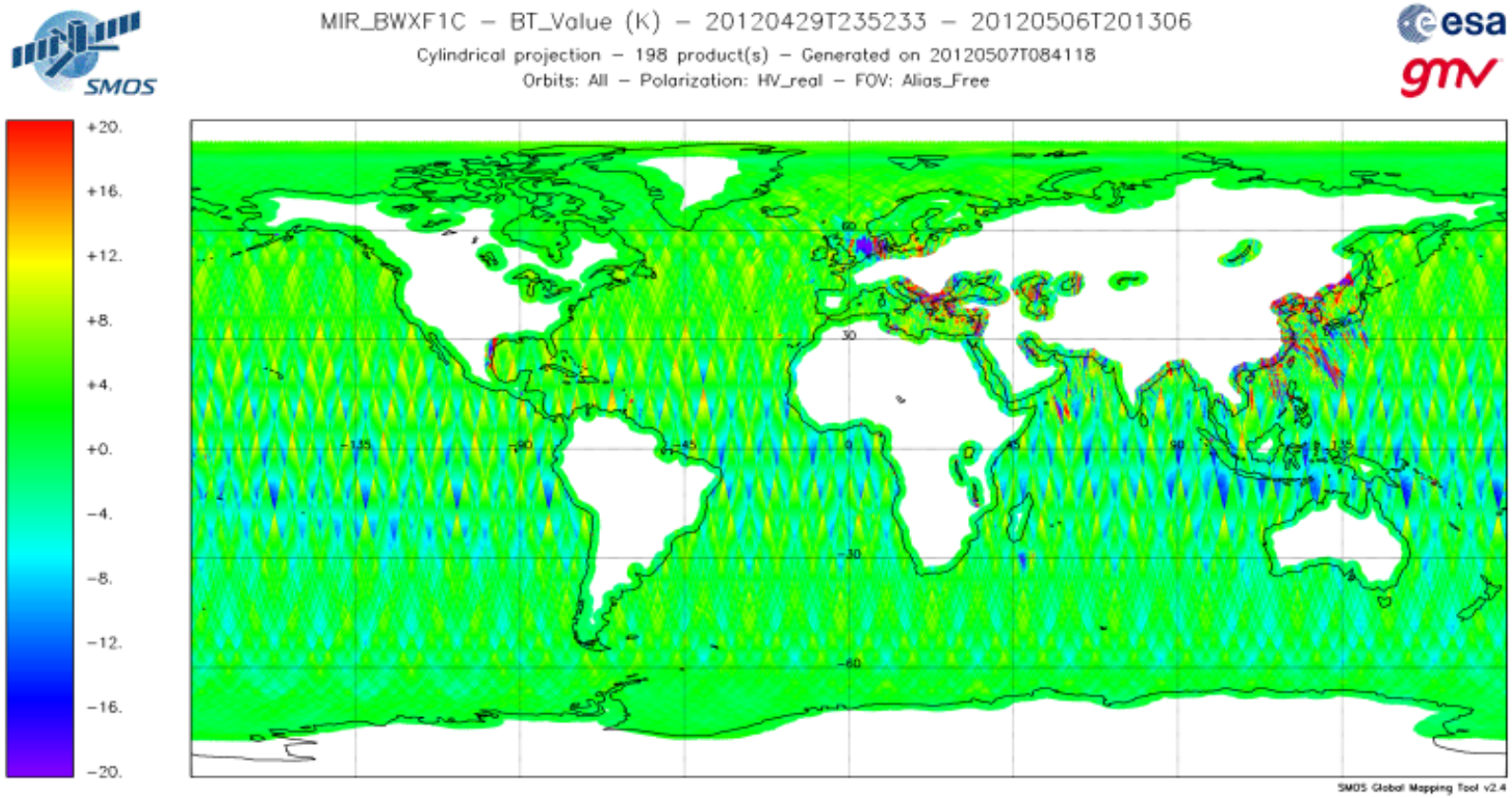


Figure 34 Imaginary Part of the XY Brightness temperature evolution over sea during the reporting period (week 13)

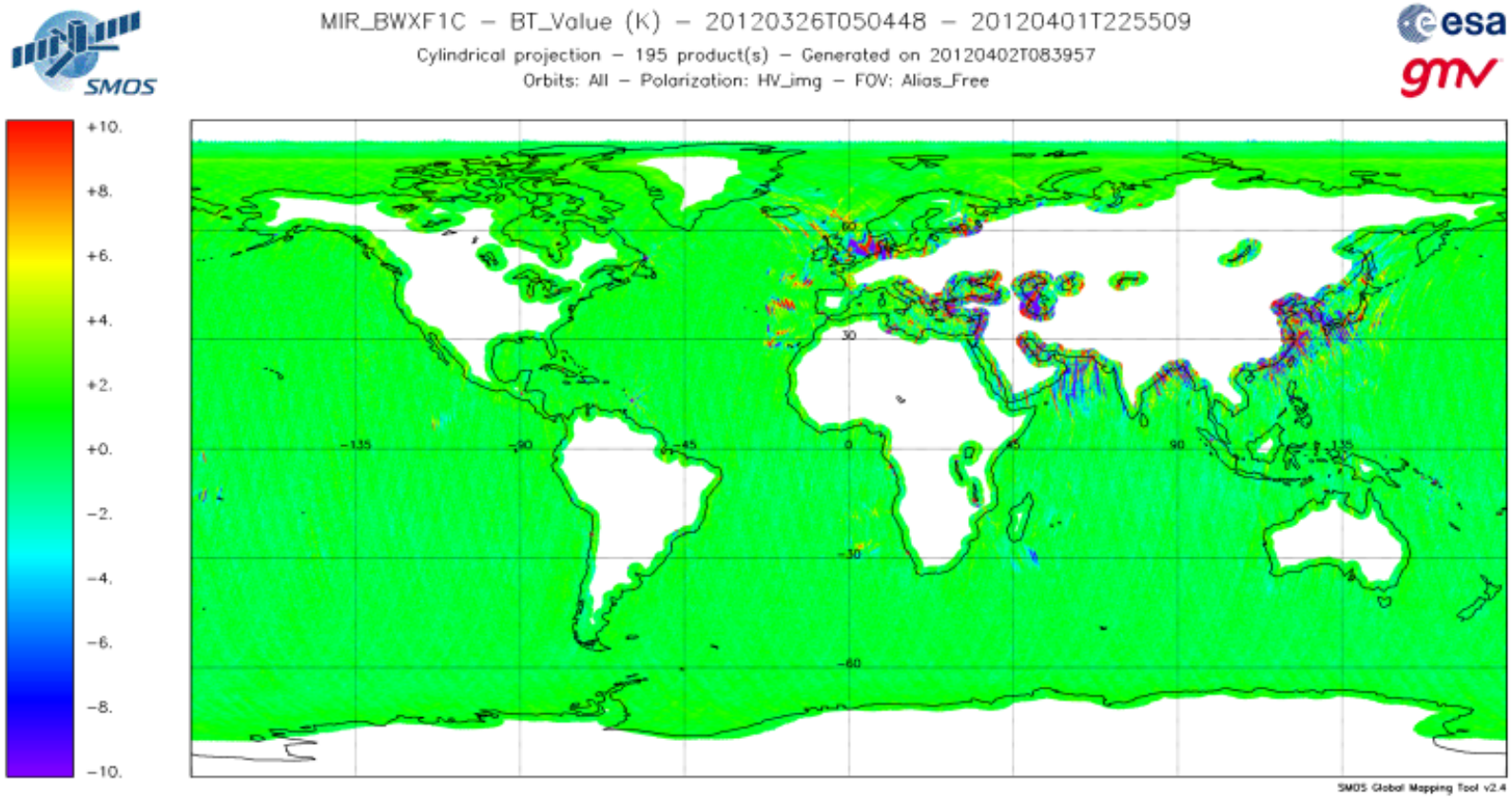


Figure 35 Imaginary Part of the XY Brightness temperature evolution over sea during the reporting period (week 14)

