

PREPARATION AND OPERATIONS OF THE MISSION PERFORMANCE
CENTRE (MPC) FOR THE COPERNICUS SENTINEL-3 MISSION

S3-A Land and Sea Ice Cyclic Performance Report

Cycle No. 016

Start date: 25/03/2017

End date: 21/04/2017



*Mission
Performance
Centre*



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Table of content

1	INTRODUCTION	1
2	CYCLE OVERVIEW	2
3	PROCESSING BASELINES.....	3
4	DATA AVAILABILITY & INSTRUMENT MODES.....	4
4.1	DATA AVAILABILITY	4
4.2	SRAL INSTRUMENT MODE.....	4
5	AVAILABILITY OF POLAR GEOPHYSICAL CORRECTIONS	9
5.1	AVAILABILITY OF GEOPHYSICAL CORRECTIONS OVER ICE SHEETS (NTC PRODUCTS).....	9
5.2	AVAILABILITY OF GEOPHYSICAL CORRECTIONS OVER ICE SHELVES (NTC PRODUCTS)	9
5.3	AVAILABILITY OF GEOPHYSICAL CORRECTIONS OVER SEA ICE	11
5.4	AVAILABILITY OF SNOW DENSITY, SNOW DEPTH AND SEA ICE CONCENTRATION OVER SEA ICE.....	12
6	GEOPHYSICAL PARAMETER MONITORING FOR LAND ICE	13
6.1	20Hz KU BAND ELEVATION (ELEVATION_ICE_SHEET_20_KU)	13
6.2	20Hz KU BAND ICE SHEET RANGE (RANGE_ICE_SHEET_20_KU)	15
6.3	20Hz KU BAND ICE SHEET SIGMA0 (SIG0_ICE_SHEET_20_KU)	17
6.4	20Hz KU BAND OCOG (ICE-1) RANGE (RANGE_OCOG_20_KU)	20
6.5	20Hz KU BAND OCOG (ICE-1) SIGMA0 (SIG0_OCOG_20_KU)	21
6.6	20Hz KU BAND PLRM ICE RANGE (RANGE_ICE_20_PLRM_KU).....	24
6.7	20Hz KU BAND PLRM SIGMA0 (SIG0_ICE_20_PLRM_KU)	26
6.8	20Hz KU BAND SURFACE CLASS (SURF_CLASS_20_KU)	28
7	SLOPE CORRECTION ASSESSMENT	30
8	GEOPHYSICAL PARAMETER MONITORING FOR SEA ICE	32
8.1	20Hz KU BAND ALTIMETER DERIVED SURFACE TYPE (SURF_TYPE_CLASS_20_KU)	32
8.2	20Hz KU BAND FREEBOARD (FREEBOARD_20_KU)	34
8.3	20Hz KU BAND INTERPOLATED SEA SURFACE HEIGHT ANOMALY (INT_SEA_ICE_SSHA_20_KU).....	35
8.4	SEA SURFACE HEIGHT ANOMALY (SEA_ICE_SSHA_20_KU).....	35
8.5	20Hz KU BAND SEA ICE CONCENTRATION (SEA_ICE_CONCENTRATION_20_KU).....	36
9	CROSSOVER ANALYSIS	38
10	REPEAT TRACK ANALYSIS	39
11	LONG TERM MONITORING.....	40
12	EVENTS	41
13	CONCLUSIONS.....	42
14	APPENDIX A	43

