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Title : **IDEAS – SMOS Public Monthly Report - December 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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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	2 April 2012	N/A	First release
2	11 May 2012	N/A	Section 4.1 updated with the details of L2OS reprocessing from 16-Dec-2011 to 23-Jan-2012 data in the nominal processing chain

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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 December 2011.

The instrument health during December was found to be nominal. There were 7 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 December 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 L2OS v550 for Level 2 on 15-Dec-2011. 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
01 December 2011 02:46 Orbit 10922	01 December 2011 02:50 Orbit 10922	FOS-0115	No	CCU reset
05 December 2011 01:09 Orbit 10978	05 December 2011 01:09 Orbit 10978	FOS-0116	No	MM Latchup (Partition 6)

06 December 2011 12:17 Orbit 10999	06 December 2011 12:19 Orbit 10999	FOS-0117	No	CMN unlock (C3)
15 December 2011 21:45 Orbit 11134	15 December 2011 22:05 Orbit 11135	FOS-0119	Yes	OCM (Collision Avoidance Manoeuvre)
21 December 2011 09:52 Orbit 11214	21 December 2011 09:55 Orbit 11214	FOS-0120	No	CCU reset
25 December 2011 11:46 Orbit 11272	25 December 2011 11:46 Orbit 11272	FOS-0120	No	MM Latchup (Partition 4)
26 December 2011 08:15 Orbit 11285	26 December 2011 08:19 Orbit 11285	FOS-0123	No	CCU reset

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.

The Level 2 Ocean Salinity data covering the period 15-Dec-2011 00:25:04z to 24-Jan-2012 00:21:40z have been regenerated. The period covers from the L2 Ocean Salinity processor deployment until the introduction of the L2 configuration update. The L2 Ocean Salinity data have been regenerated using the L2 configuration introduced on 23-Jan-2012 (see section 4.2.5 in the QC Monthly report of January 2012 for the details of the new L2 OS configuration). The files are OPER class and they can be identified through the file counter which is 2 or higher.

4.2 Processing changes

4.2.1 Processor updates

The L2OS processor v550 was transferred into operations on 15-Dec-2011.

This processor supports the application of different Ocean Target Transformation for ascending and descending orbits.

The start sensing time of the first product generated with the new processor baseline is 15/12/2011 at 07:05:29.

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

L2OS	550
L2SM	500

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

An update schema baseline has been transferred into operations together with the new Level 2 Ocean Salinity processor on 15/12/2011. The schema package used by the new processors is the schemas_2011-10-25_v05-01-00.

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_CNFOSD_20050101T000000_20500101T000000_001_020_3.EEF

Dissemination date: 2011-12-15 17:03:00z

Start sensing time at L2 processor: N/A

Justification: Updated in the frame of the new L2OP v550 Processing Baseline. Corrected error on wind speed for roughness model 1 (was 1.5 m/s, now 2m/s)

SM_OPER_AUX_CNFOSF_20050101T000000_20500101T000000_001_020_3.EEF

Dissemination date: 2011-12-15 17:03:00z

Start sensing time at L2 processor: 2011-12-15 07:05:29z

Justification: Updated in the frame of the new L2OP v550 Processing Baseline. Corrected error on wind speed for roughness model 1 (was 1.5 m/s, now 2m/s)

SM_OPER_AUX_OTT1F__20100501T000000_20500101T000000_550_002_3

Dissemination date: 2011-12-15 17:03:00z

Start sensing time at L2 processor: 2011-12-15 07:05:29z

Justification: Updated in the frame of the new L2OP v550 Processing Baseline. The OTT file contains different information for ascending and descending orbits.

SM_OPER_AUX_OTT2F__20100501T000000_20500101T000000_550_002_3

Dissemination date: 2011-12-15 17:03:00z

Start sensing time at L2 processor: 2011-12-15 07:05:29z

Justification: Updated in the frame of the new L2OP v550 Processing Baseline. The OTT file contains different information for ascending and descending orbits.

SM_OPER_AUX_OTT3F__20100501T000000_20500101T000000_550_002_3

Dissemination date: 2011-12-15 17:03:00z

Start sensing time at L2 processor: 2011-12-15 07:05:29z

Justification: Updated in the frame of the new L2OP v550 Processing Baseline. The OTT file contains different information for ascending and descending orbits.

SM_OPER_AUX_SSS____20050101T000000_20500101T000000_001_013_3

Dissemination date: 2011-12-15 17:03:00z

Start sensing time at L2 processor: 2011-12-15 07:05:29z

Justification: Updated in the frame of the new L2OP v550 Processing Baseline. Corrected bad data for January & shifted data for February-December

SM_OPER_AUX_BULL_B_20111002T000000_20111101T235959_120_001_3

Dissemination date: 2011-12-05 16:41:17z

Start sensing time at L1 processor: N/A

Justification: Bulletin Update including values from October 2011 and the prediction for November 2011. Its usage is intended for reprocessing.

SM_OPER_AUX_BULL_B_20111002T000000_20500101T000000_120_001_3

Dissemination date: 2011-12-05 16:41:17z

Start sensing time at L1 processor: 2011-12-05 11:55:08z

Justification: Bulletin Update including values from October 2011 and the prediction for November 2011. It is usage is intended for the nominal production.

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
2011-12-01 15:19:50z	2011-12-01 15:21:34z	Short	Nominal
2011-12-08 15:48:00z	2011-12-08 15:49:44z	Short	Nominal
2011-12-13 15:44:53z	2011-12-13 17:07:07z	NIR Calibration	Nominal Brightness temperature: 3.69 K RMS: 0.11 K Moon elevation: 39.98 deg Sun Elevation: -6.58 deg Right Ascension: 169.54 deg

			Declination: 15.10 deg
2011-12-14 15:14:30z	2011-12-14 15:16:14z	Short	Nominal
2011-12-21 15:34:17z	2011-12-21 16:56:31z	NIR Calibration	Nominal Brightness temperature: 3.68 K RMS: 0.12 K Moon elevation: 29.12 deg Sun Elevation: -9.02 deg Right Ascension: 176.95 deg Declination: 17.99 deg
2011-12-22 1:16:00z	2011-12-22 2:09:19z	Long	Nominal
2011-12-22 2:46:51z	2011-12-22 3:40:10z	Long	Nominal
2011-12-24 3:17:56z	2011-12-24 4:43:36z	FTR	Nominal Brightness temperature: 3.66K RMS: 0.12 K Moon elevation: -12.61 deg Sun Elevation: -13.22 deg Right Ascension: 178.57 deg Declination: 25.66 deg
2011-12-29 15:30:30z	2011-12-29 15:32:14z	Short	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
01/12/2011 02:46 Orbit 10922	01/12/2011 02:50 Orbit 10922	L0 Nominal & NRT Production and higher levels	CCU reset (FOS-0115)
15/12/2011 21:45 Orbit 11134	15/12/2011 22:05 Orbit 11135	Level 1C and Level 2 production	OCM Planned gaps due to Collision Avoidance Manoeuvre
21/12/2011 09:52 Orbit 11214	21/12/2011 09:55 Orbit 11214	L0 Nominal & NRT Production and higher levels	CCU reset (FOS-0120)
26/12/2011 08:15 Orbit 11285	26/12/2011 08:19 Orbit 11285	L0 Nominal & NRT Production and higher levels	CCU reset (FOS-0123)

Table 4-6 Operational gaps summary

Start	Finish	Data Level	Comments
21/12/2011 09:52 Orbit 11214	21/12/2011 09:56 Orbit 11214	L1C & L2 Production	L1C processor failed in the processing of the data

4.5 Summary of degraded data

In November 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.

Table 4-7 Summary of degraded data

Start	Finish	Affected products	Problem Description
09/12/2011 00:00z	09/12/2011 02:38z	L1C and L2 products	The auxiliary file with the prediction of the Ionespheric Electron Content has not

Orbit 11035	Orbit 11037		been updated during this period.
06/12/2011 12:17z Orbit 10999	06/12/2011 12:19z Orbit 10999	Level 1 and Level 2 products	Wrong instrument calibration due to the CMN unlock (FOS-0117)
12/12/2011 00:00z Orbit 11079	13/12/2011 04:16z Orbit 11096	L1C and L2 products	The auxiliary file with the prediction of the Ionespheric Electron Content has not been updated during this period.
15/12/2011 07:05z Orbit 11126	15/12/2011 16:18z Orbit 11131	L2 Ocean Salinity products	The Ocean Target Transformation was not applied correctly during that period.
17/12/2011 00:00z Orbit 11151	18/12/2011 12:42z Orbit 11173	L1C and L2 products	The auxiliary file with the prediction of the Ionespheric Electron Content has not been updated during this period.
26/12/2011 00:00z Orbit 11280	27/12/2011 23:59z Orbit 11309	L1C and L2 products	The auxiliary file with the prediction of the Ionespheric Electron Content has not been updated during this period.

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 processor, the L1c Sea Product contains some corrupted measurements. The grid points affected by this anomaly are all the pure sea pixels located in the polar region in an area above 72 deg latitude North and South. The major impact of this anomaly is on users who are using L1c data to study sea-ice conditions and users who want to retrieve salinity over the Arctic Sea. Those users need to filter out all pixels above 72 deg latitude before using the data.

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. No anomalies have been detected in the reporting period. During the reporting period, there have been NIR calibrations events on 13 December and 21 December. 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 22 December 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.

A Flat Target Response acquisition was also conducted on 24 December for monitoring purposes. The Flat Target Response (FTR) has been considered stable and it will not be updated into the nominal processing chain.

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 1 to Figure 30. 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 36 shows the evolution of the soil moisture retrievals. Those values present significant differences with the Volumetric Soil Water at L1 (see Figure 37) provided by ECMWF. The Level 2 ESL has pointed out that the possible cause is that the predicted precipitation event might not actually occur. The L2 Soil Moisture and Ocean Salinity production is nominal in the reporting period. Figure 36 shows the evolution of the soil moisture retrievals. Those values present significant differences with the Volumetric Soil Water at L1 (see Figure 37) provided by ECMWF. The Level 2 ESL has pointed out that the possible cause is that the predicted precipitation event might not actually occur. Also, it has been detected 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-1506.pdf).

Figure 1 1st Stokes evolution over land during the reporting period (week 48)

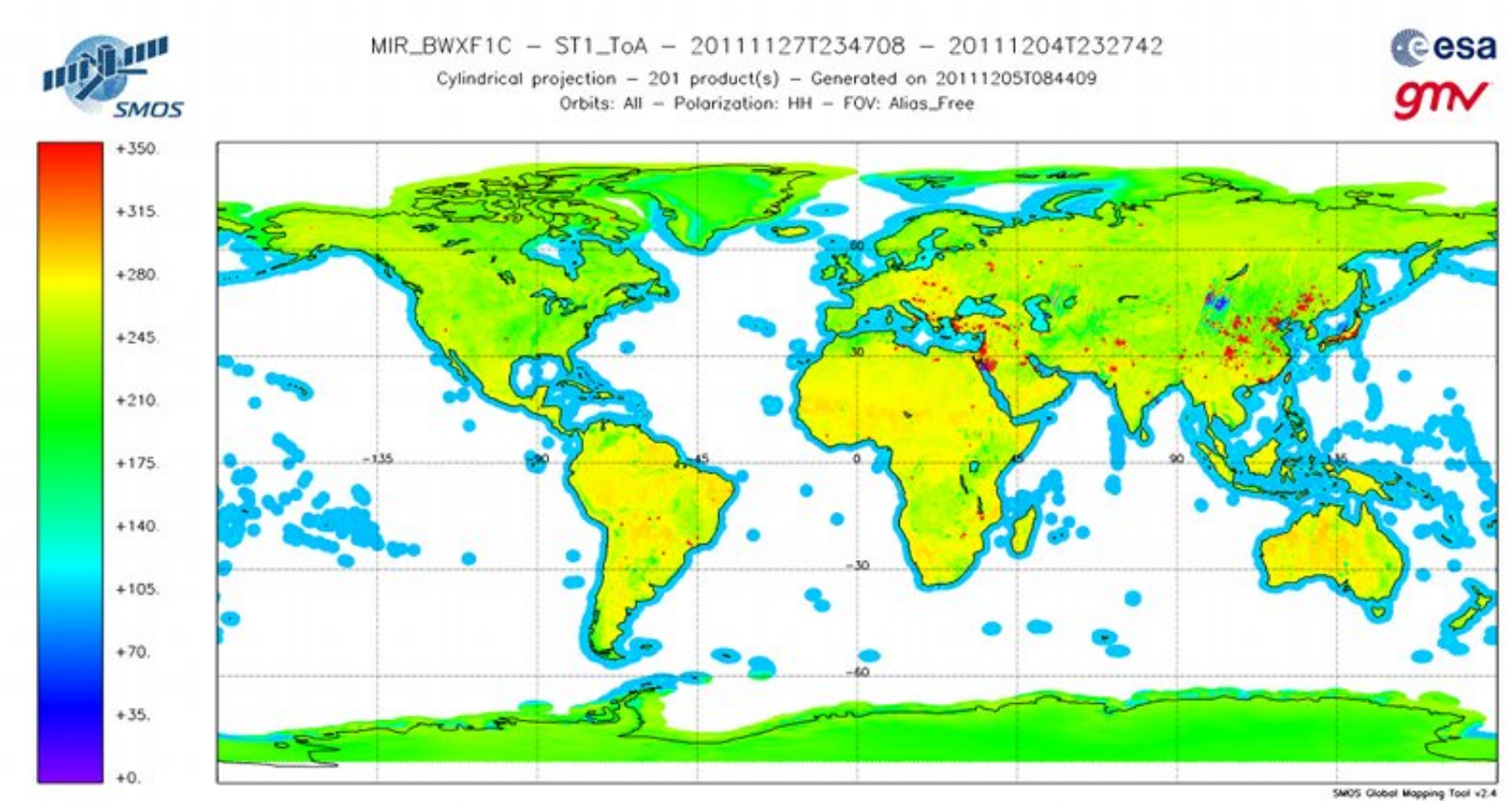


Figure 2 1st Stokes evolution over land during the reporting period (week 49)

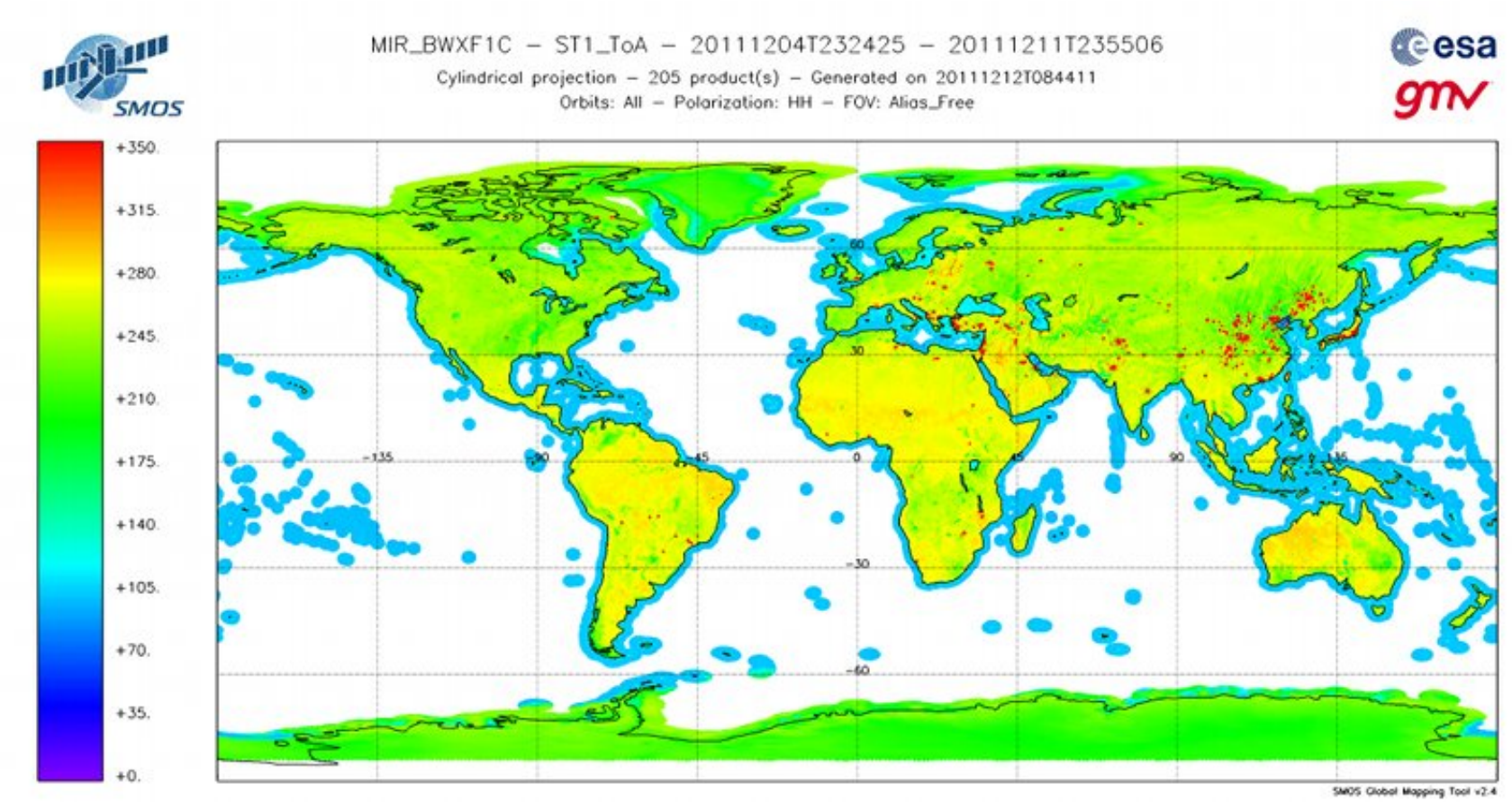


Figure 3 1st Stokes evolution over land during the reporting period (week 50)