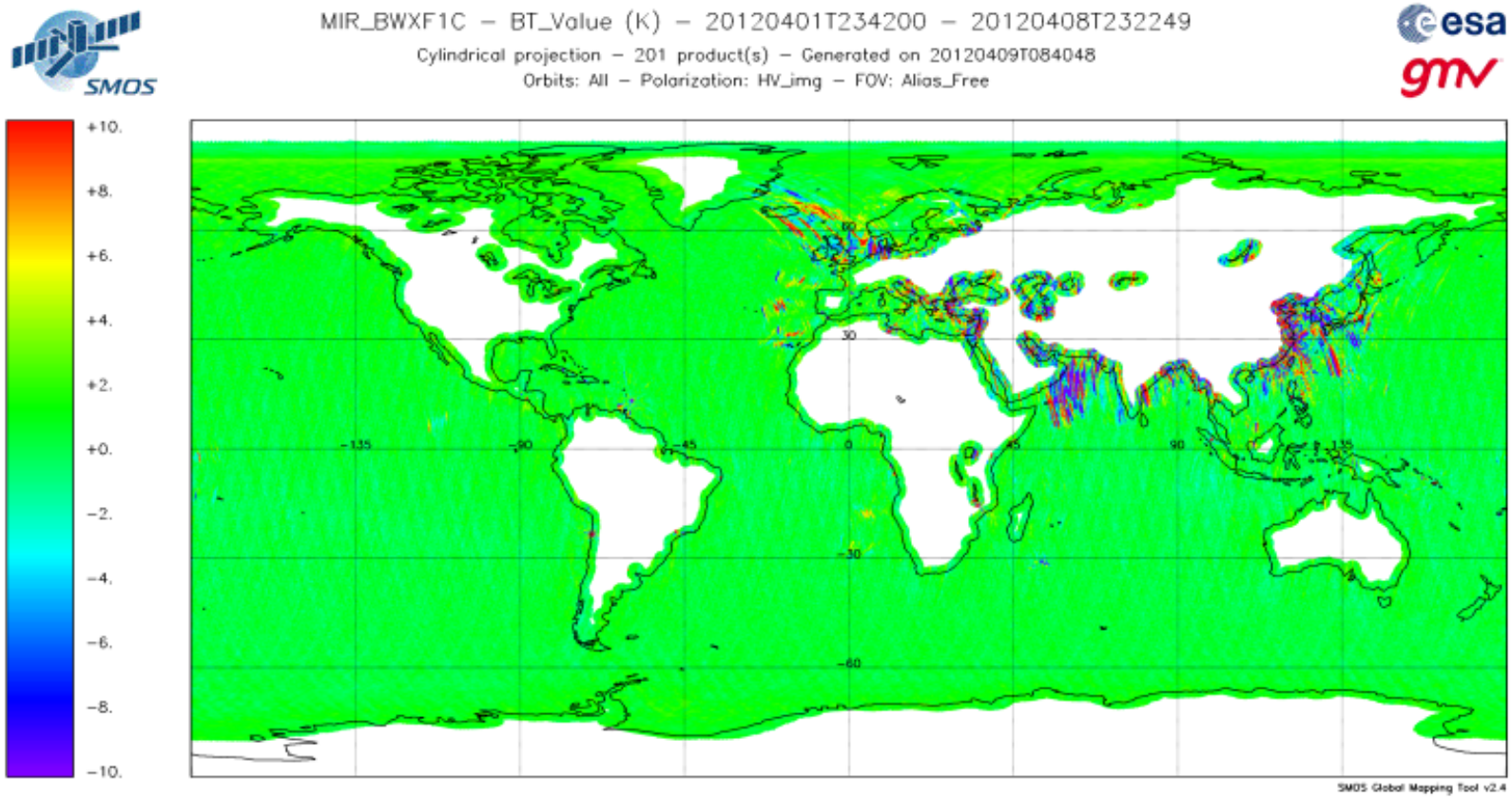


Figure 36 Imaginary Part of the XY Brightness temperature evolution over sea during the reporting period (week 15)