List of Figures

Figure 1: SR_2_LAN IPF Versions and Availability during cycle 16-----	3
Figure 2: SR_2_WAT IPF Versions and Availability during cycle 16-----	3
Figure 3 : Map of SRAL mode over Antarctic ice sheet and ice shelves for cycle 16 NTC -----	5
Figure 4: Map of SRAL mode over Greenland ice sheet for cycle 16 NTC-----	6
Figure 5: Map of SRAL mode over the Antarctic sea ice for cycle 16 NTC -----	7
Figure 6: Map of SRAL mode over the Arctic sea ice for cycle 16 NTC-----	8
Figure 7: Map of Ocean Tide Correction (sol. 2) over Antarctic ice shelves in cycle 16 NTC -----	10
Figure 8: Map of Ocean Tide Correction (sol. 2) Failure Locations over Arctic in cycle 16 NTC -----	12
Figure 9: Map of 20Hz Ku band Ice Sheet Elevation over Antarctica and Greenland for cycle 16 -----	15
Figure 10: Maps of 20Hz Ku Band Ice Sheet Range (range_ice_sheet_20_ku) -----	17
Figure 11: Maps of 20Hz Ku Band Ice Sheet Sigma0 (sig0_ice_sheet_20_ku) -----	19
Figure 12: Maps of 20Hz Ku Band OCOG (Ice-1) Range (range_ocog_20_ku) -----	21
Figure 13: Maps of 20Hz Ku Band OCOG (Ice-1) Sigma0 (sig0_ocog_20_ku)-----	23
Figure 14: Maps of 20Hz Ku Band PLRM Ice Range (range_ice_20_plrm_ku) -----	25
Figure 15: Maps of 20Hz Ku Band PLRM Sigma0 (sig0_ice_20_plrm_ku)-----	27
Figure 16: Maps of 20Hz Ku Band Surface Class (surf_class_20_ku)-----	29
Figure 17: Maps of Slope Correction Failure Locations-----	31
Figure 18: Maps of 20Hz Ku Band Altimeter Derived Surface Type (surf_type_class_20_ku) -----	33
Figure 19: Maps of 20Hz Ku band Freeboard (freeboard_20_ku)-----	35
Figure 20: Maps of 20Hz Ku band Sea Ice Concentration (sea_ice_concentration_20_ku) -----	37

List of Tables

Table 1: Data Availability for NTC-----	4
Table 2: % Availability of Geophysical Corrections over Ice Sheets (NTC)-----	9
Table 3: % Availability of Geophysical Corrections over Ice Shelves (NTC)-----	10
Table 4: % Availability of Geophysical Corrections over Sea Ice (STC)-----	11
Table 5: % Availability of Snow Density, Snow Depth, Sea Ice Concentration over Sea Ice-----	12

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1 Introduction

This document provides a report of the performance and data quality of the Sentinel-3A SRAL Level 2 data products over land ice (polar ice sheets, ice shelves, and ice caps) and sea ice surfaces.

For land ice the SR_2_LAN Level 2 NTC (Non Time Critical) products which contain the final orbit and geophysical corrections are assessed. These are produced by the S3 Instrument Processing Facility (IPF) at CNES.

For sea ice, we assess the SR_2_WAT Marine Level 2 NTC (Non Time Critical) products, produced by the S3 Marine Centre.

The objectives of this document are :

- ❖ To provide a data quality assessment.
- ❖ To report on any changes likely to impact data quality at any level, from instrument status to software configuration.
- ❖ To present the major useful results for cycle 16, from 25 March 2017 to 21 Apr 2017.

 <p>SENTINEL 3 Mission Performance Centre</p>	<p>Sentinel-3 MPC</p> <p>S3-A Land and Sea Ice Cyclic Performance Report</p> <p>Cycle No. 016</p>	<p>Ref.: S3MPC.UCL.PR.08-016</p> <p>Issue: 1.0</p> <p>Date: 02/06/2017</p> <p>Page: 2</p>
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2 Cycle Overview

This is 27-day cycle 16 (25-March-2017 to 21-Apr-2017), the third cycle since Sentinel-3A entered its routine operational phase following commissioning. Sentinel-3A was launched on 16-February-2016.

During this cycle, Sentinel-3A SRAL operated in SAR mode over land ice and sea ice surfaces.

3 Processing Baselines

During this cycle there was no Instrument Processing Facility (IPF) software version change for SR_2_LAN NTC products.

One version of the IPF was used to compute the altimeter parameters for the L2 Land (SR_2-LAN) NTC dataset during this cycle. This was IPF-SM-2, version 06.07. For NRT and STC Land products two versions of the IPF were used (06.06 and 06.07).