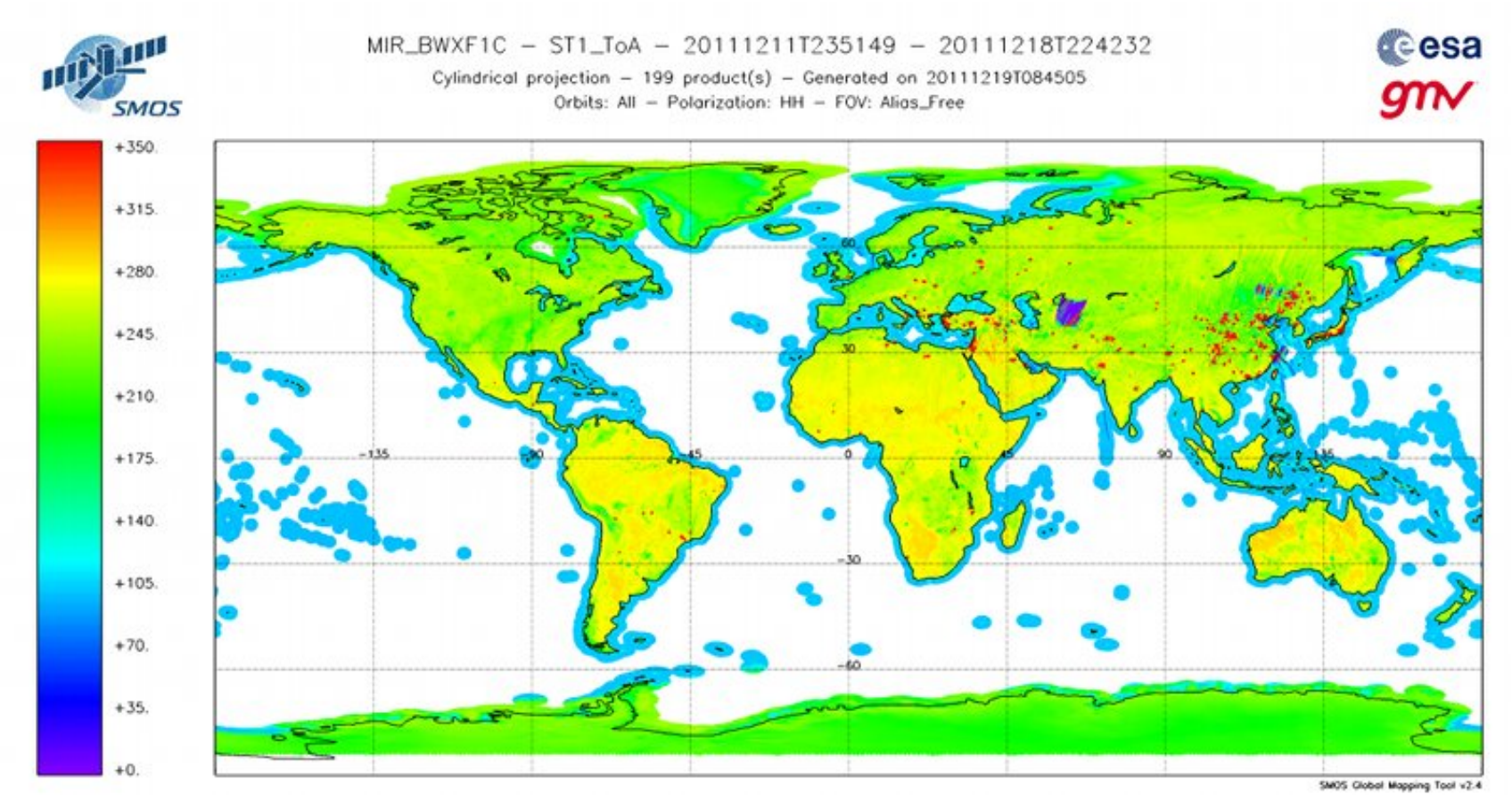


Figure 4 1st Stokes evolution over land during the reporting period (week 51)

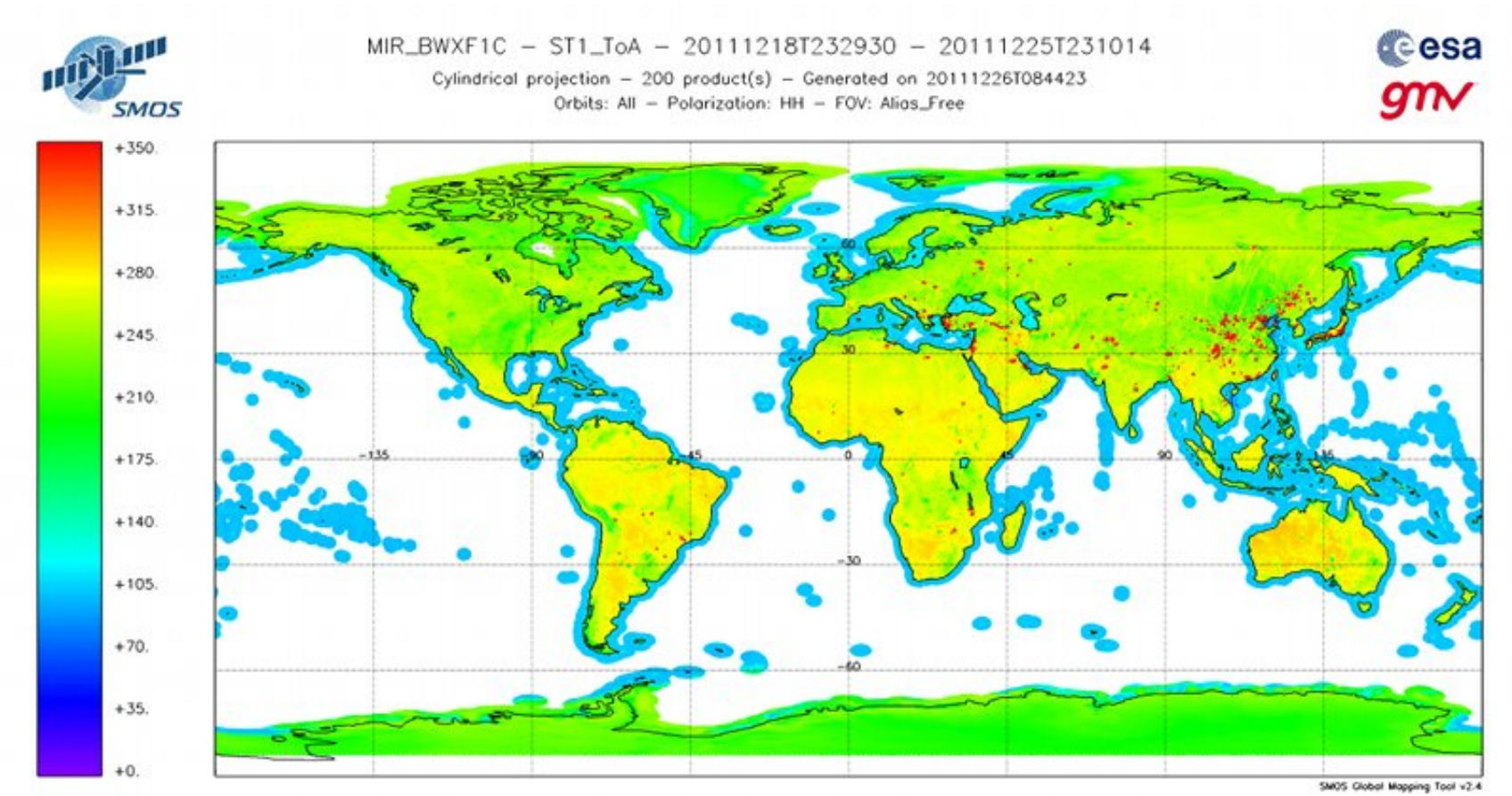


Figure 5 1st Stokes evolution over land during the reporting period (week 52)

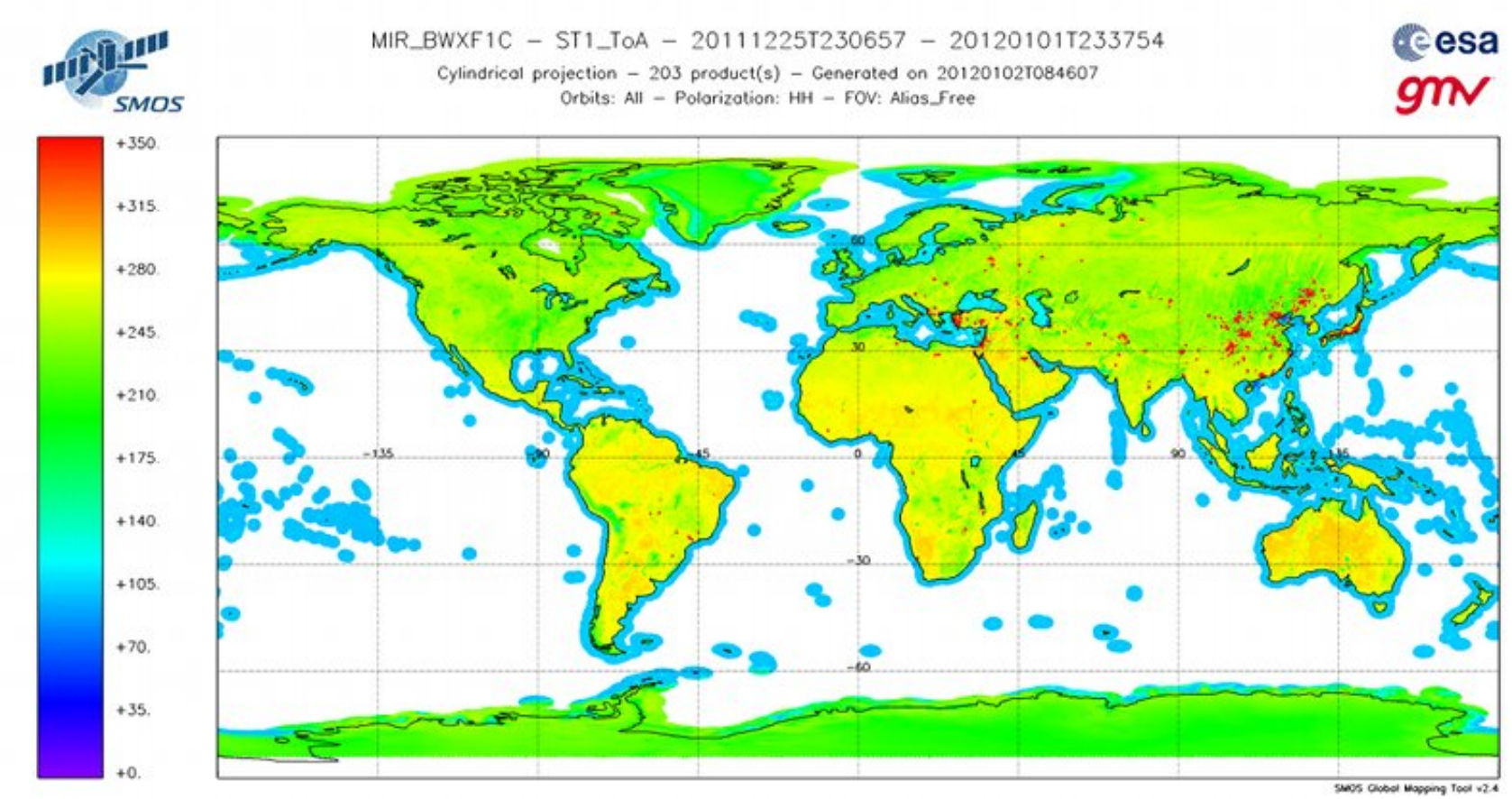


Figure 6 Real Part of the XY Brightness temperature evolution over land during the reporting period (week 48)

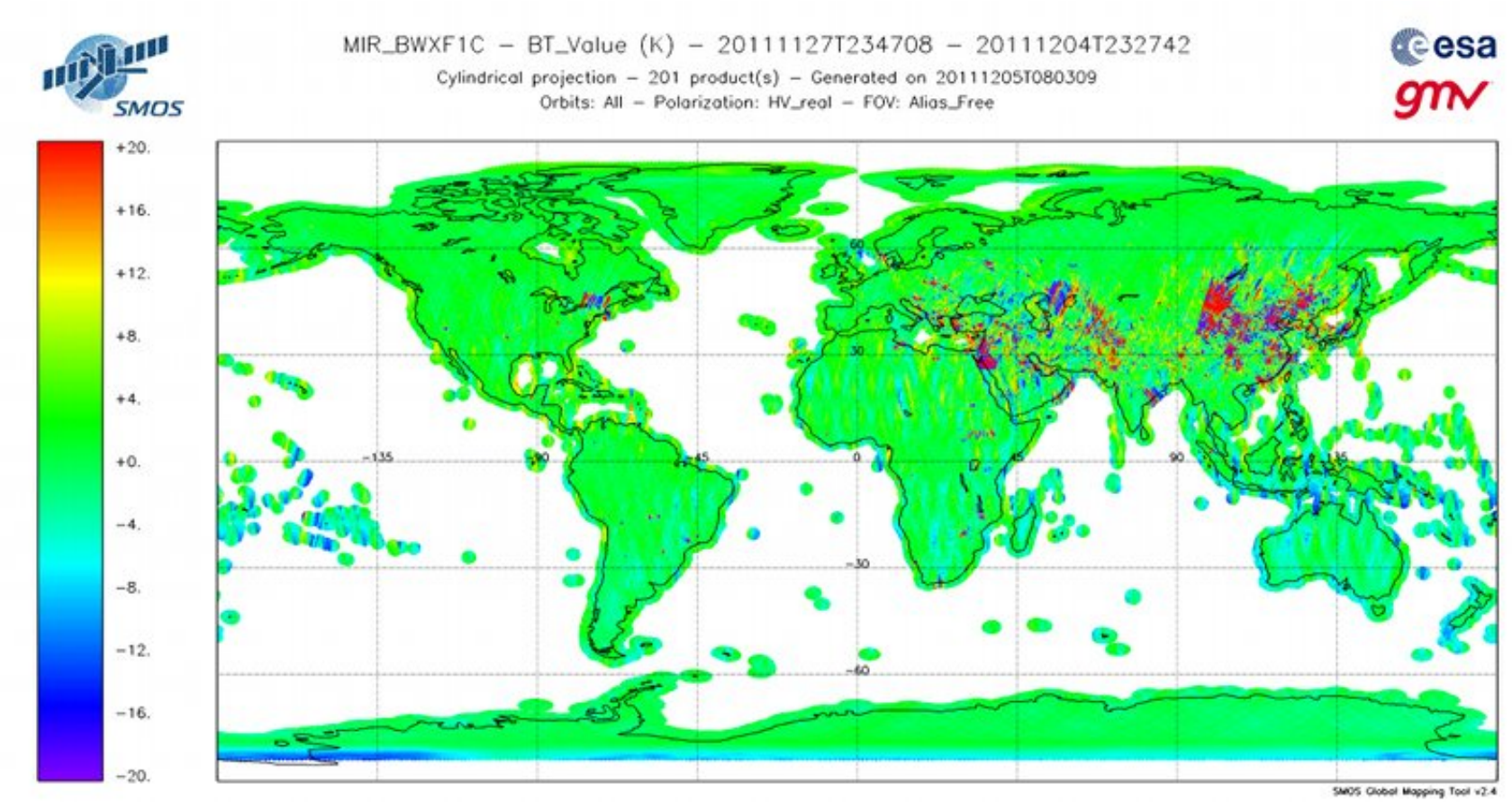


Figure 7 Real Part of the XY Brightness temperature evolution over land during the reporting period (week 49)

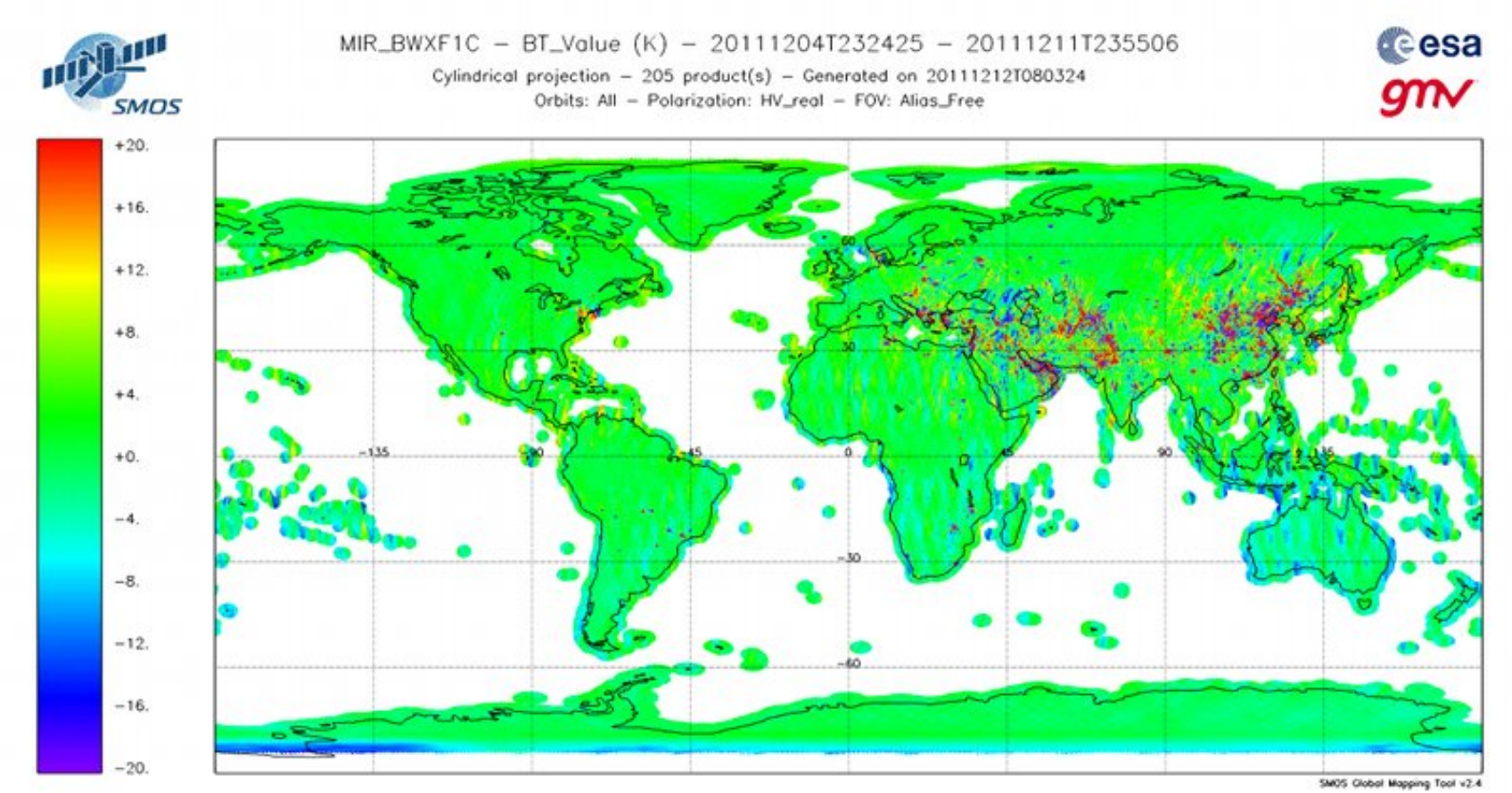


Figure 8 Real Part of the XY Brightness temperature evolution over land during the reporting period (week 50)