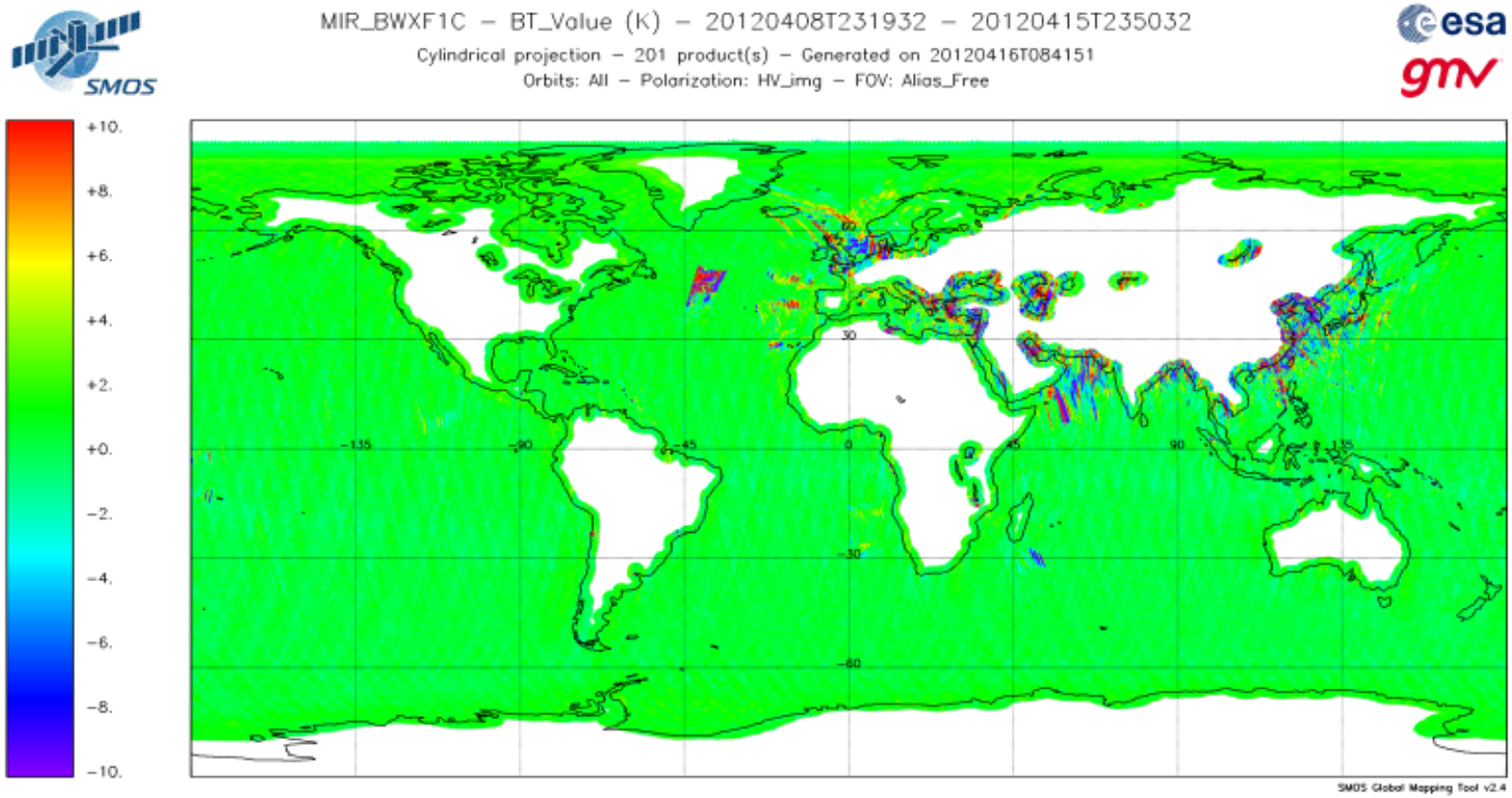


Figure 37 Imaginary Part of the XY Brightness temperature evolution over sea during the reporting period (week 16)

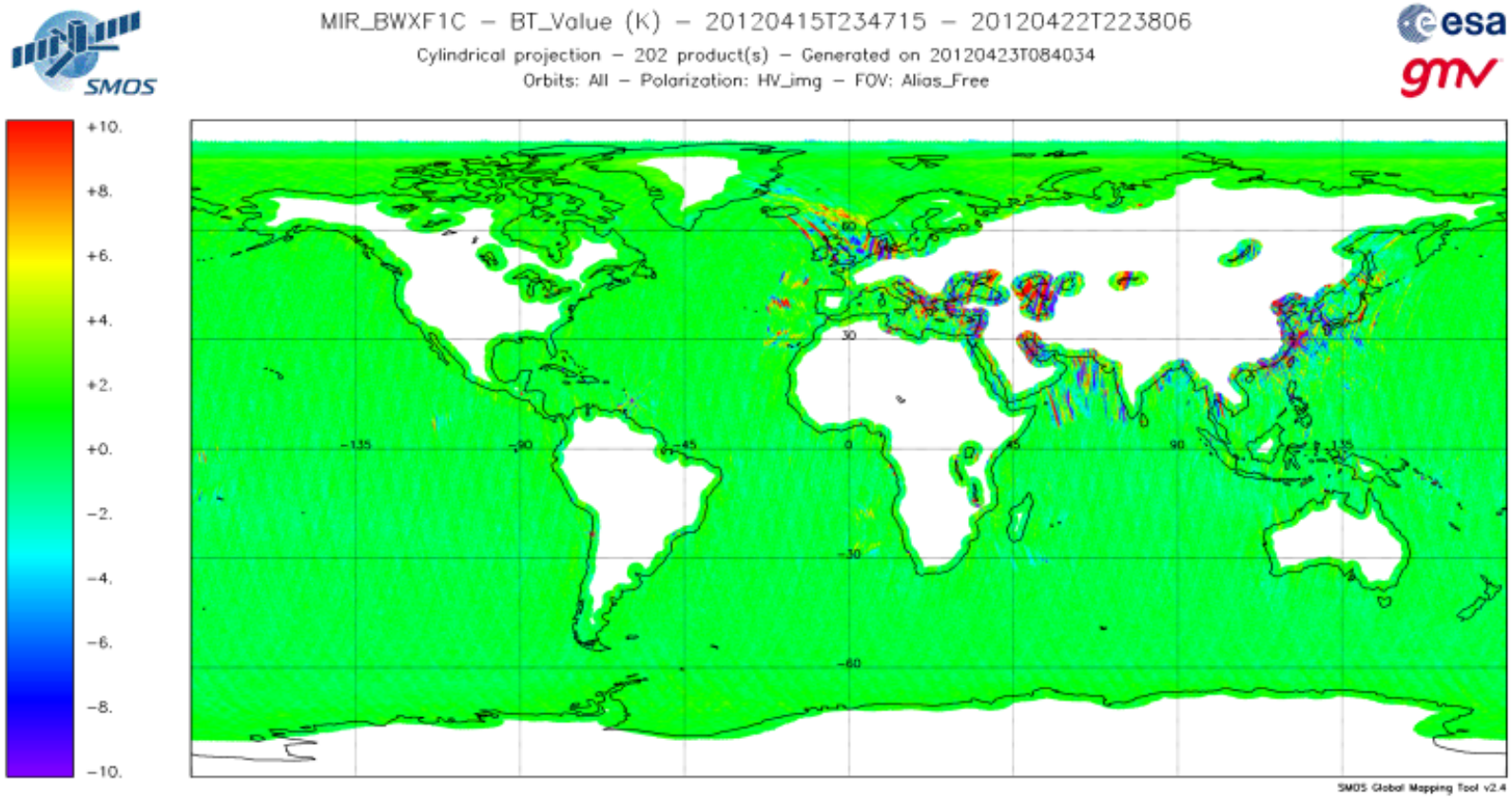


Figure 38 Imaginary Part of the XY Brightness temperature evolution over sea during the reporting period (week 17)