Figure 1: SR_2_LAN IPF Versions and Availability during cycle 16

The version of the S3-MPC software used to compute the altimeter parameters for the L2 Marine (SR_2-WAT) NTC dataset is the IPF-SM-2, version 06.07. Two versions were used for STC products (IPF v6.0.6 and v6.0.7).



Figure 2: SR_2_WAT IPF Versions and Availability during cycle 16

	Sentinel-3 MPC S3-A Land and Sea Ice Cyclic Performance Report Cycle No. 016	Ref.: S3MPC.UCL.PR.08-016 Issue: 1.0 Date: 02/06/2017 Page: 4
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4 Data Availability & Instrument Modes

4.1 Data Availability

The percentage of L2 product orbits received during this 27 day cycle by the MPC and contributing to this report were:

Product Type	Latency	% Orbits Received
SR_2_LAN	NTC	99.2%
SR_2_WAT	NTC	100%

Table 1: Data Availability for NTC

Note that these are percentages of products received by the Mission Performance Centre at the time of report issue, and may be lower than the final data availability if there have been processing centre delays.

4.2 SRAL Instrument Mode

Over land ice surfaces the SRAL instrument operated in SAR closed loop during this cycle. Closed-loop is the autonomous form of surface tracking typically used for altimetry missions, as compared with open-loop which depends on a pre-computed DEM stored onboard.



Flag: instr_op_mode_20_ku

Mode: all

Cycle: 16 NTC SR_2_LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:32

IPF Version: IPF-SM-2 06.07

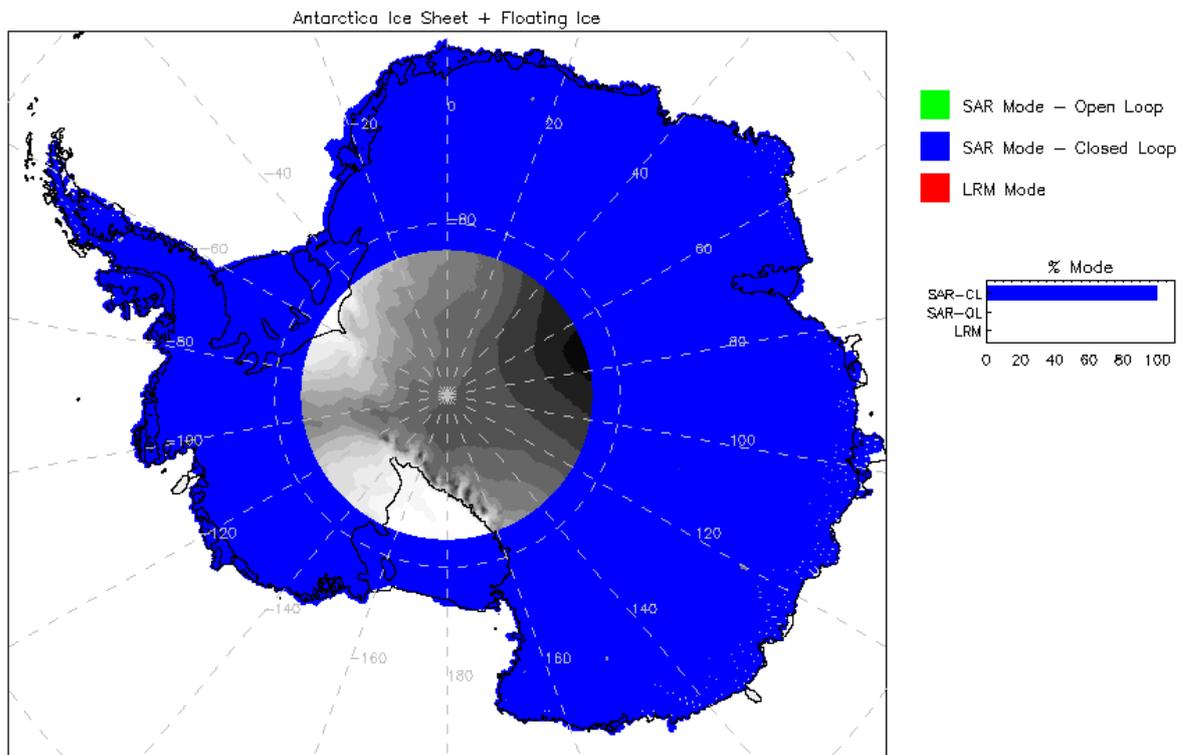


Figure 3 : Map of SRAL mode over Antarctic ice sheet and ice shelves for cycle 16 NTC