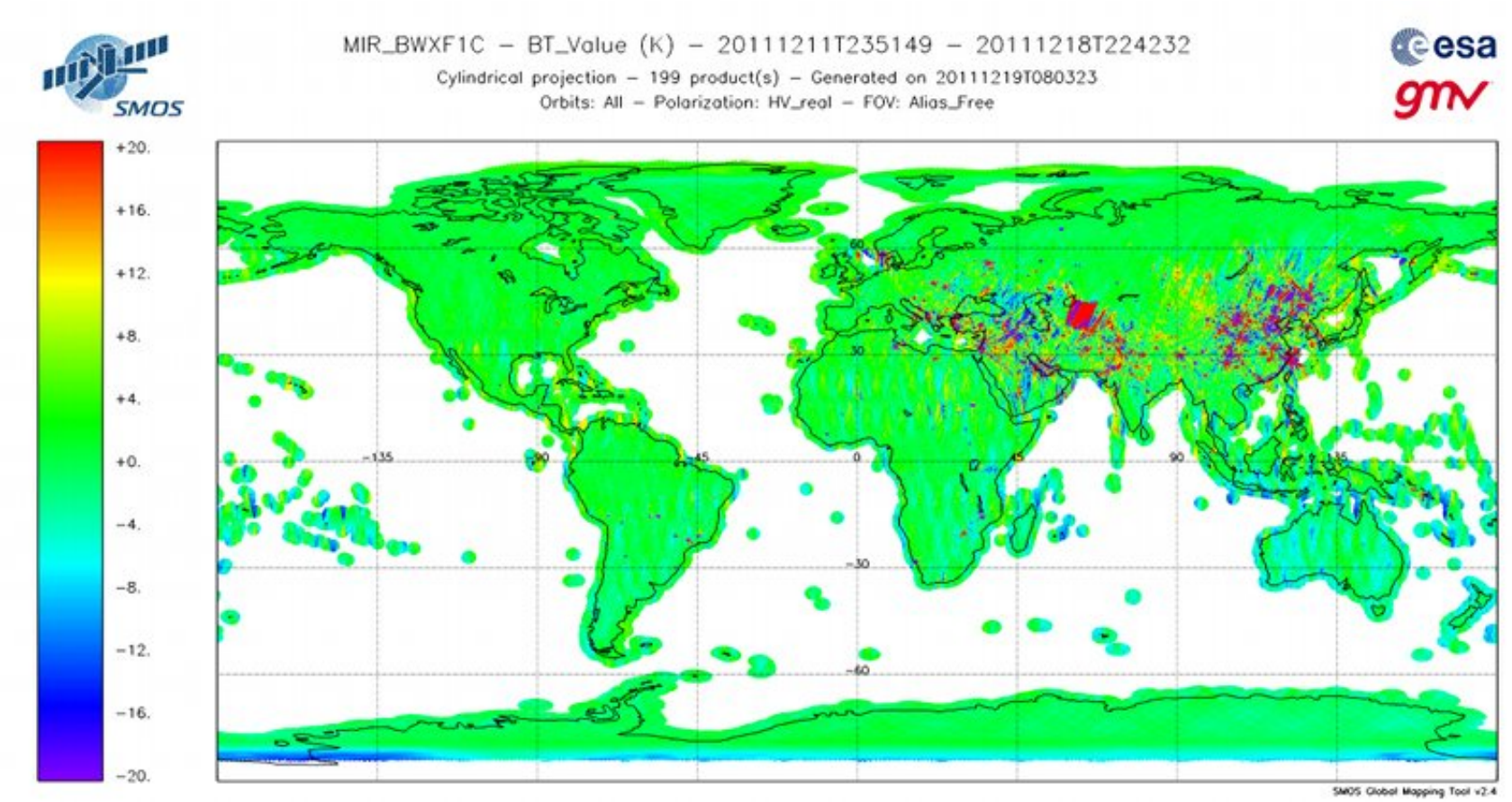


Figure 9 Real Part of the XY Brightness temperature evolution over land during the reporting period (week 51)

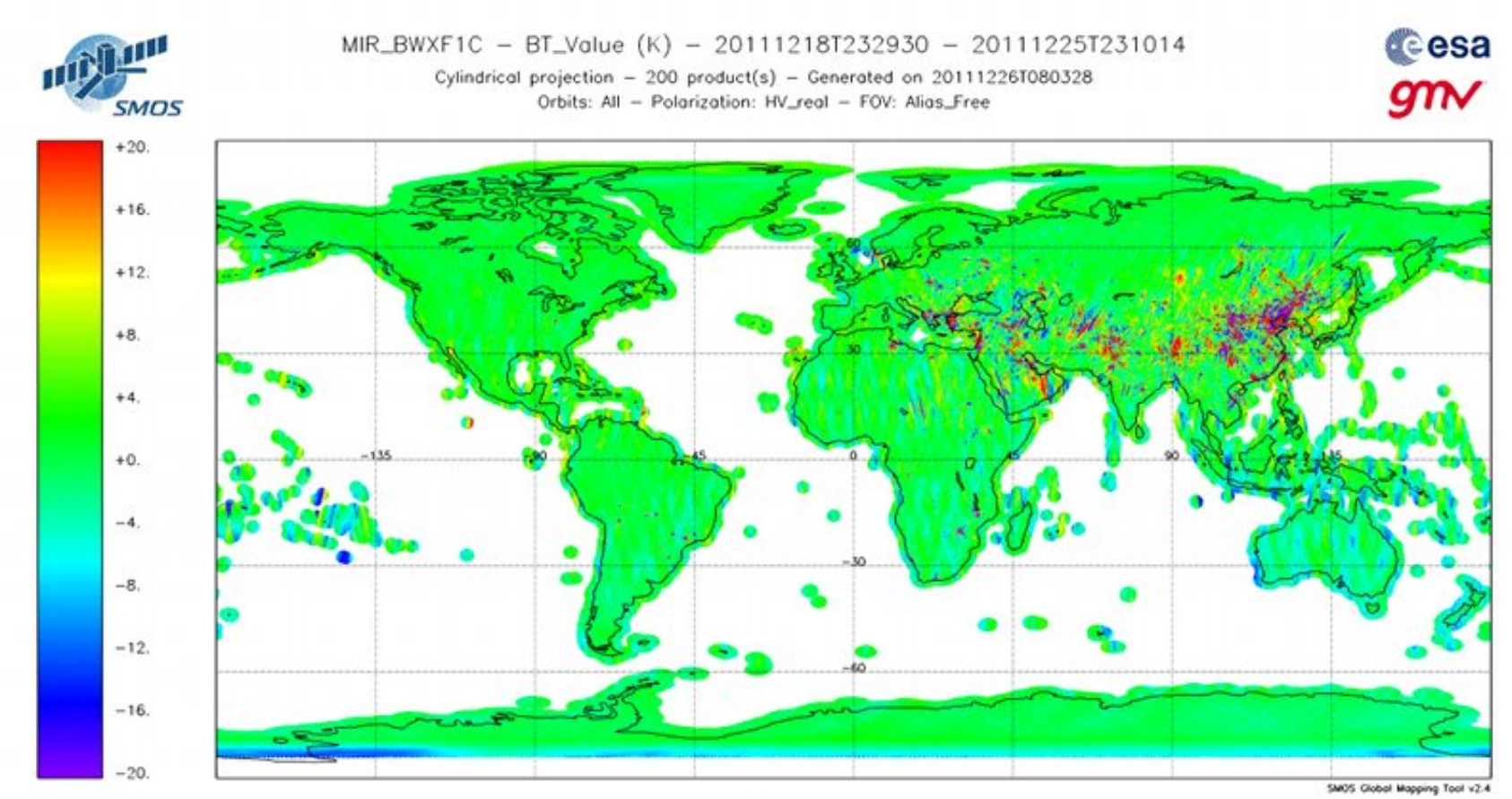


Figure 10 Real Part of the XY Brightness temperature evolution over land during the reporting period (week 52)

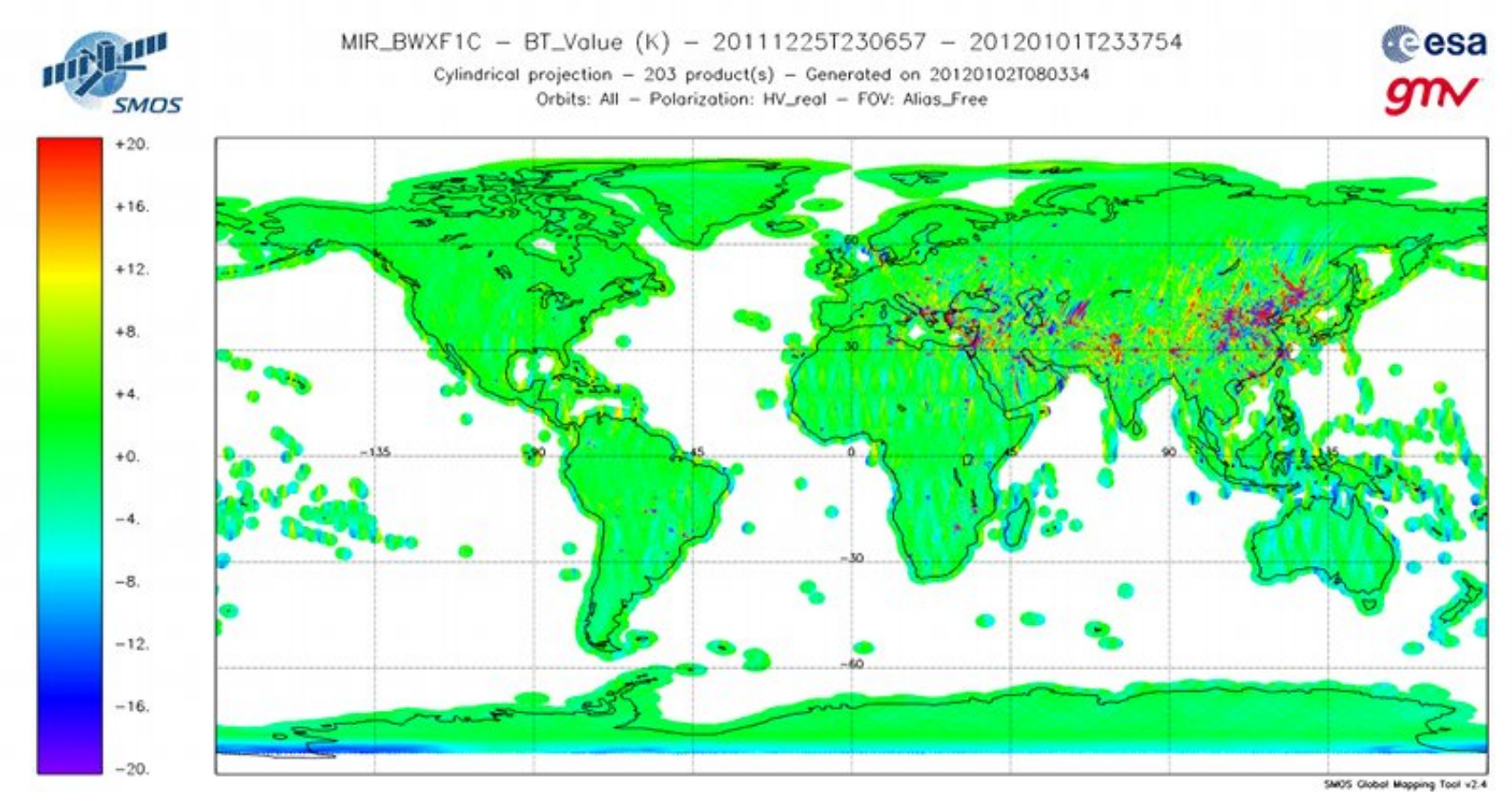


Figure 11 Imaginary Part of the XY Brightness temperature evolution over land during the reporting period (week 48)

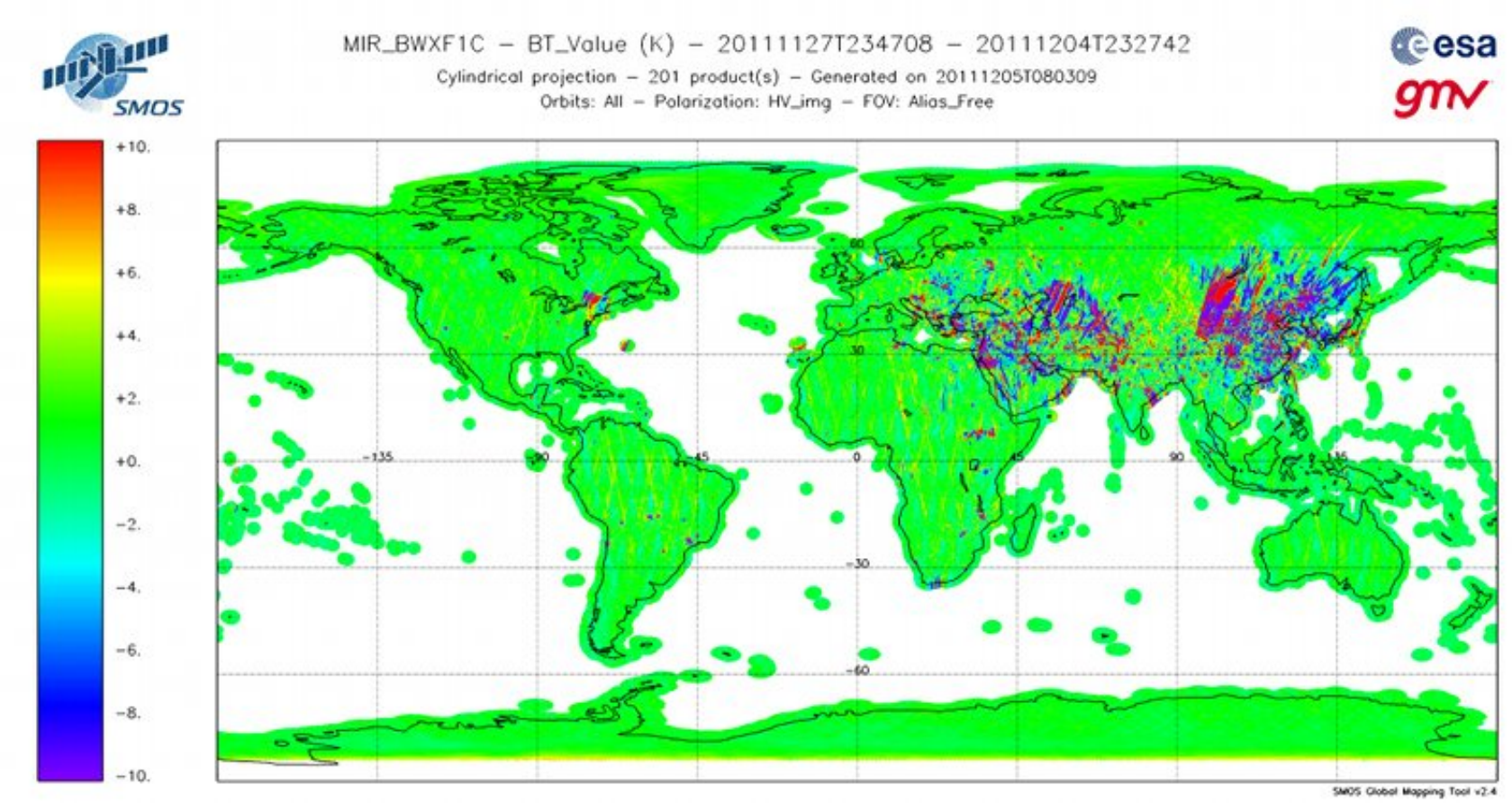


Figure 12 Imaginary Part of the XY Brightness temperature evolution over land during the reporting period (week 49)

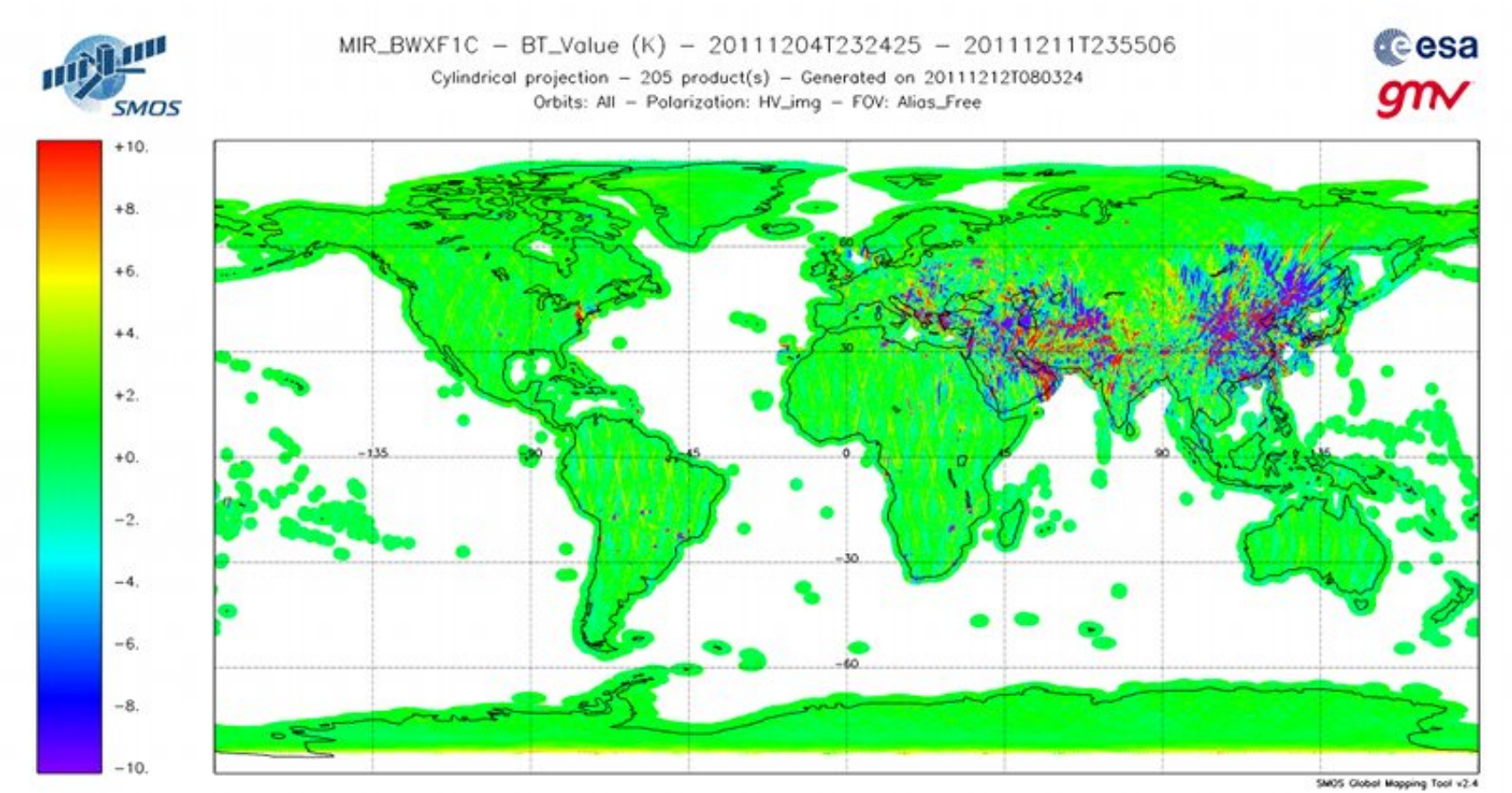


Figure 13 Imaginary Part of the XY Brightness temperature evolution over land during the reporting period (week 50)