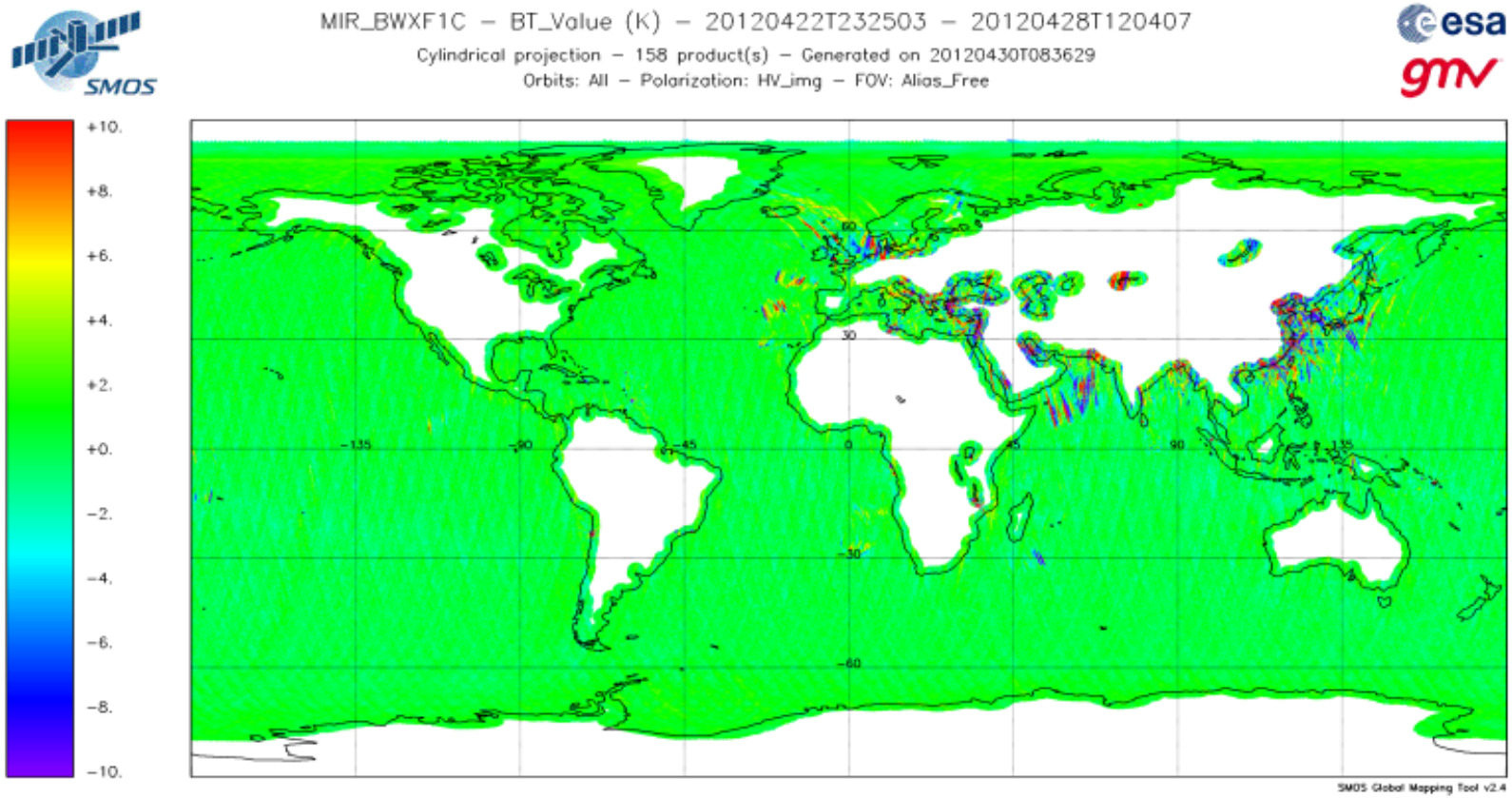


Figure 39 Imaginary Part of the XY Brightness temperature evolution over sea during the reporting period (week 18)

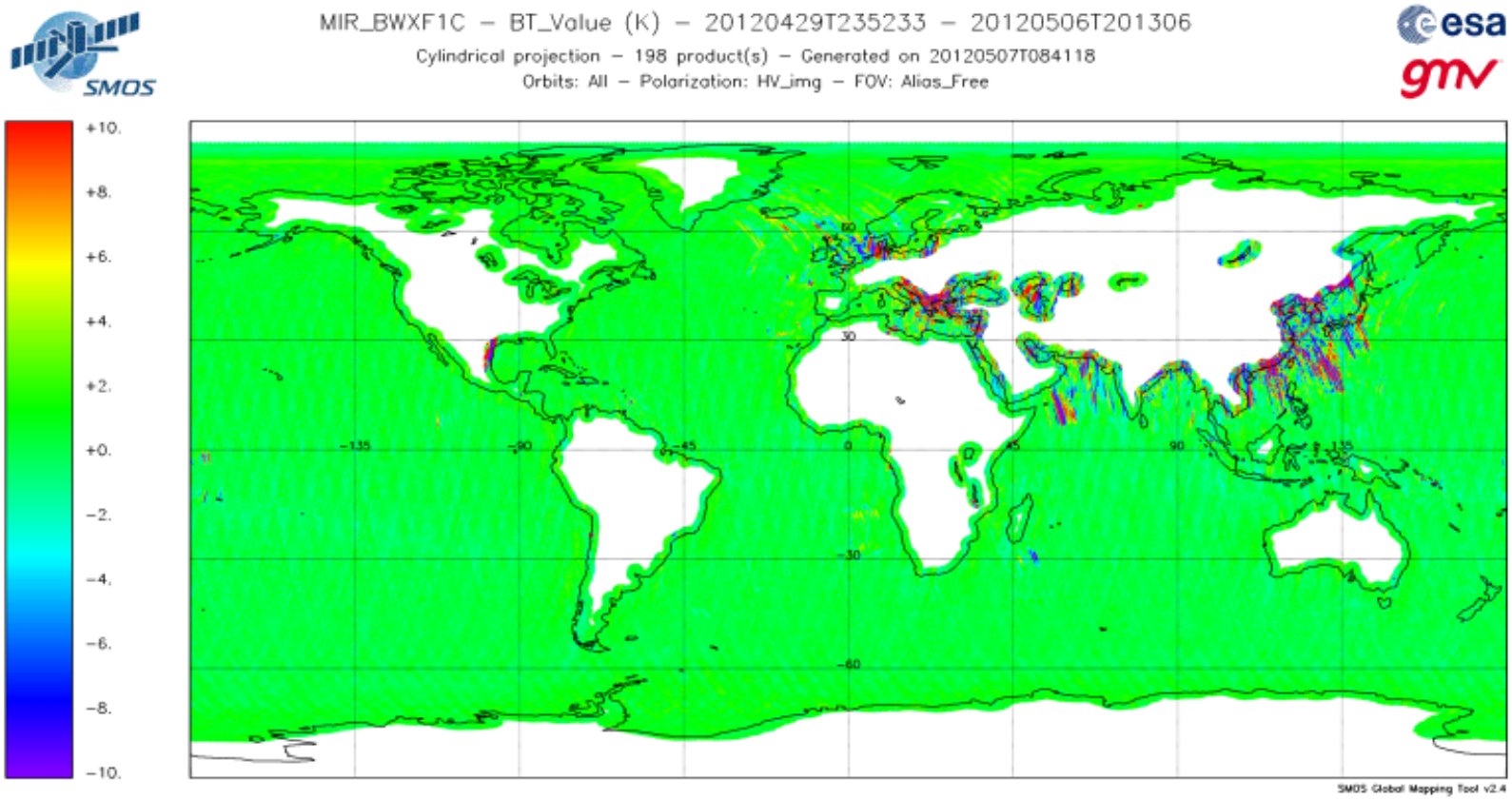


Figure 40 Soil moisture evolution during the reporting period (week 13)

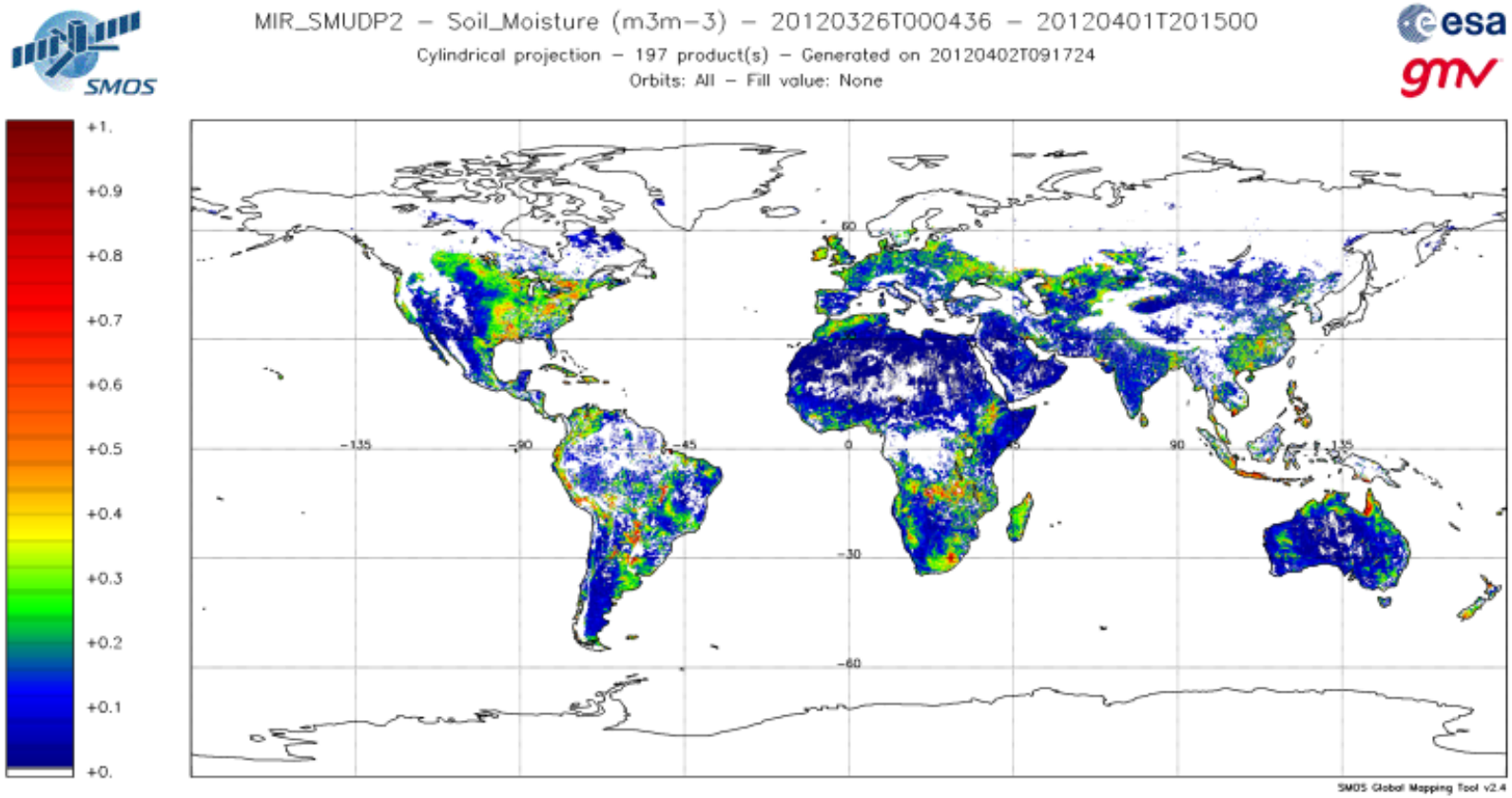


Figure 41 Soil moisture evolution during the reporting period (week 14)

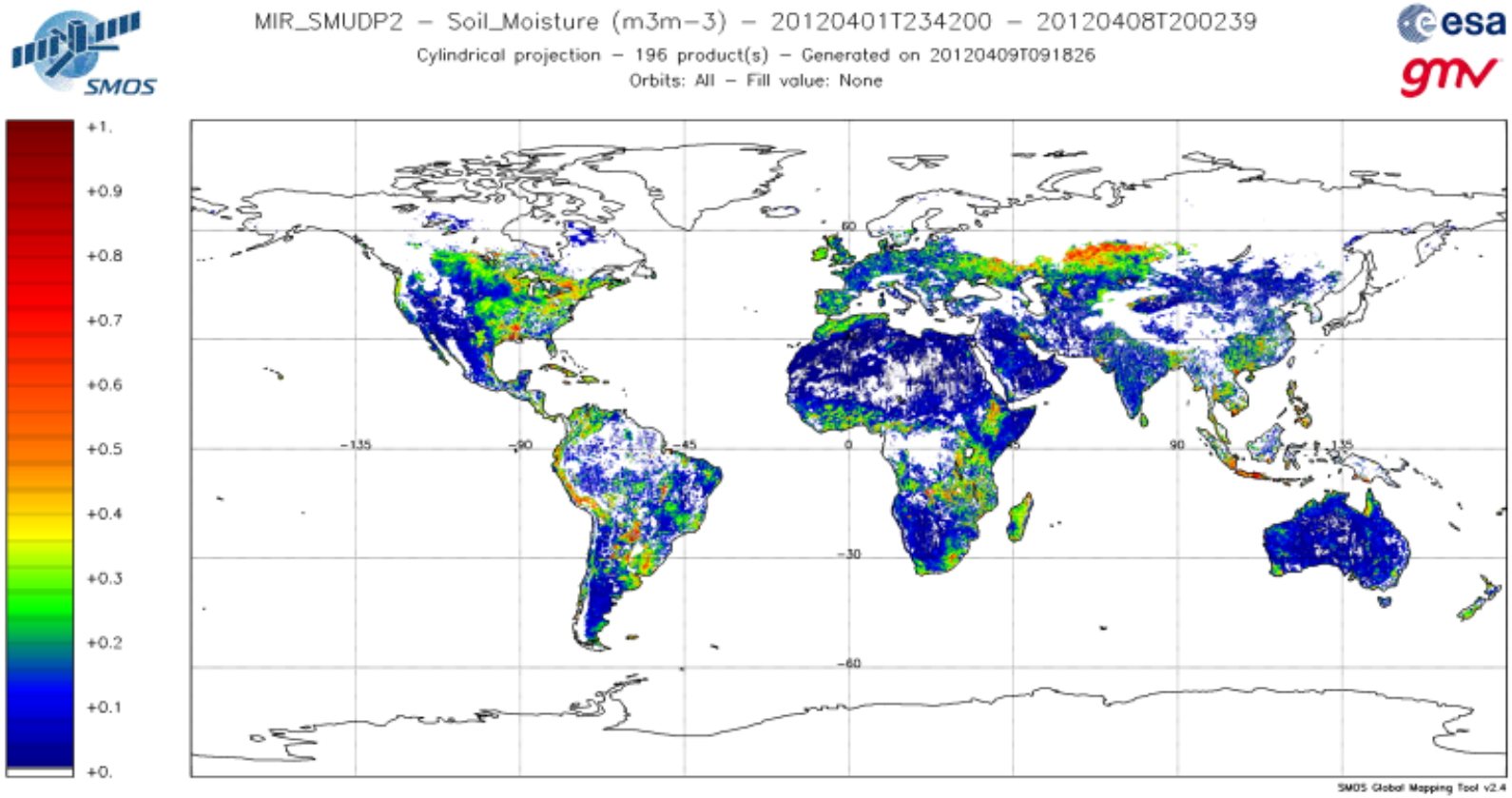


Figure 42 Soil moisture evolution during the reporting period (week 15)