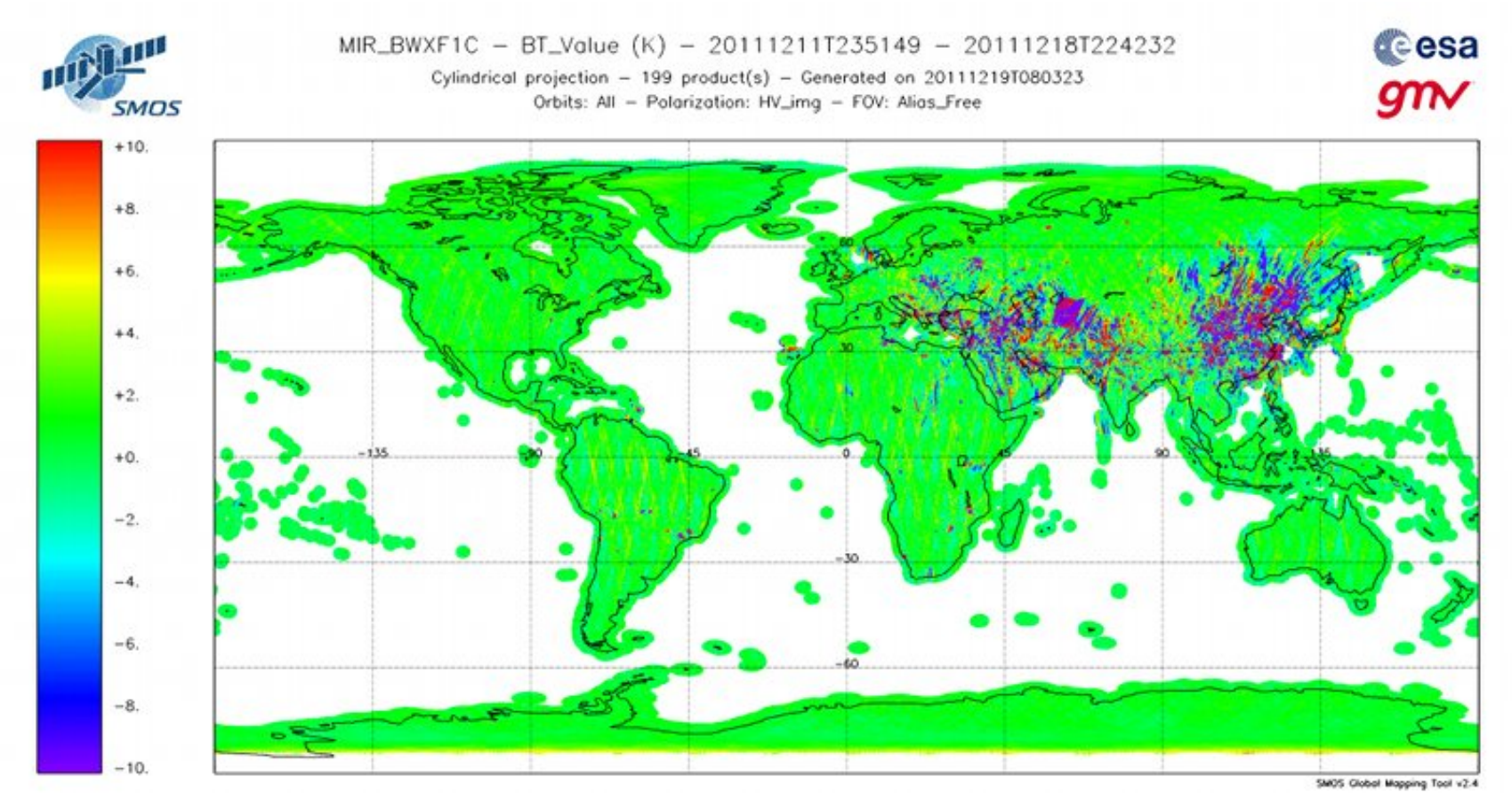


Figure 14 Imaginary Part of the XY Brightness temperature evolution over land during the reporting period (week 51)

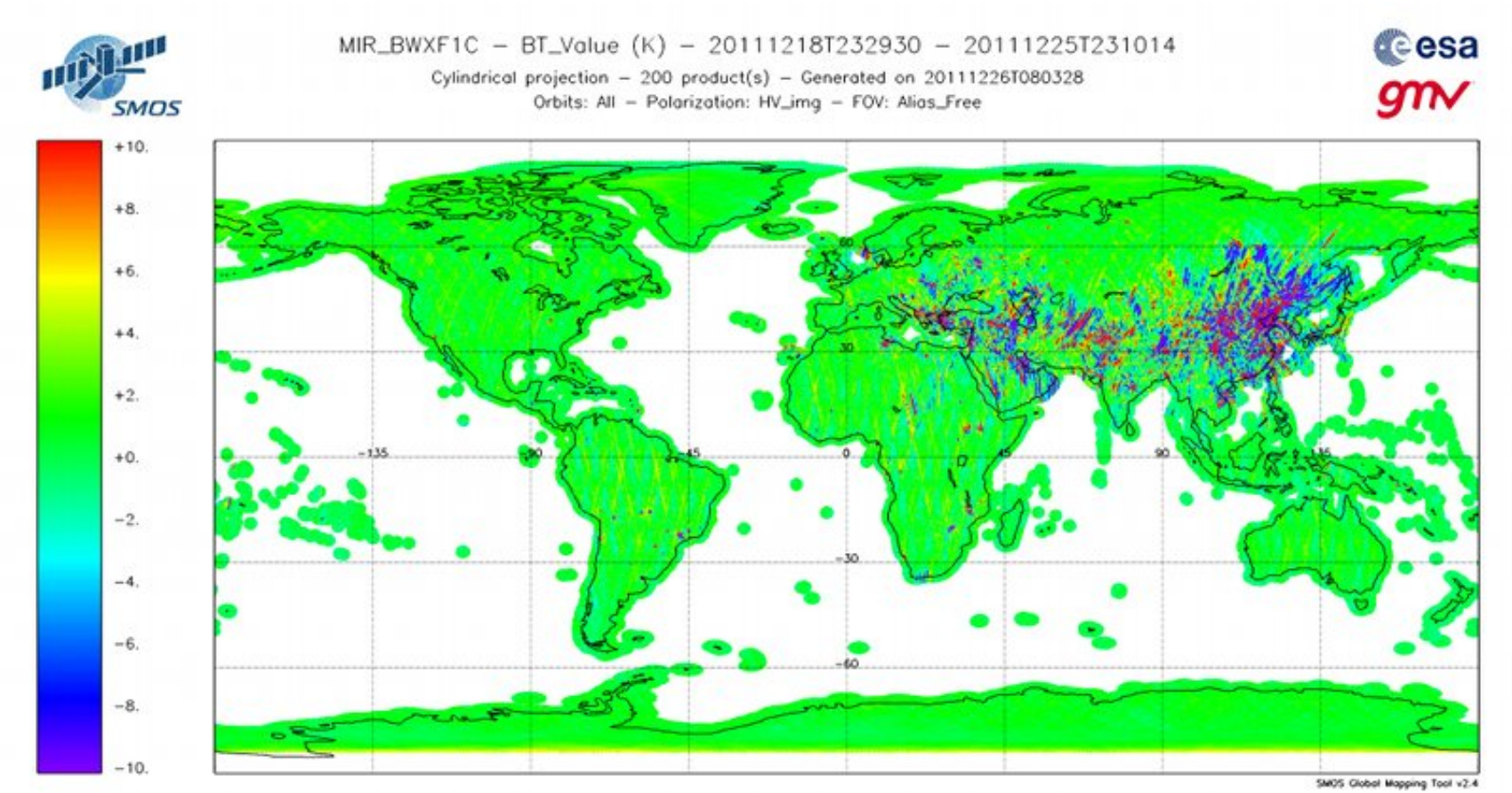


Figure 15 Imaginary Part of the XY Brightness temperature evolution over land during the reporting period (week 52)

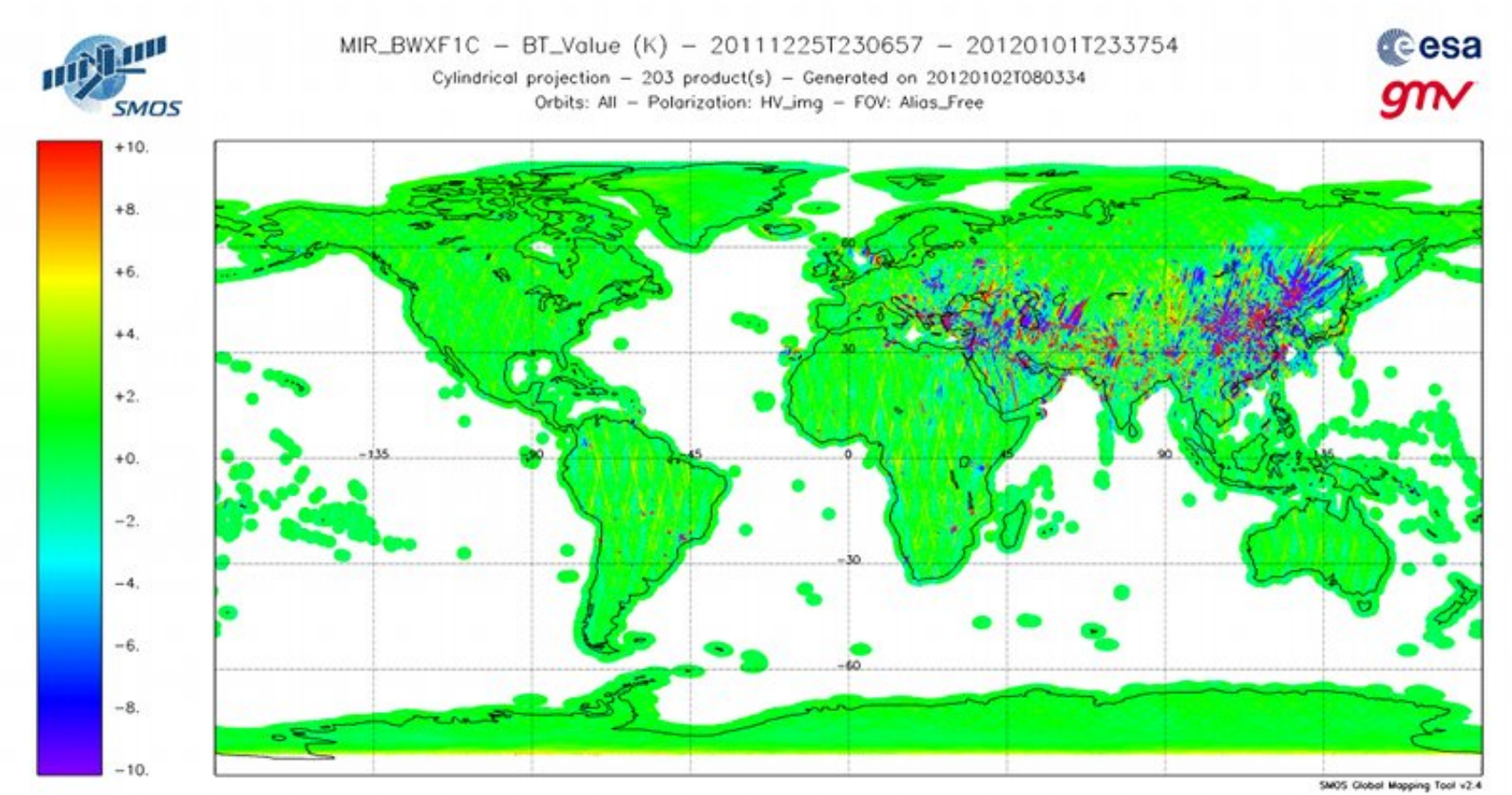


Figure 16 1st Stokes evolution over sea during the reporting period (week 48)

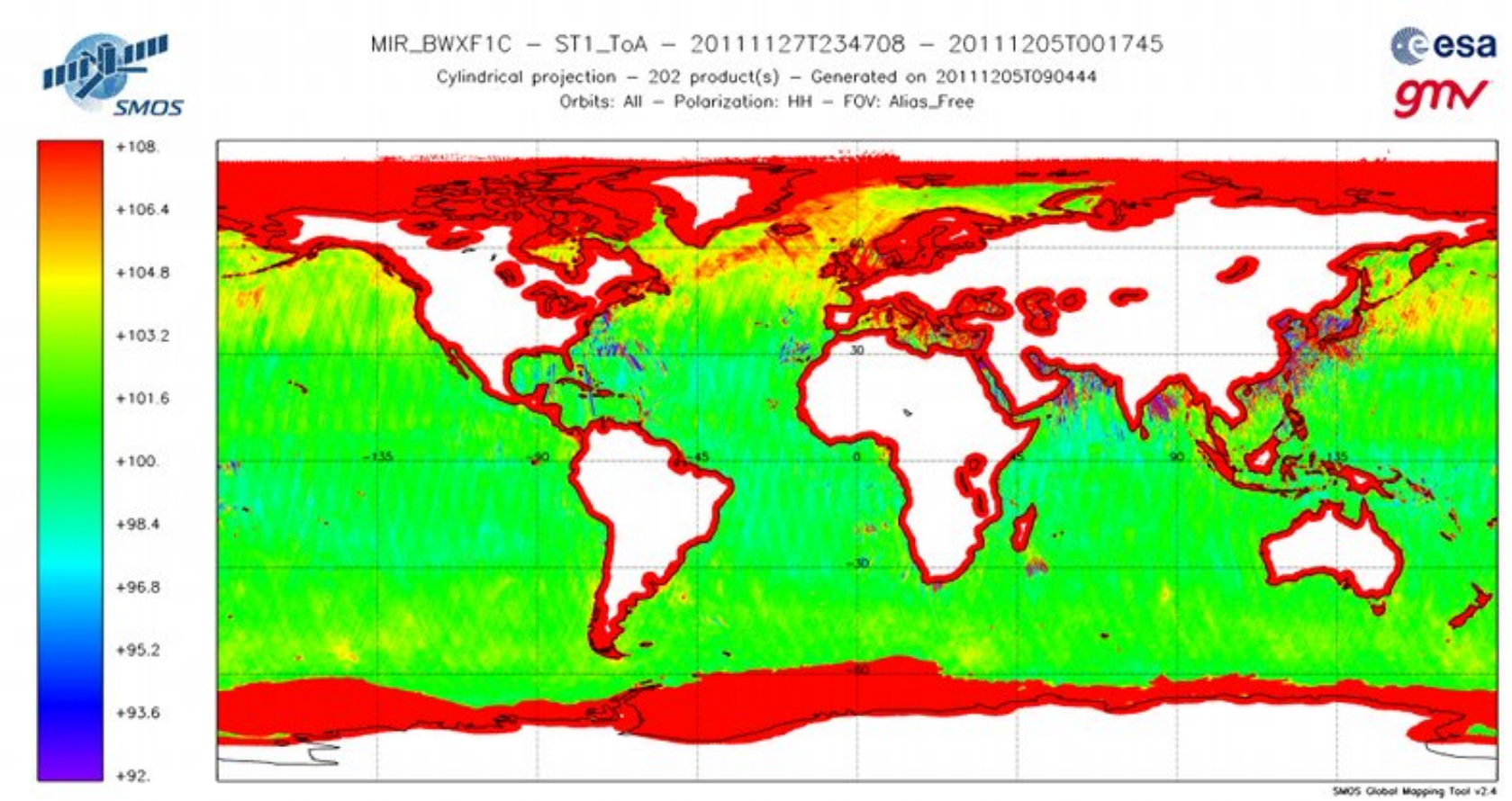


Figure 17 1st Stokes evolution over sea during the reporting period (week 49)

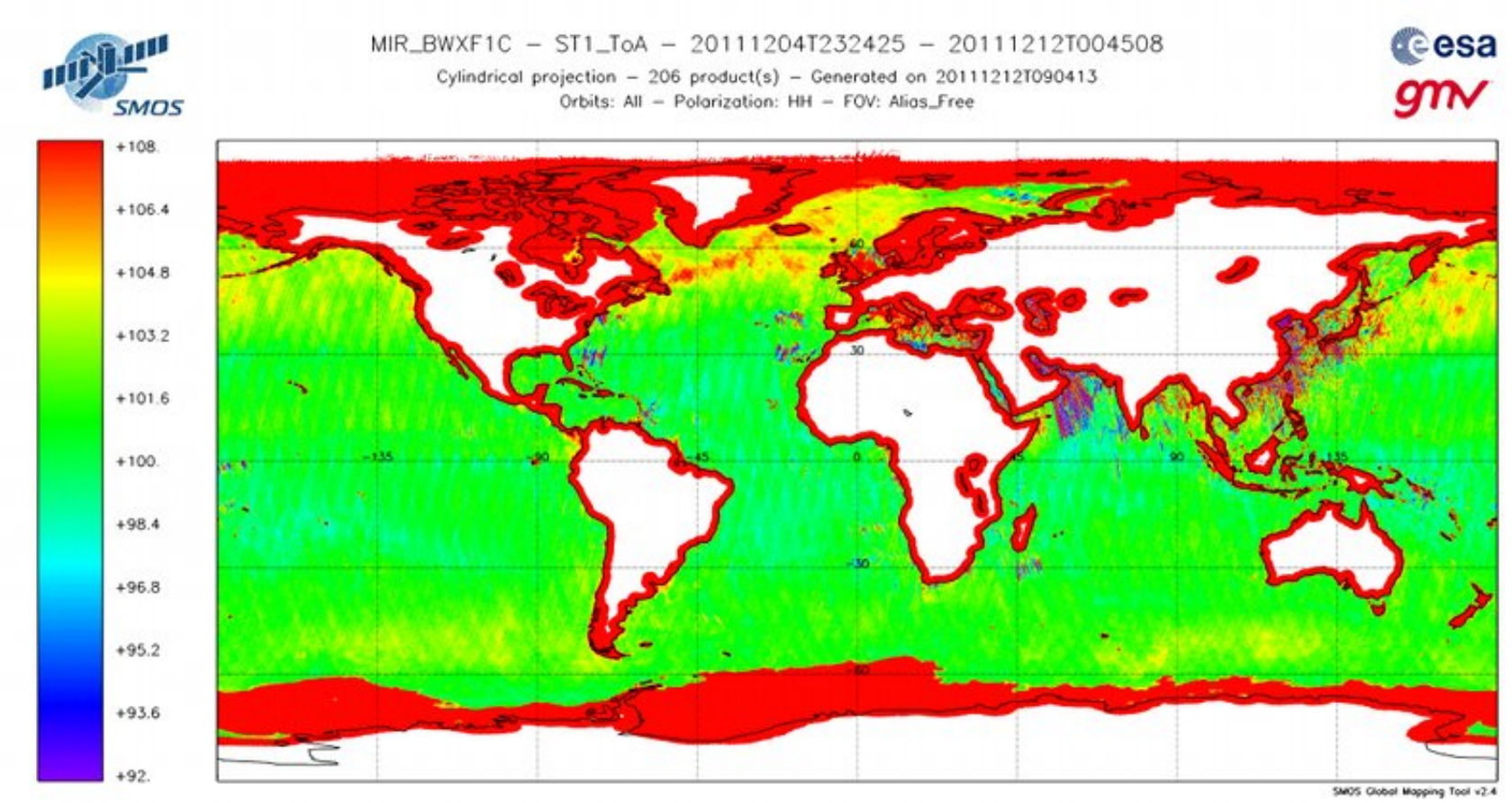


Figure 18 1st Stokes evolution over sea during the reporting period (week 50)