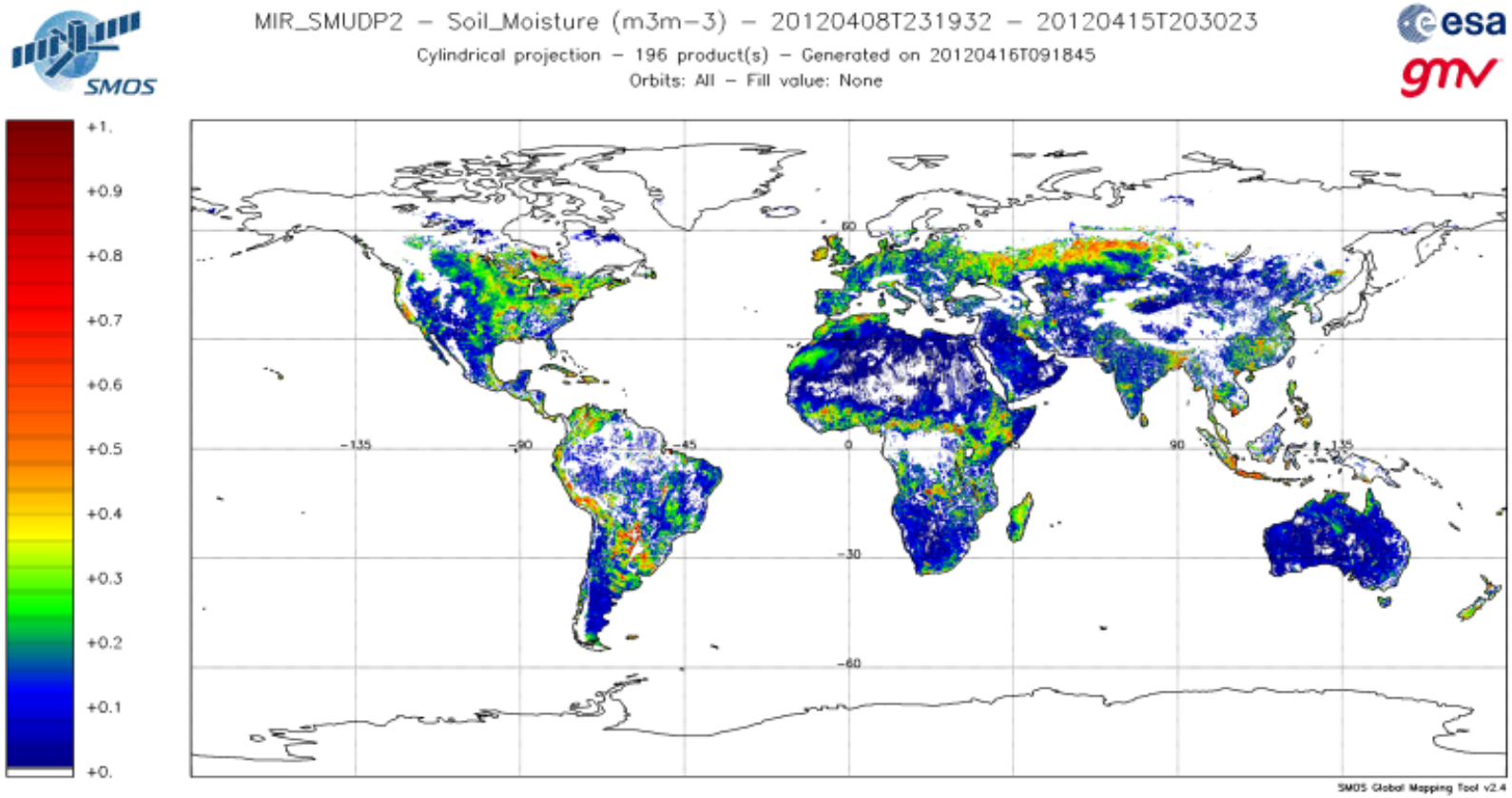


Figure 43 Soil moisture evolution during the reporting period (week 16)

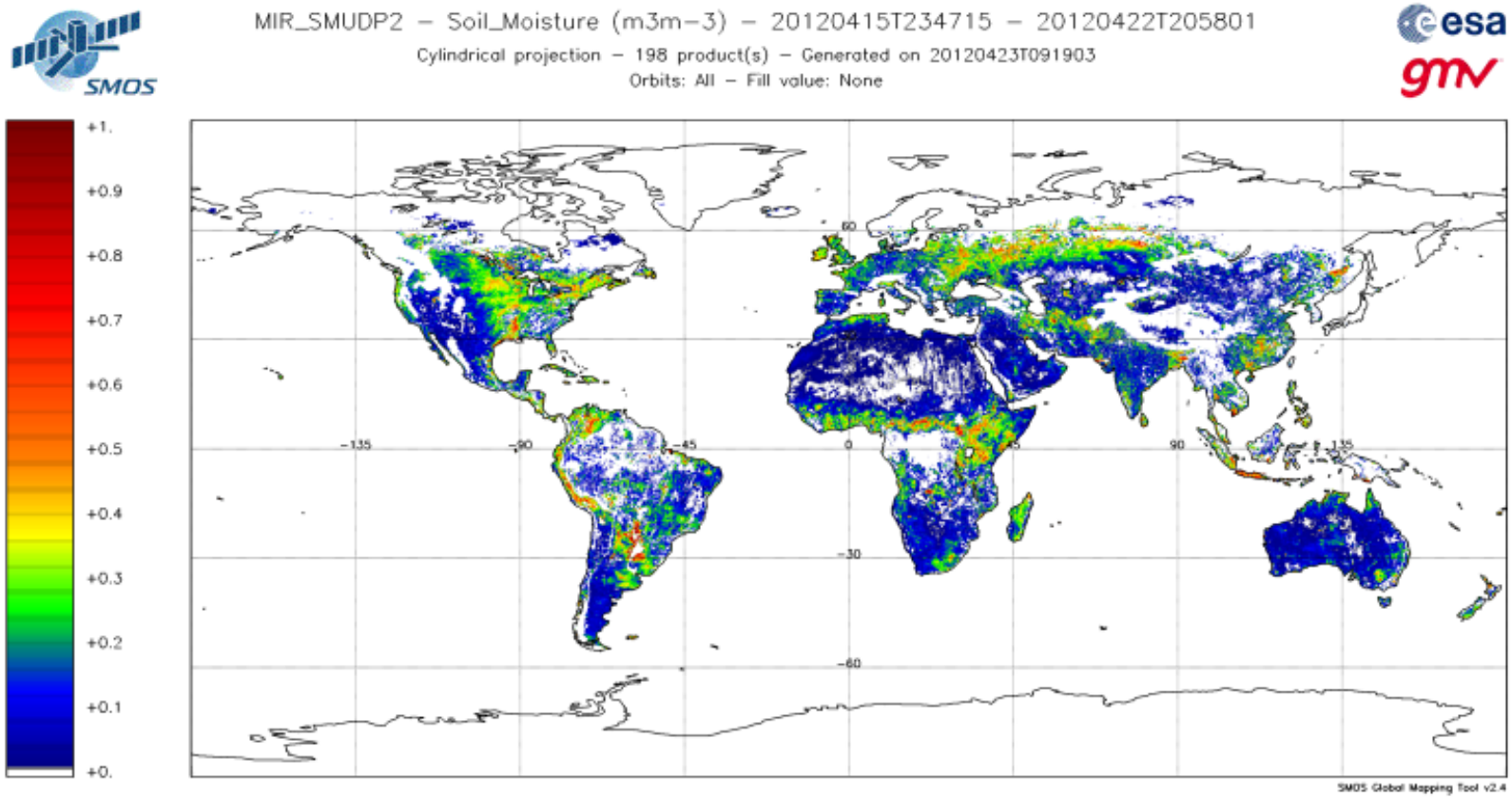


Figure 44 Soil moisture evolution during the reporting period (week 17)

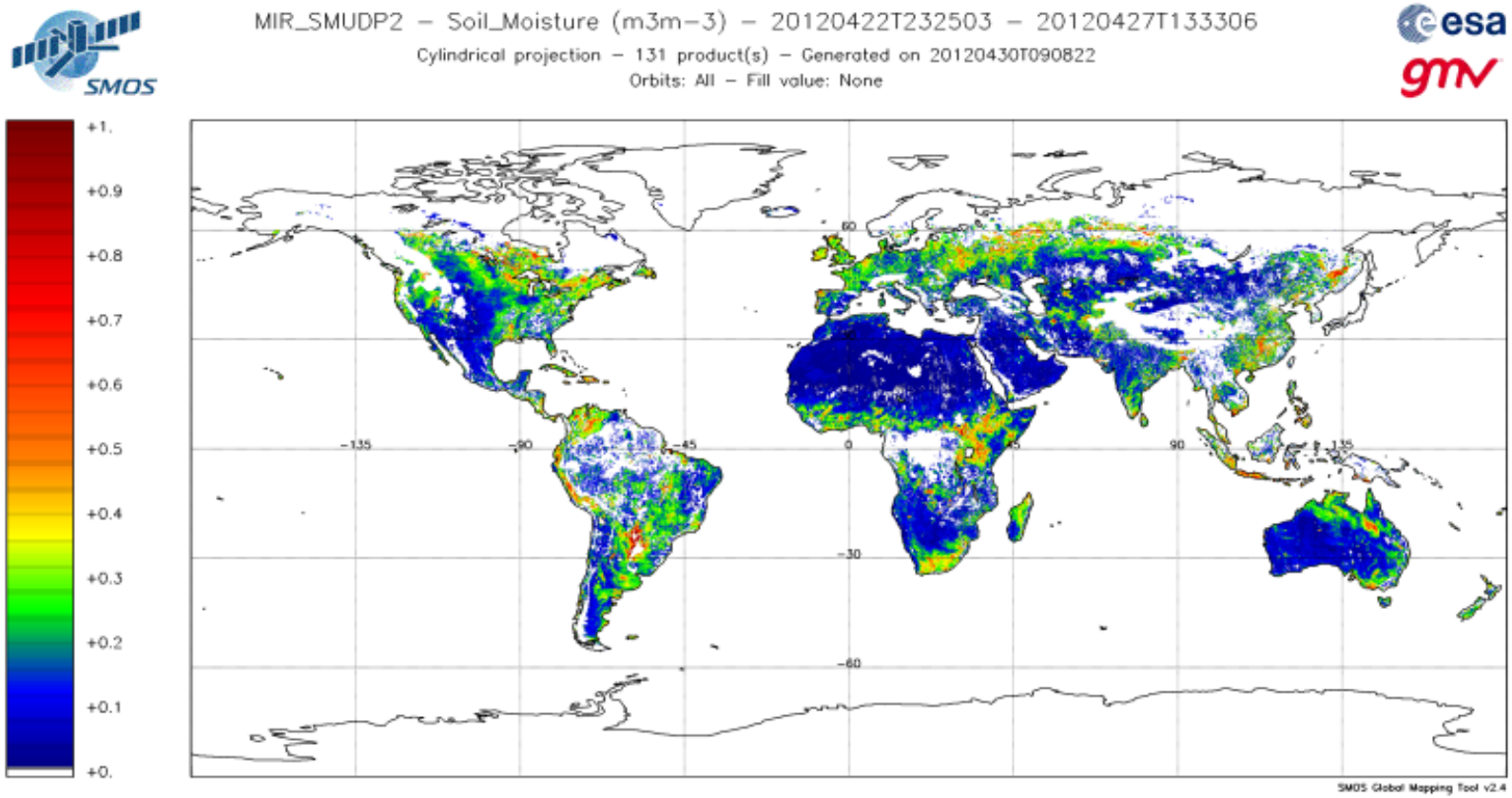


Figure 45 Soil moisture evolution during the reporting period (week 18)