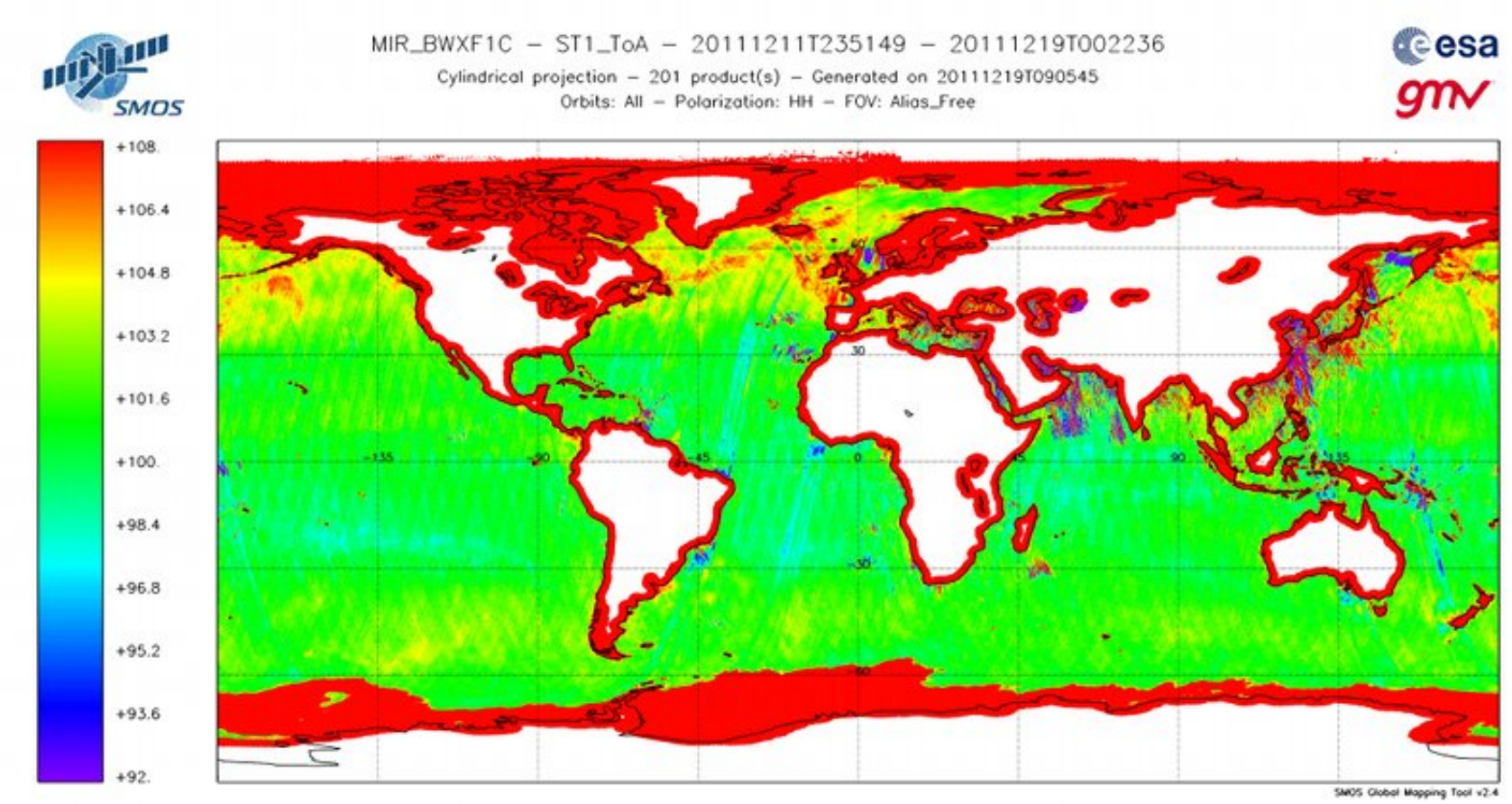


Figure 19 1st Stokes evolution over sea during the reporting period (week 51)

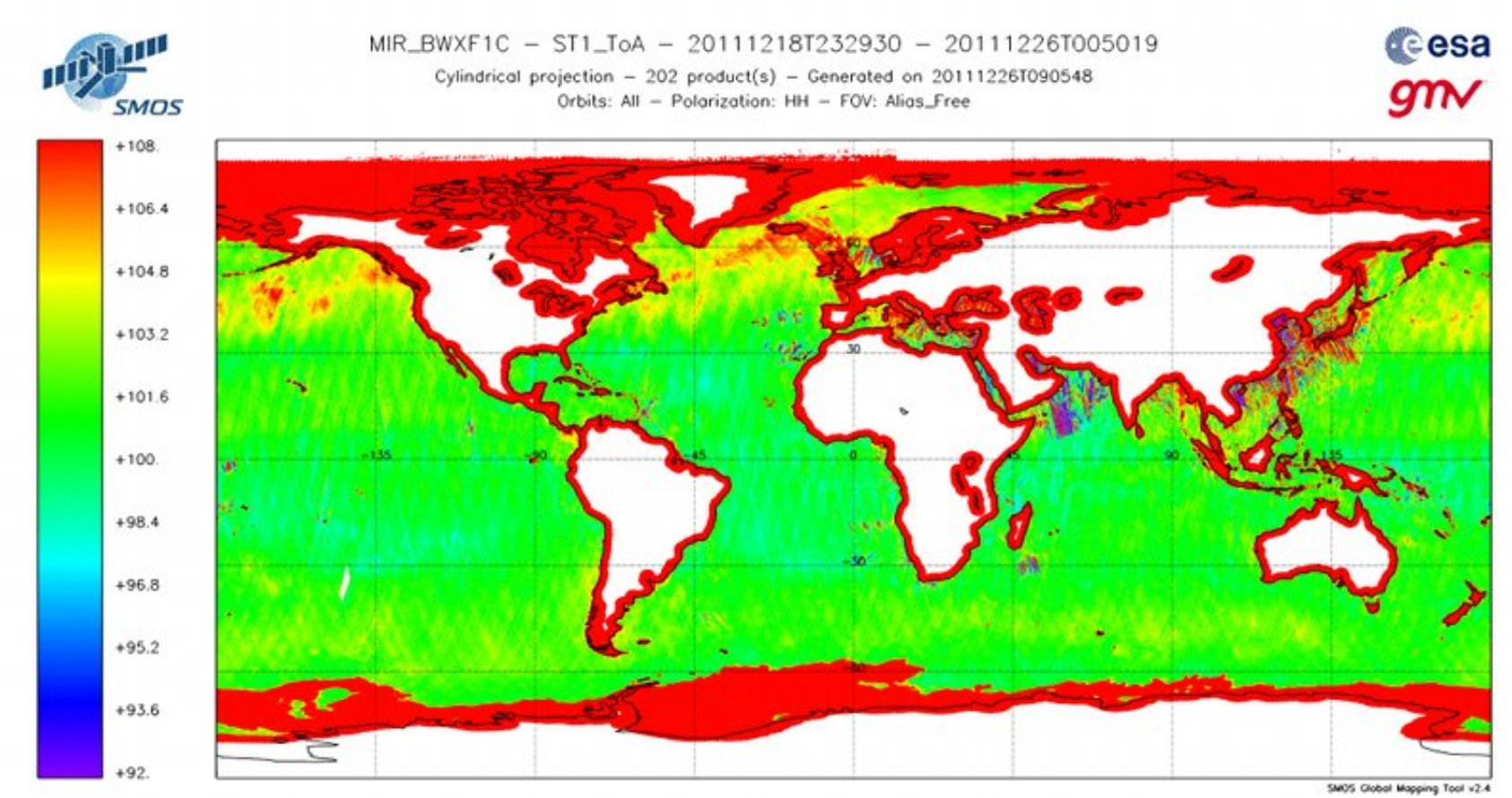


Figure 20 1st Stokes evolution over sea during the reporting period (week 52)

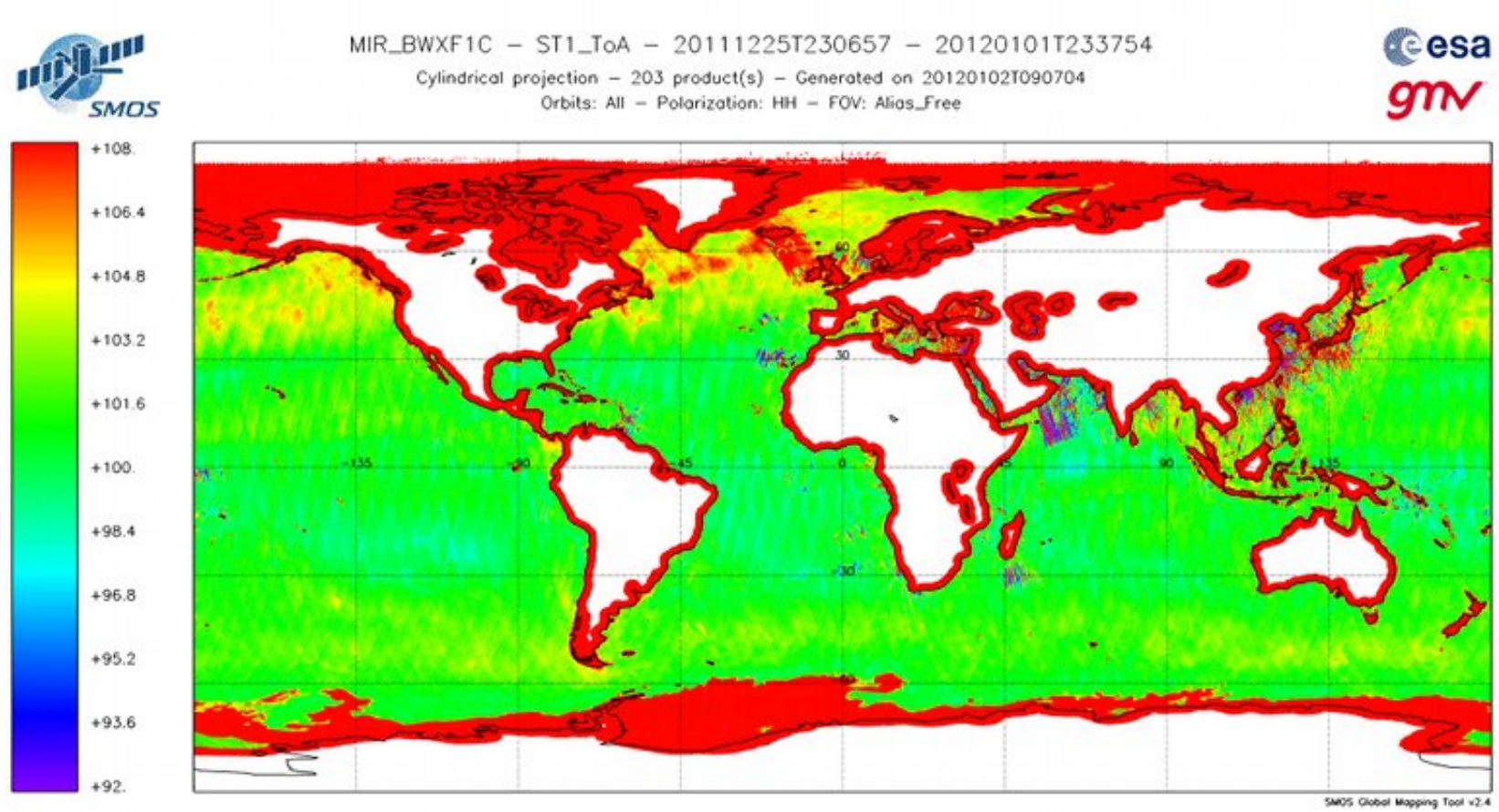


Figure 21 Real Part of the XY Brightness temperature evolution over sea during the reporting period (week 48)

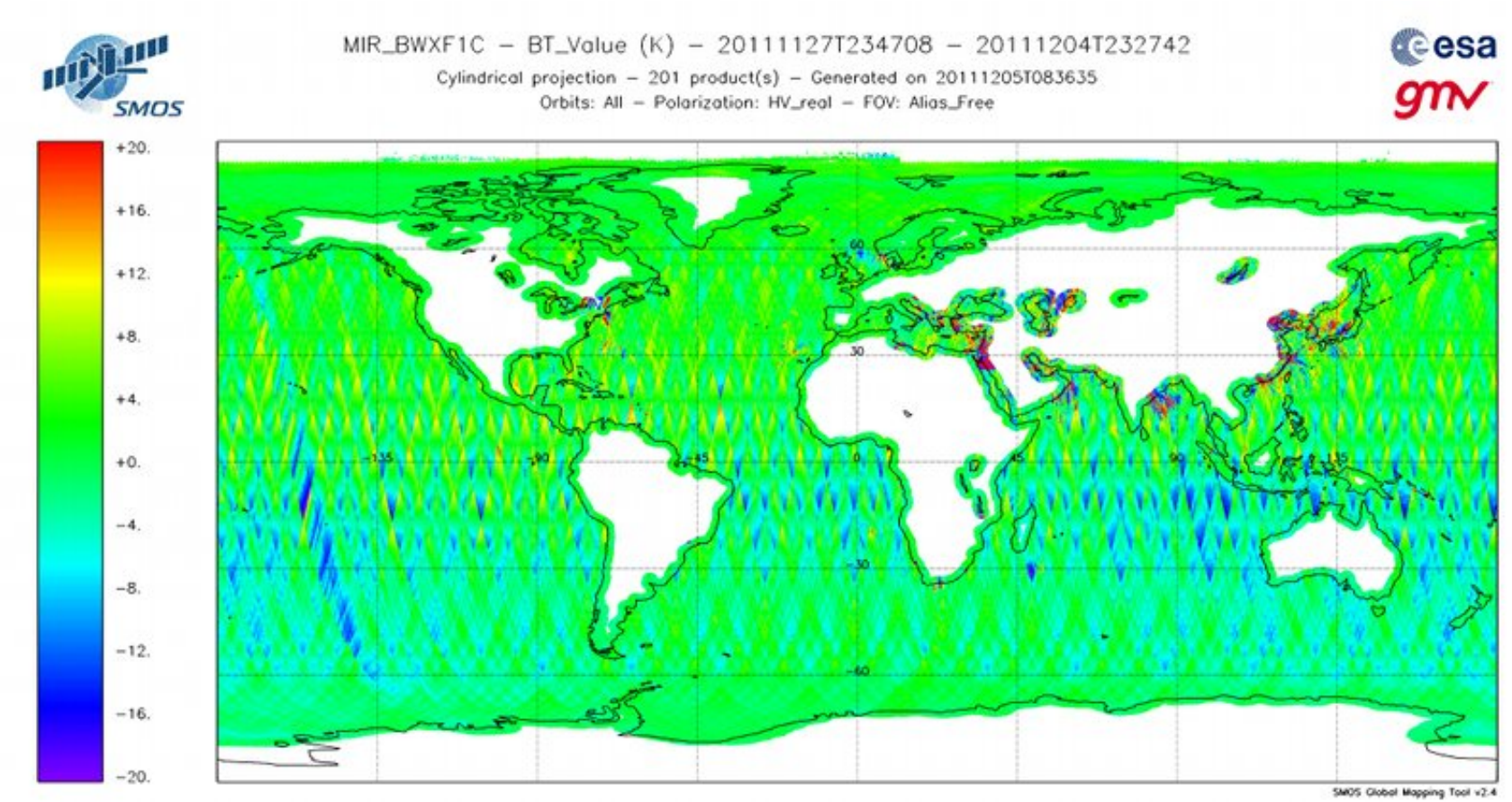


Figure 22 Real Part of the XY Brightness temperature evolution over sea during the reporting period (week 49)

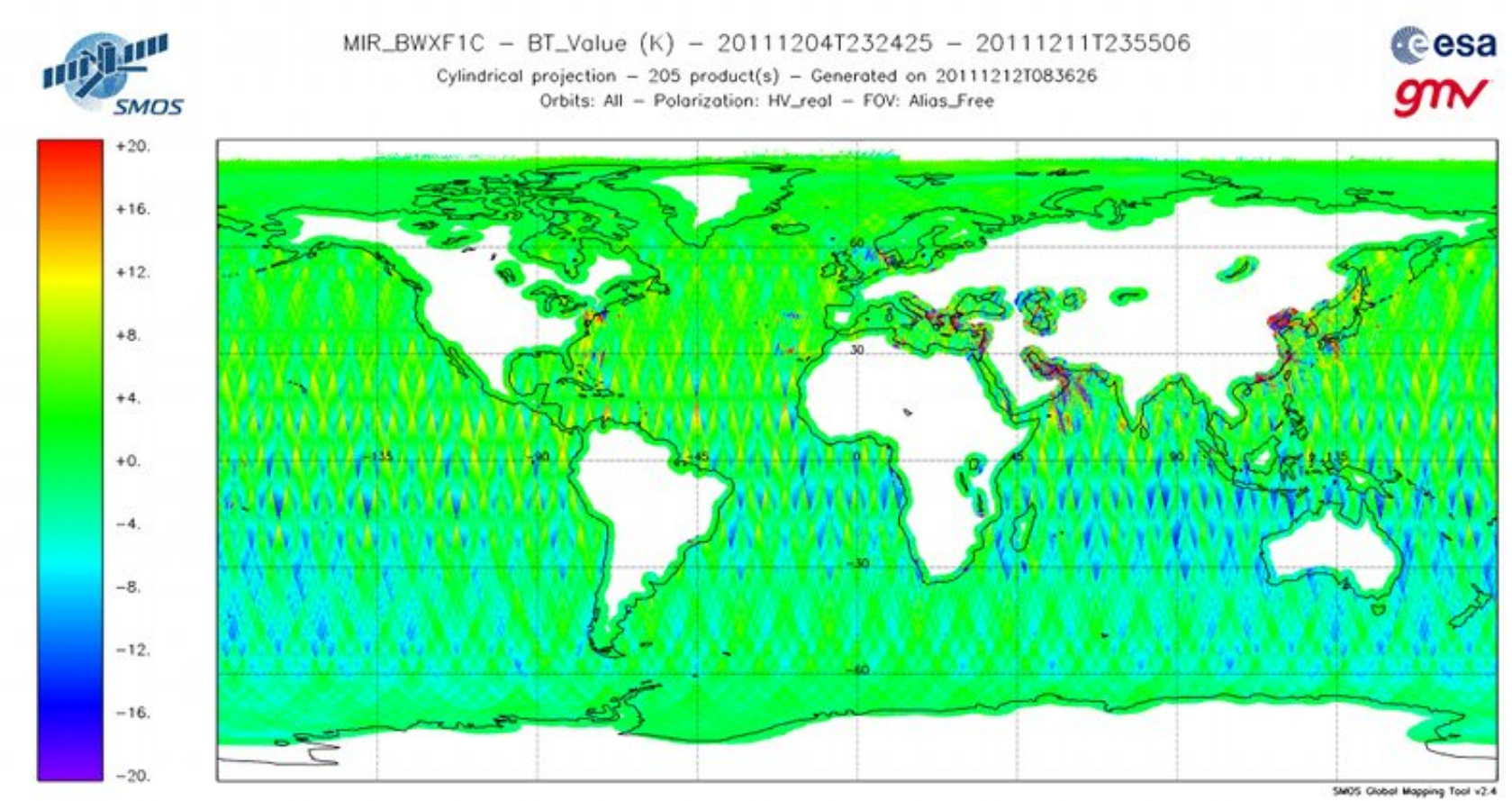


Figure 23 Real Part of the XY Brightness temperature evolution over sea during the reporting period (week 50)