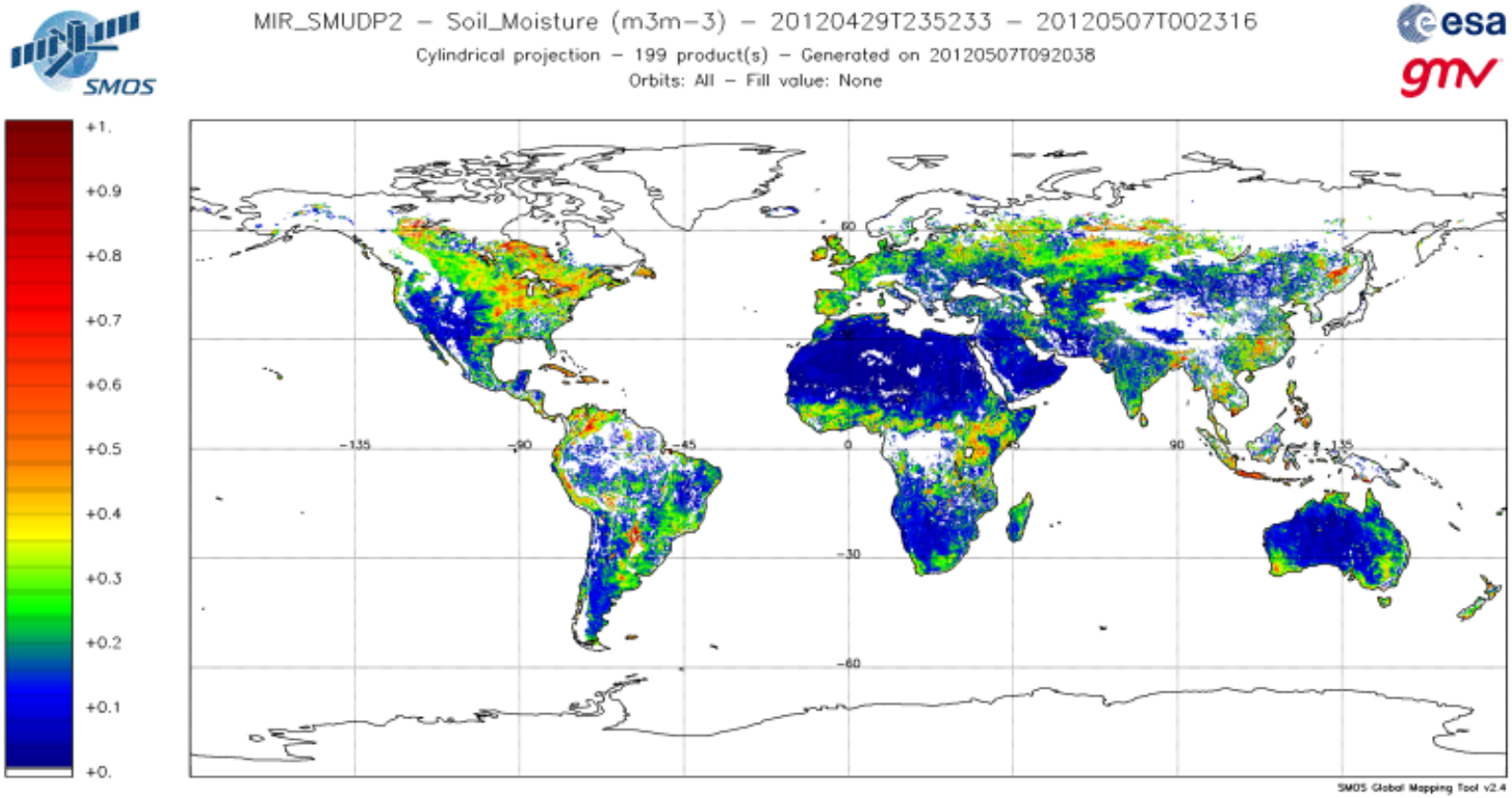


Figure 46 Soil moisture on Taklamakan desert during the reporting period: SM in ascending passes (left) and SM in descending passes (right)

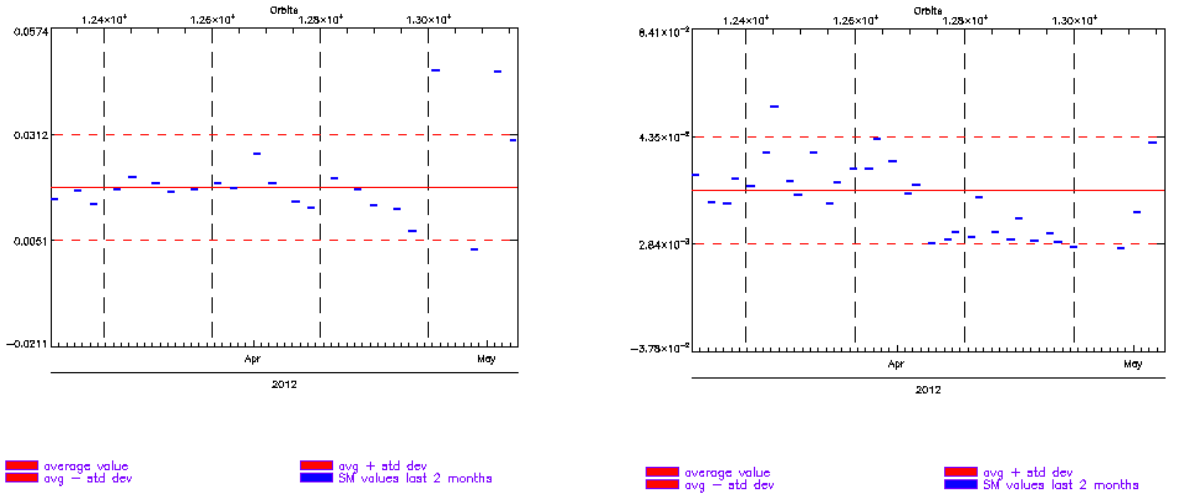
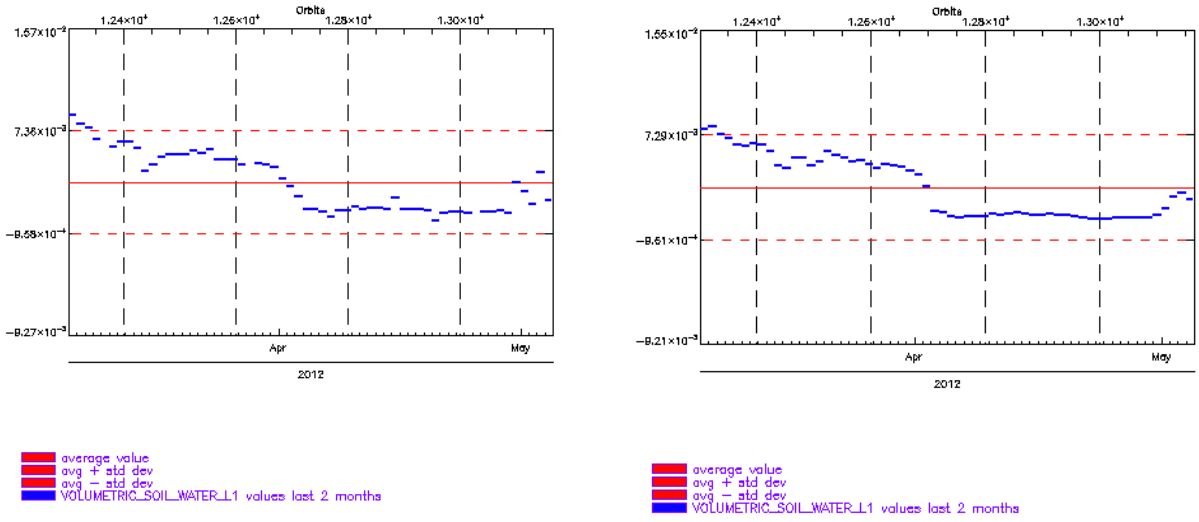


Figure 47 Volumetric Soil Water L1 provided by ECMWF on Taklamakan desert during the reporting period: ascending passes (left) and descending passes (right)



6. ADF CONFIGURATION AT THE END OF THE REPORTING PERIOD

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APPENDIX A. CONFIGURATION DOCUMENT LIST

The list of internal documents used for the generation of this report is:

- Unavailability_10_05_12.xls
- Details_Calibrations_23_04_12.xls
- SO-MN-IDR-GS-0383_CCB-106_11-Apr-12_v10.doc
- SO-MN-IDR-GS-0384_CCB-107_20-Apr-12_v10.doc
- SO-MN-IDR-GS-0385_CCB-108_24-Apr-12_v10.doc
- SO-MN-IDR-GS-0386_CCB-109_08-May-12_v10.doc

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