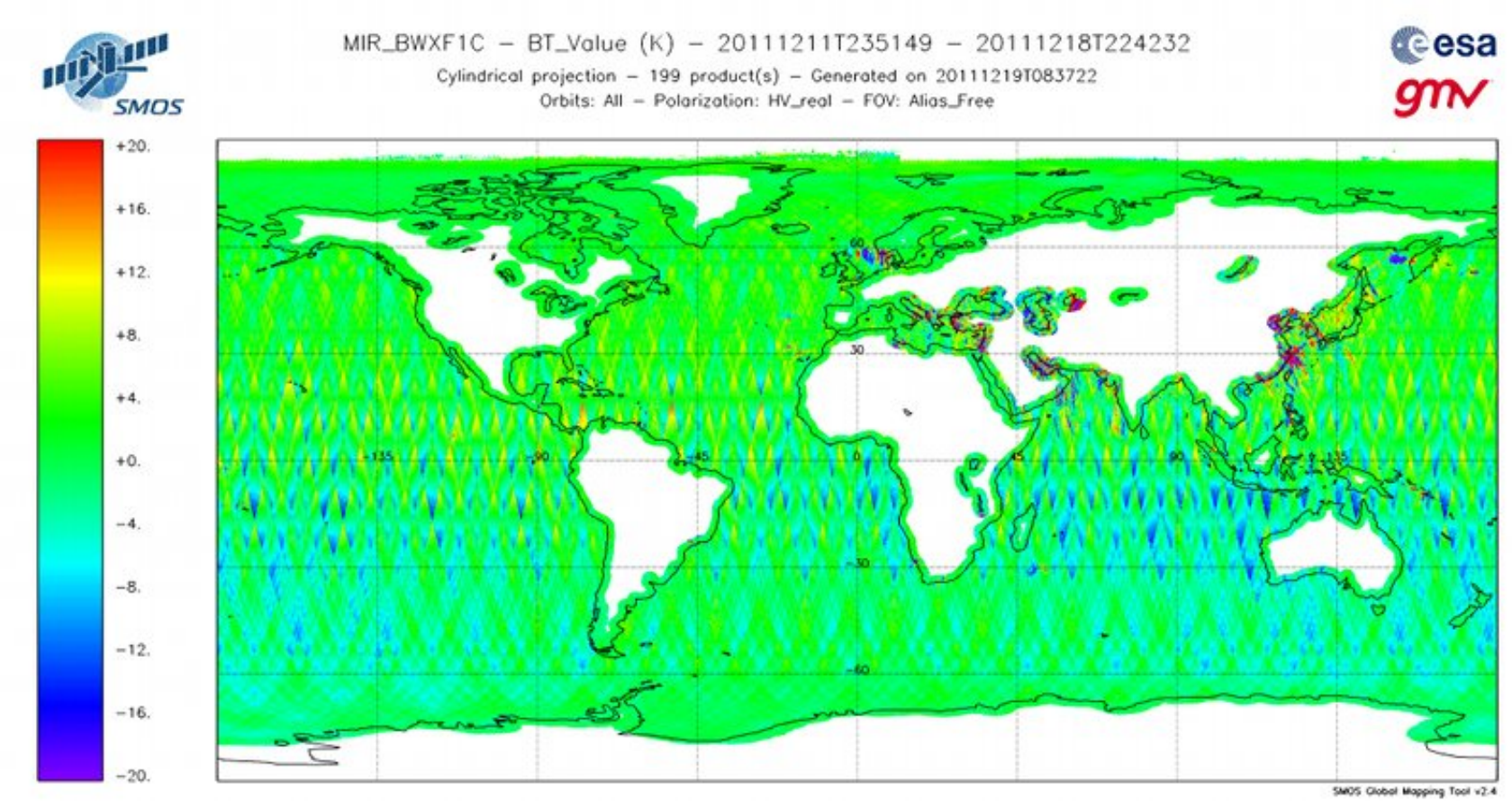


Figure 24 Real Part of the XY Brightness temperature evolution over sea during the reporting period (week 51)

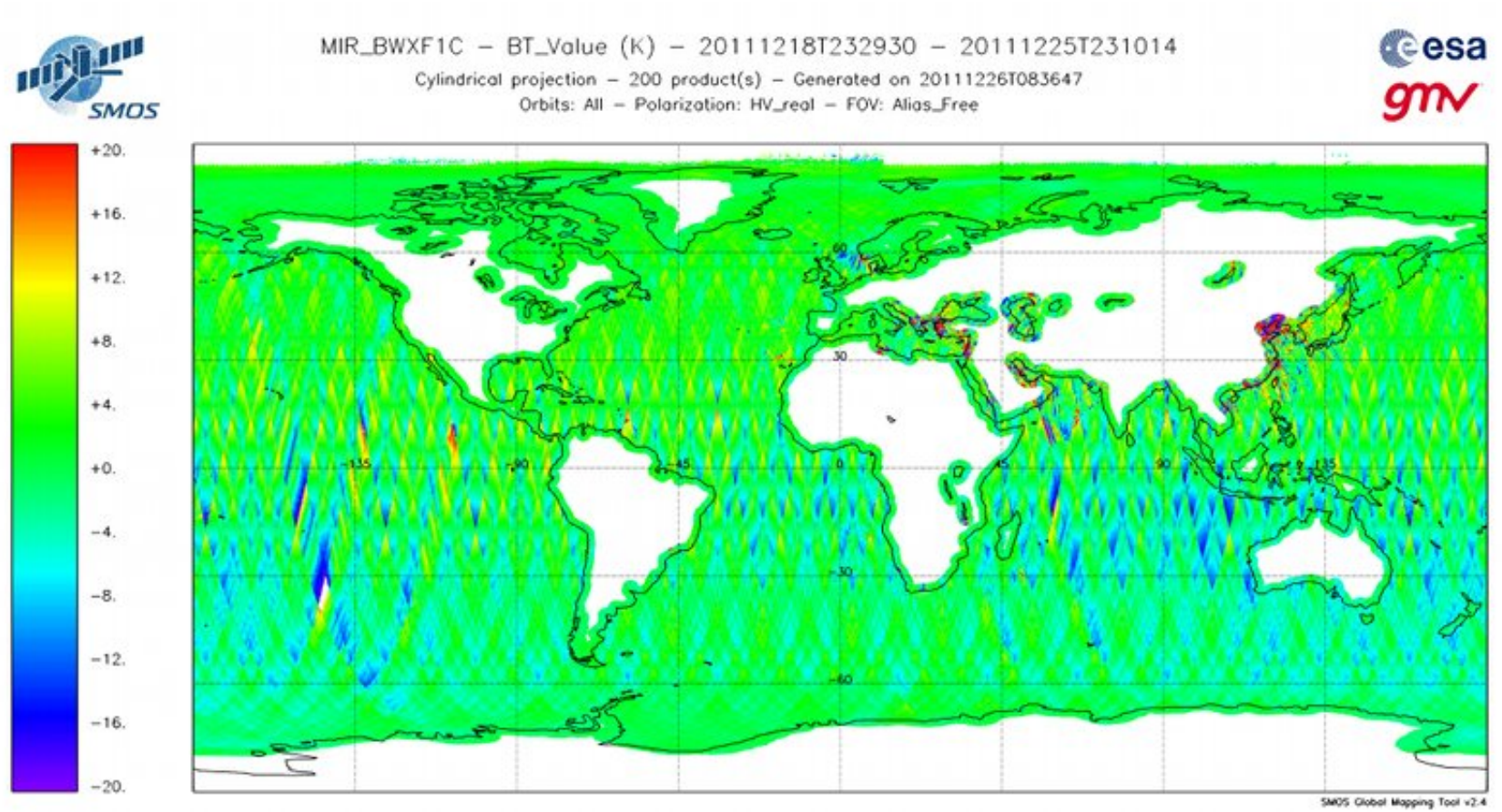


Figure 25 Real Part of the XY Brightness temperature evolution over sea during the reporting period (week 52)

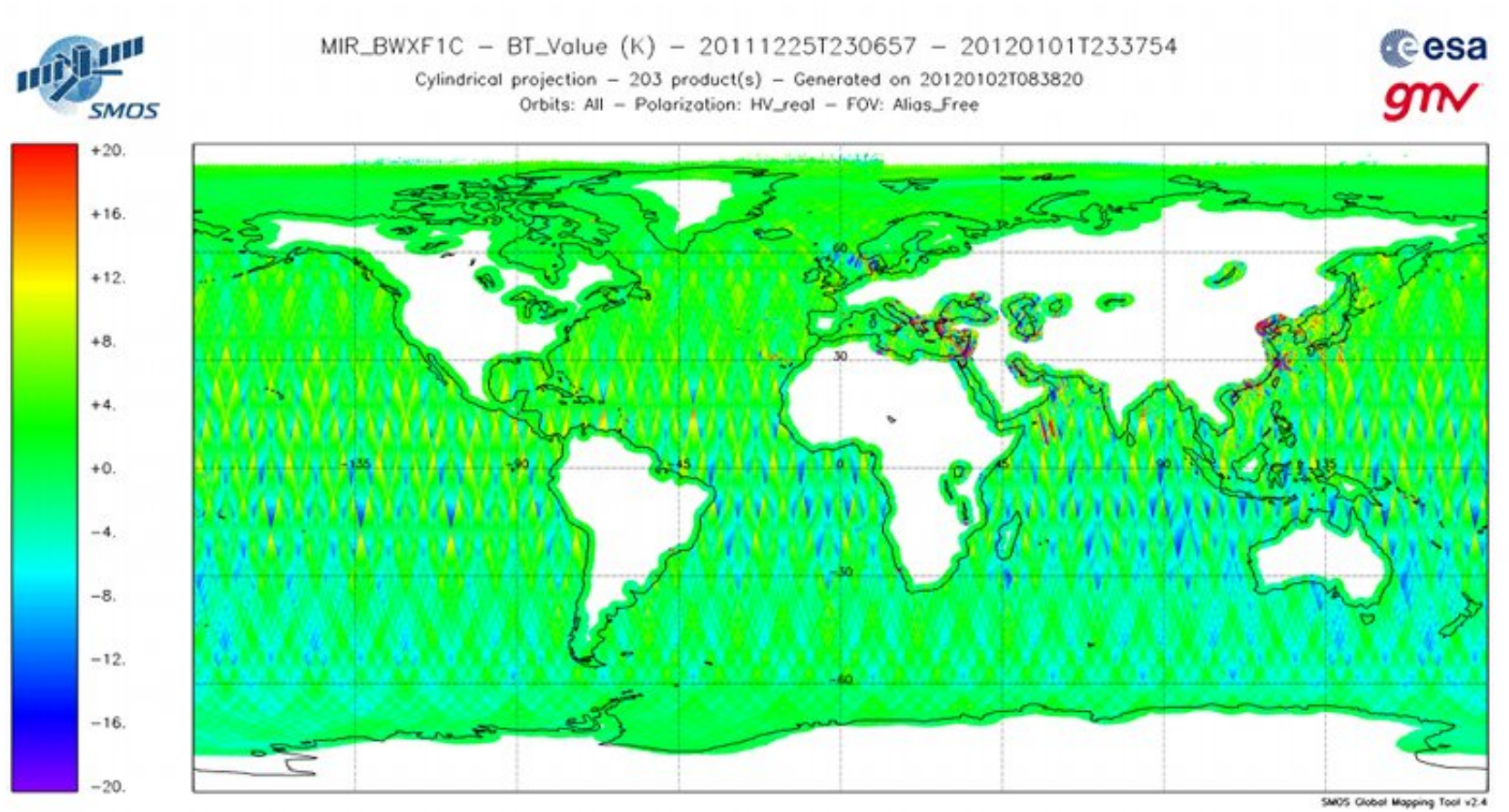


Figure 26 Imaginary Part of the XY Brightness temperature evolution over sea during the reporting period (week 48)

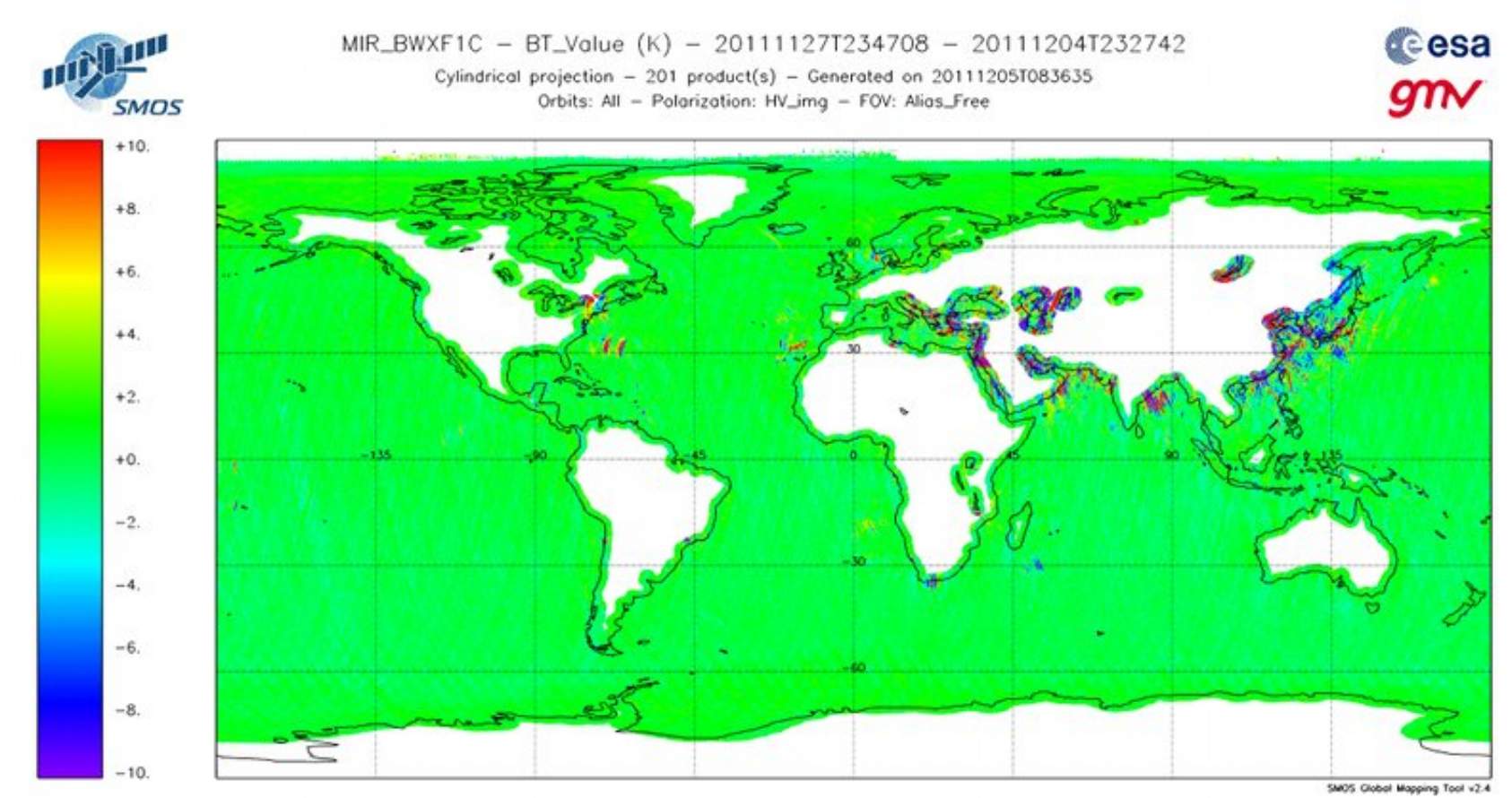


Figure 27 Imaginary Part of the XY Brightness temperature evolution over sea during the reporting period (week 49)

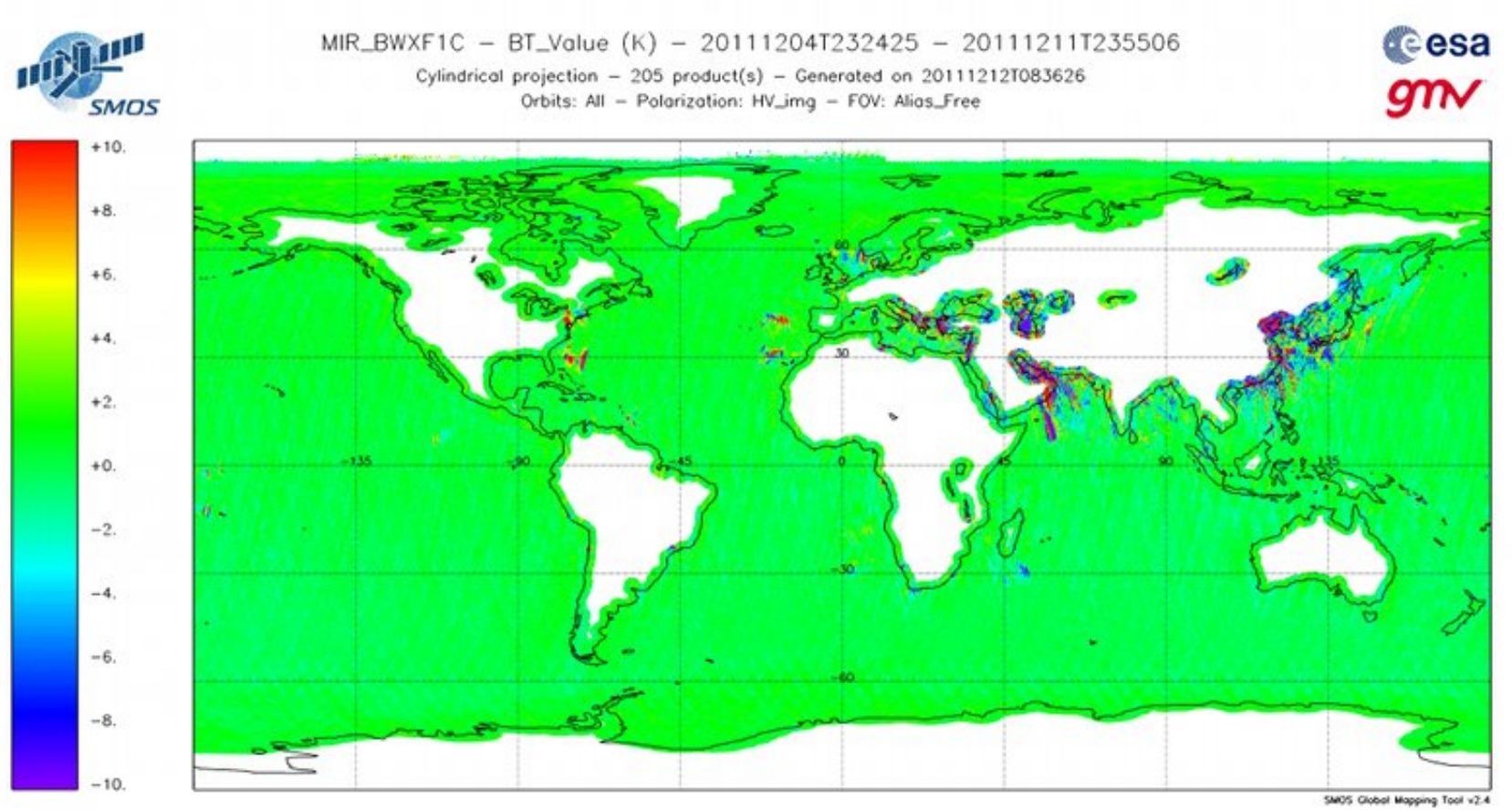


Figure 28 Imaginary Part of the XY Brightness temperature evolution over sea during the reporting period (week 50)

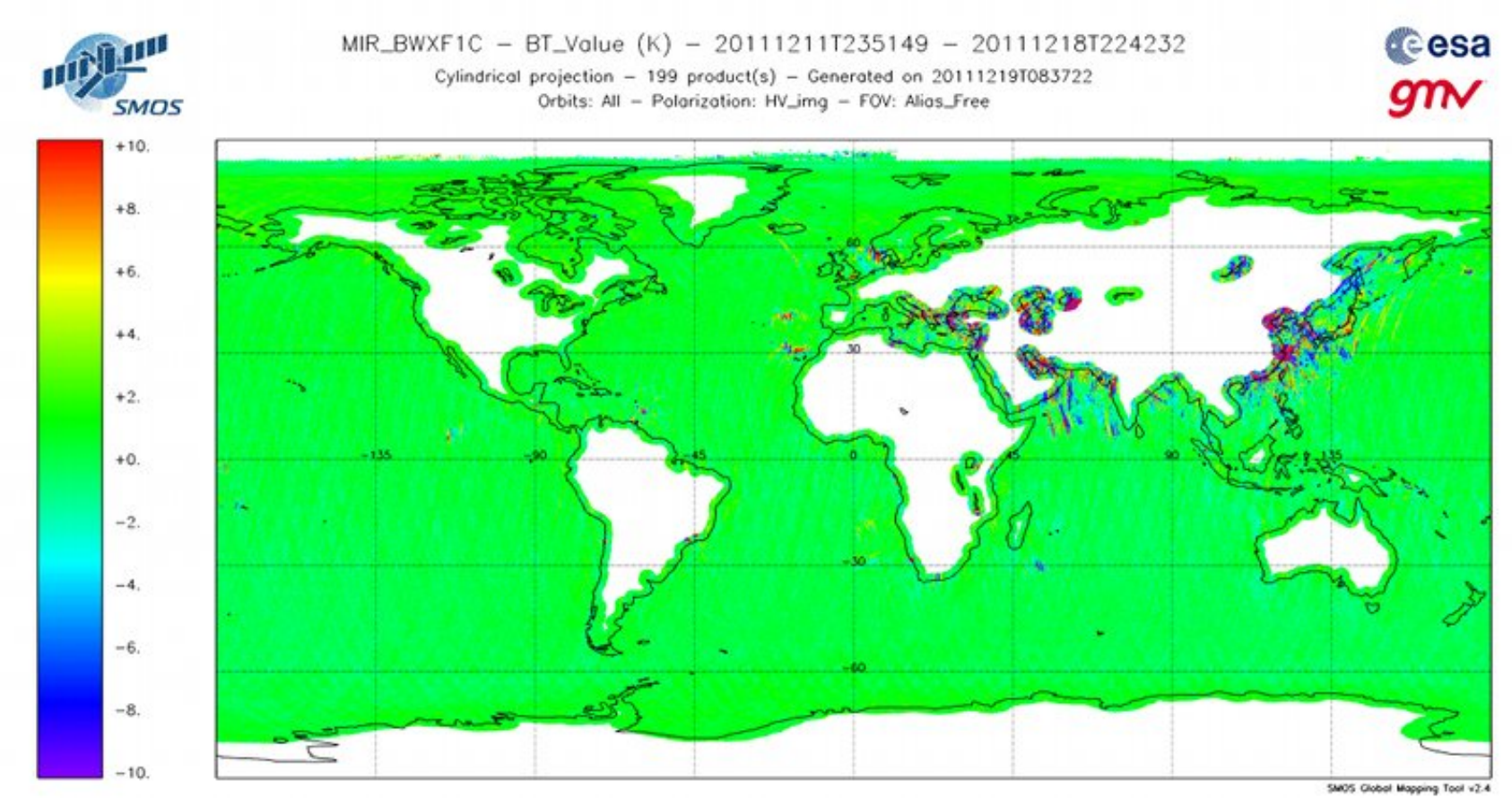


Figure 29 Imaginary Part of the XY Brightness temperature evolution over sea during the reporting period (week 51)

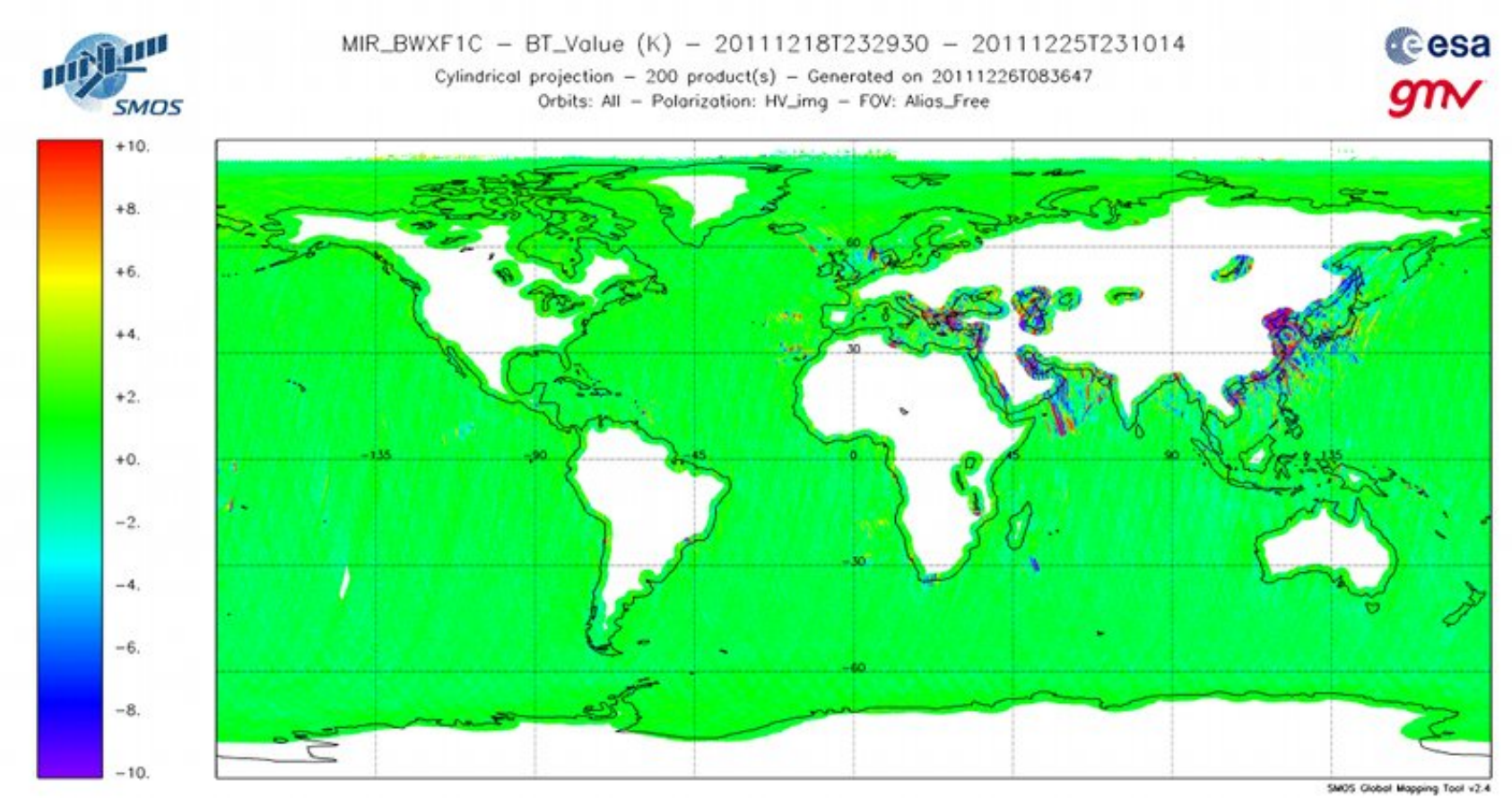


Figure 30 Imaginary Part of the XY Brightness temperature evolution over sea during the reporting period (week 52)

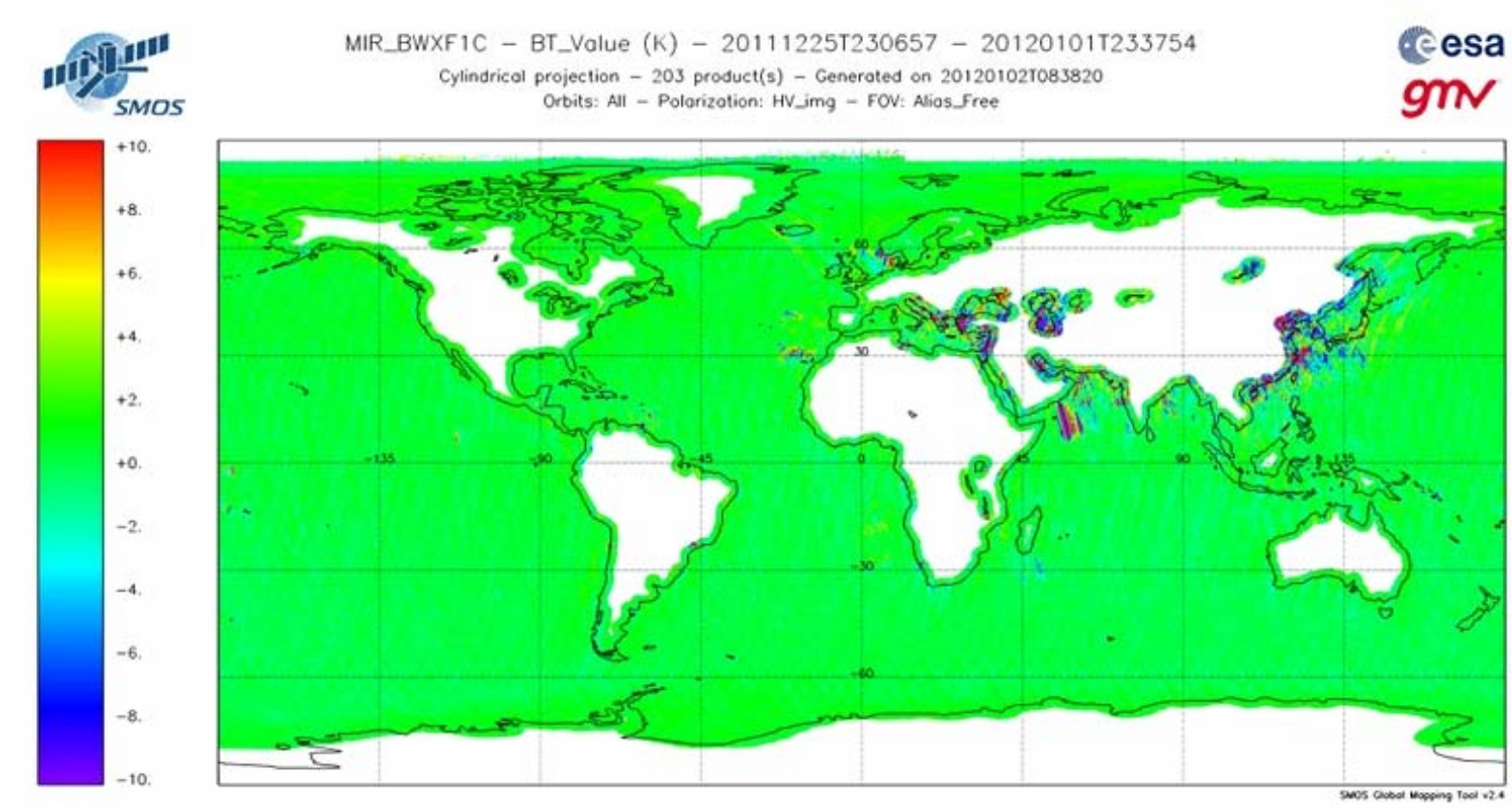


Figure 31 Soil moisture evolution during the reporting period (week 48)

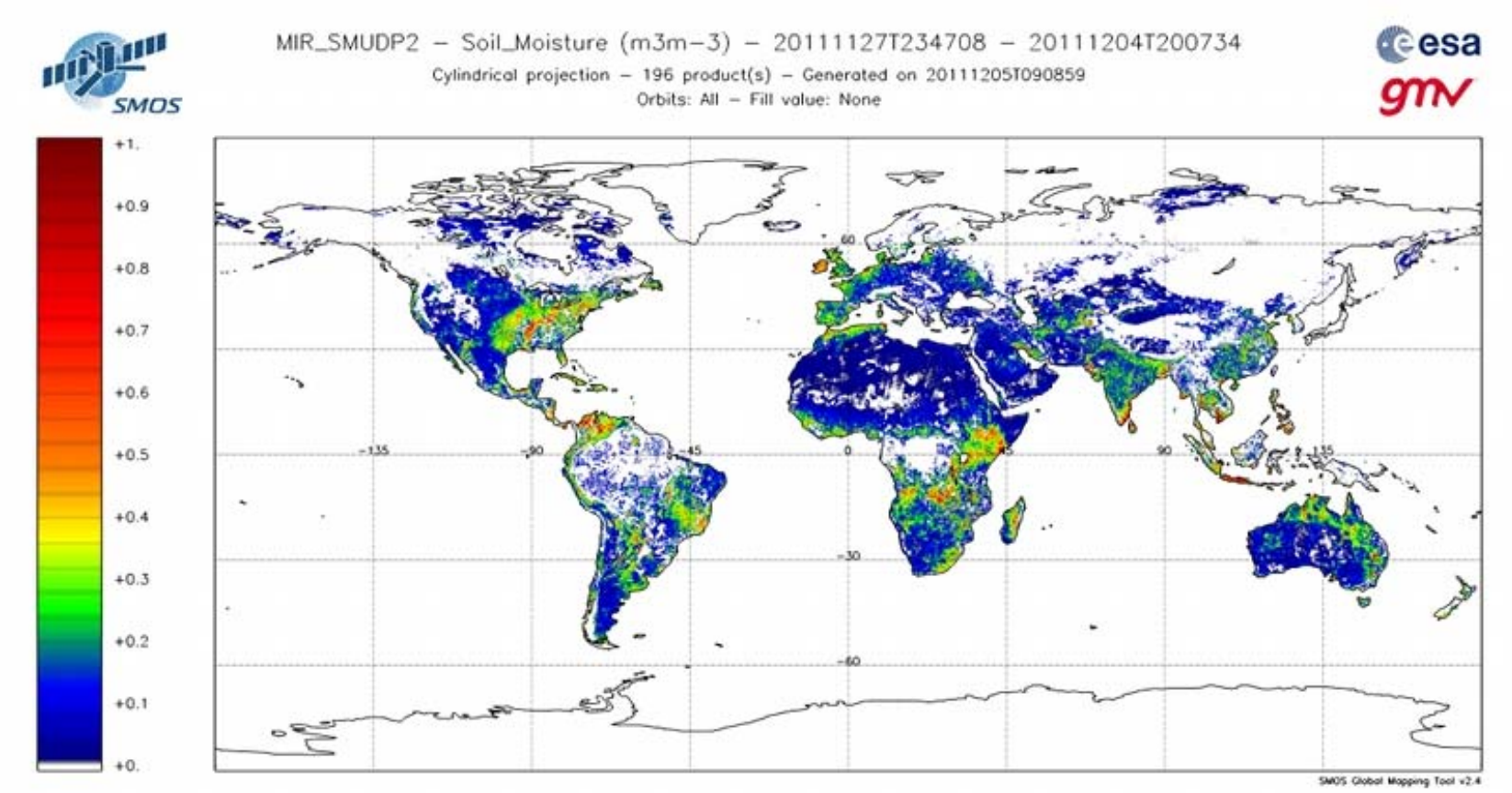


Figure 32 Soil moisture evolution during the reporting period (week 49)

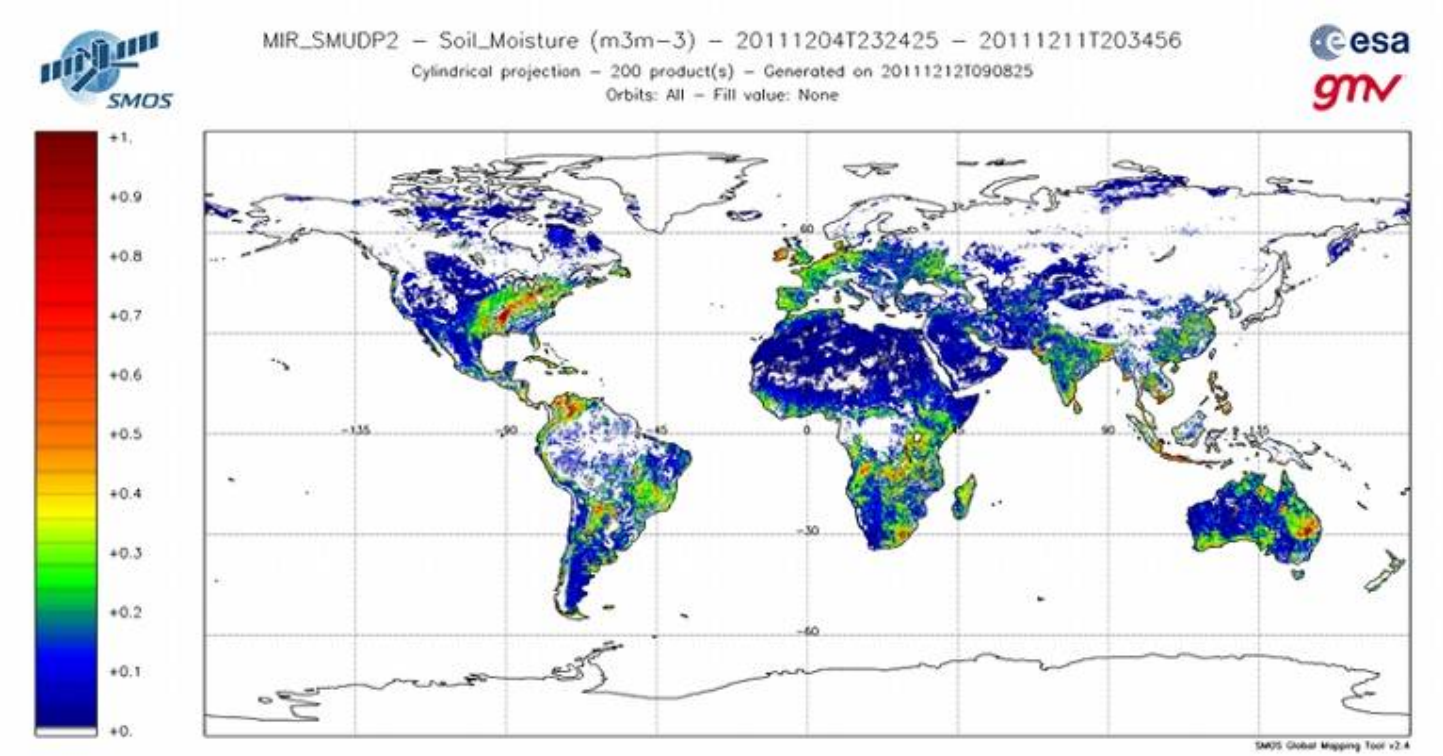


Figure 33 Soil moisture evolution during the reporting period (week 50)

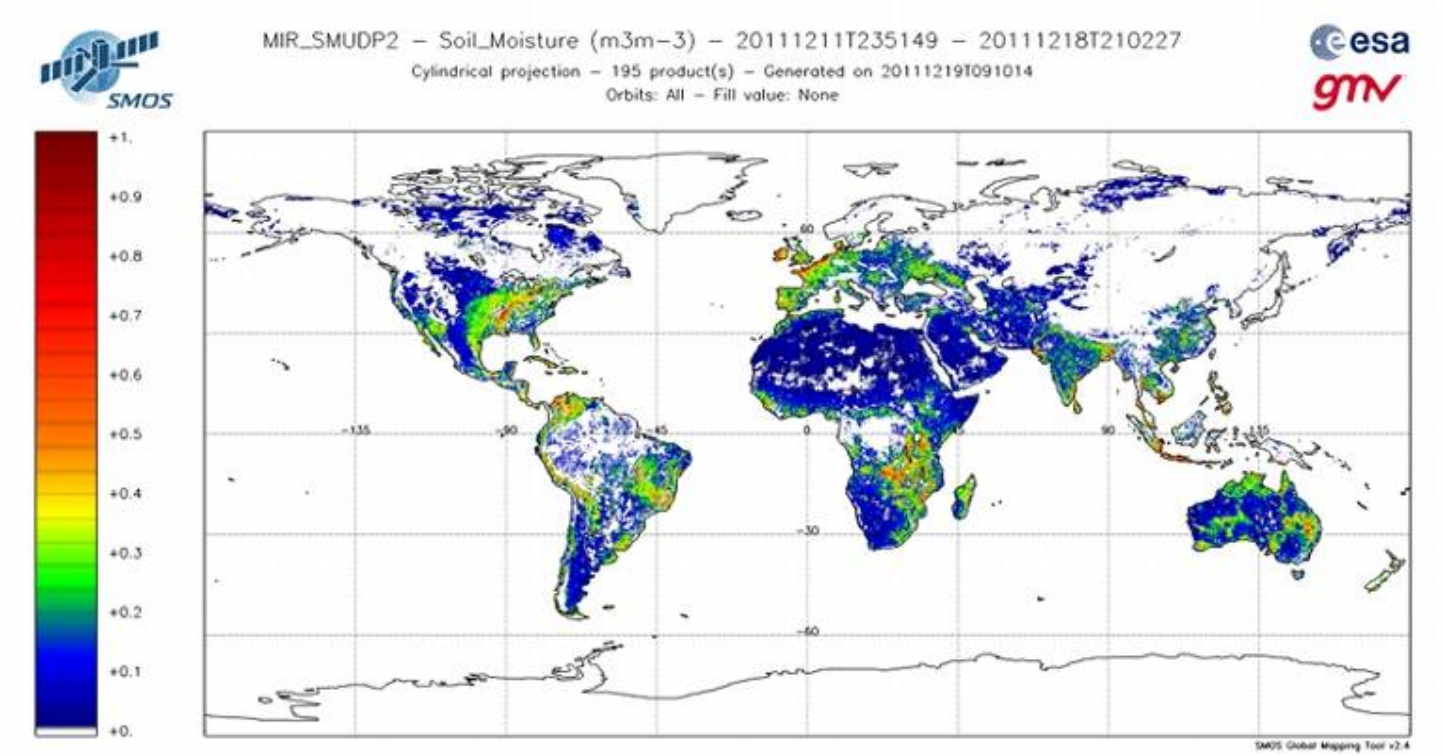


Figure 34 Soil moisture evolution during the reporting period (week 51)

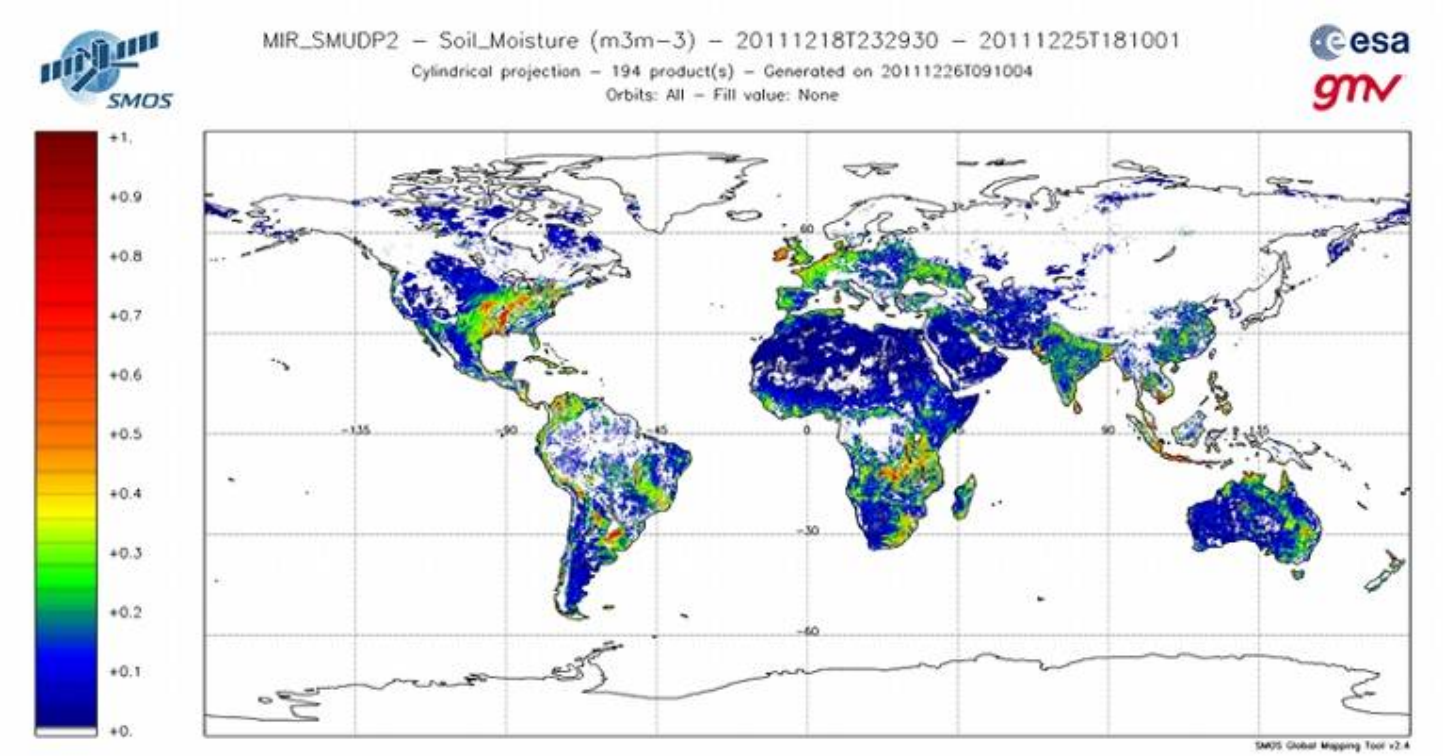


Figure 35 Soil moisture evolution during the reporting period (week 52)

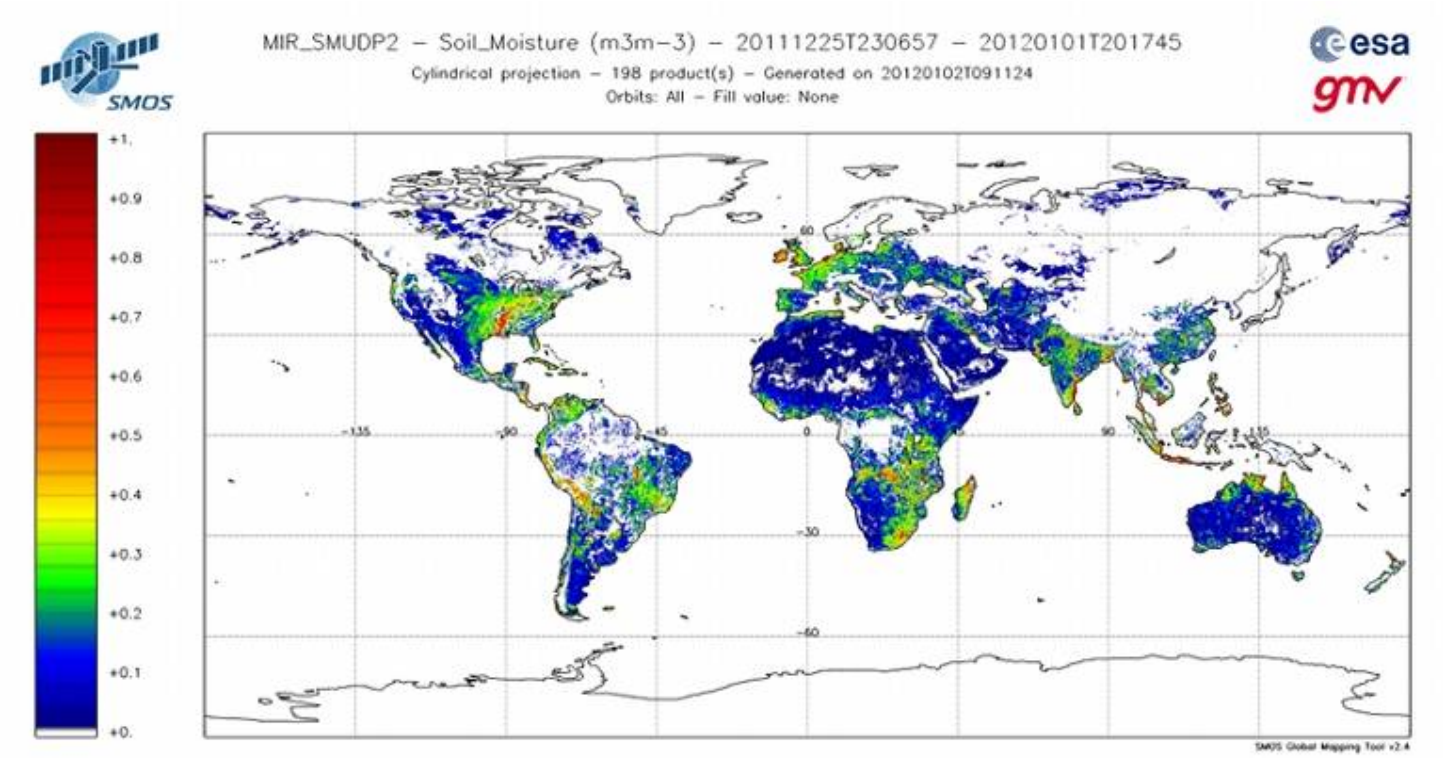


Figure 36 Soil moisture on Taklamakan desert during the reporting period: SM in ascending passes (left) and SM in descending passes (right)

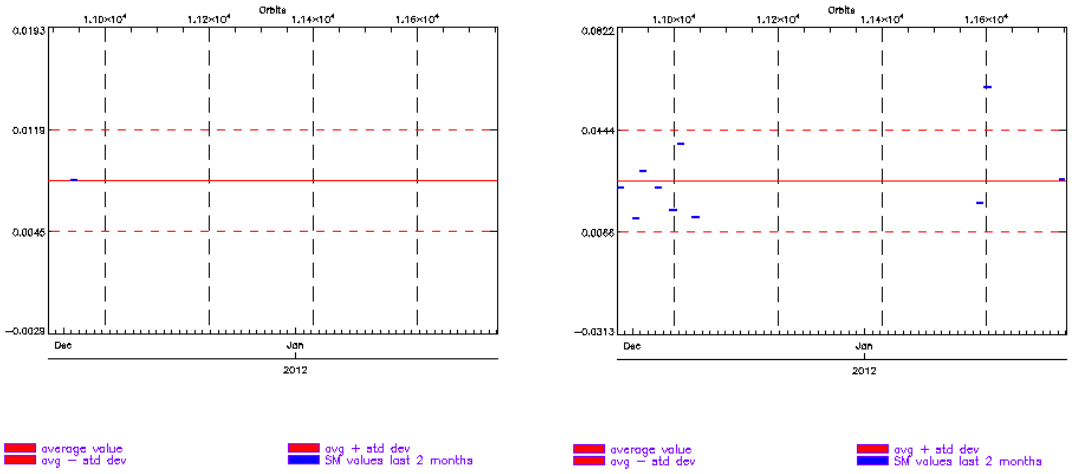
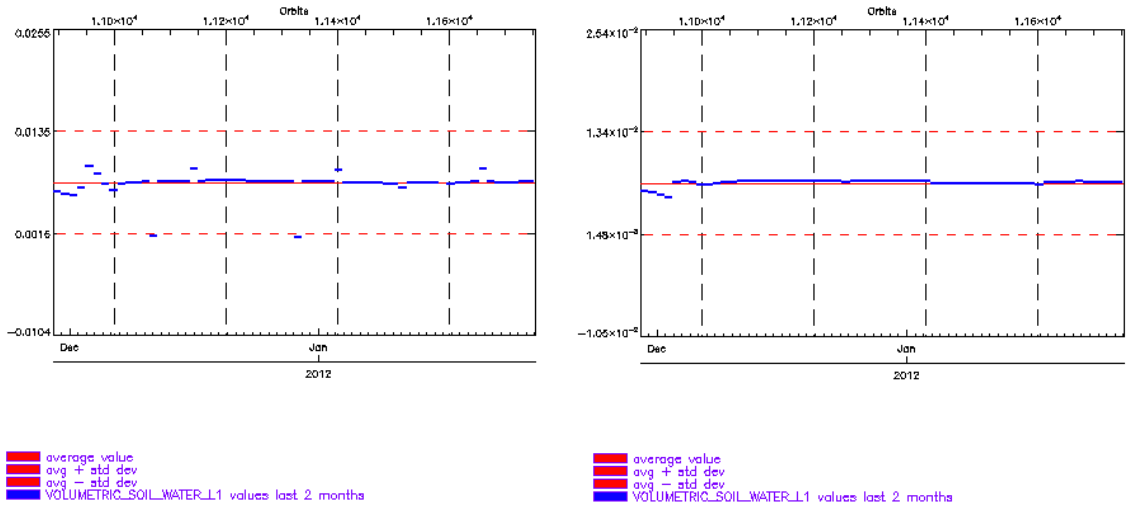


Figure 37 Volumetric Soil Water L1 provided by ECMWF on Taklamakan desert during the reporting period: ascending passes (left) and descending passes (right)



6. ADF CONFIGURATION AT THE END OF THE REPORTING PERIOD

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AUX_APDS__	SM_OPER_AUX_APDS___20050101T000000_20500101T000000_300_002_3.EEF	No
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AUX_BFP___	SM_OPER_AUX_BFP____20050101T000000_20500101T000000_340_003_3.EEF	No
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AUX_CNFL0P	SM_OPER_AUX_CNFL0P_20050101T000000_20500101T000000_001_005_3.EEF	No
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AUX_CNFOSD	SM_OPER_AUX_CNFOSD_20050101T000000_20500101T000000_001_020_3.EEF	Yes
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AUX_DFFXYZ	SM_OPER_AUX_DFFXYZ_20050101T000000_20500101T000000_001_003_3	No
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AUX_DISTAN	SM_OPER_AUX_DISTAN_20050101T000000_20500101T000000_001_011_3	No
AUX_ECOLAI	SM_OPER_AUX_ECOLAI_20050101T000000_20500101T000000_305_006_3	No
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APPENDIX A. CONFIGURATION DOCUMENT LIST

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

- Unavailability_11_01_12.xls
- Details_Calibrations_20_03_12.xls
- SO-MN-IDR-GS-0369_CCB-92_07-Dec-11_v10.doc
- SO-MN-IDR-GS-0370_CCB-93_14-Dec-11_v10.doc
- SO-MN-IDR-GS-0371_CCB-94_20-Dec-11_v10.doc
- SO-MN-IDR-GS-0372_CCB-95_11-Jan-12_v10.doc

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