Flag: instr_op_mode_20_ku

Mode: all

Cycle: 16 NTC SR_2_LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:32

IPF Version: IPF-SM-2 06.07

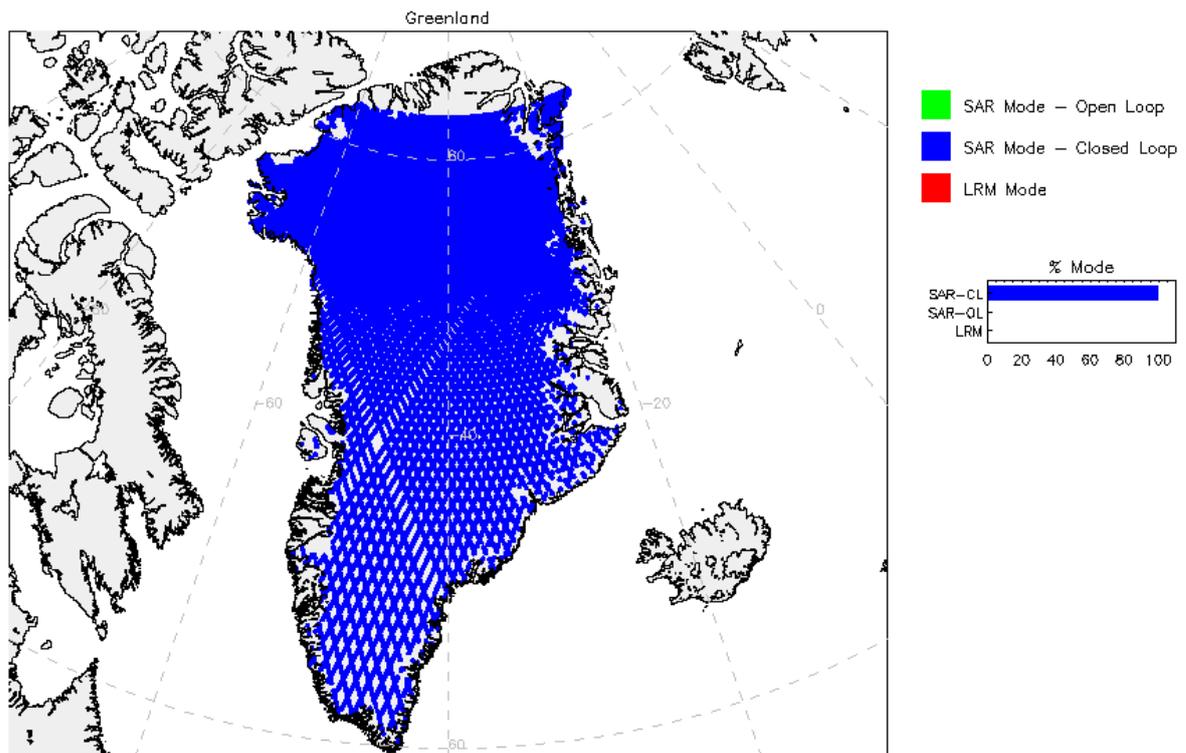


Figure 4: Map of SRAL mode over Greenland ice sheet for cycle 16 NTC

For sea ice and ocean surfaces the SRAL instrument operated in SAR open loop mode during this cycle. Note that the mode mask is fixed and does not dynamically change from cycle to cycle. In open loop the range window is positioned using a 1-D along track DEM with a-priori knowledge of the surface height.



Flag: instr_op_mode_20_ku

Mode: all

Cycle: 16 NTC SR_2_WAT

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:27

IPF Version: IPF-SM-2 06.07

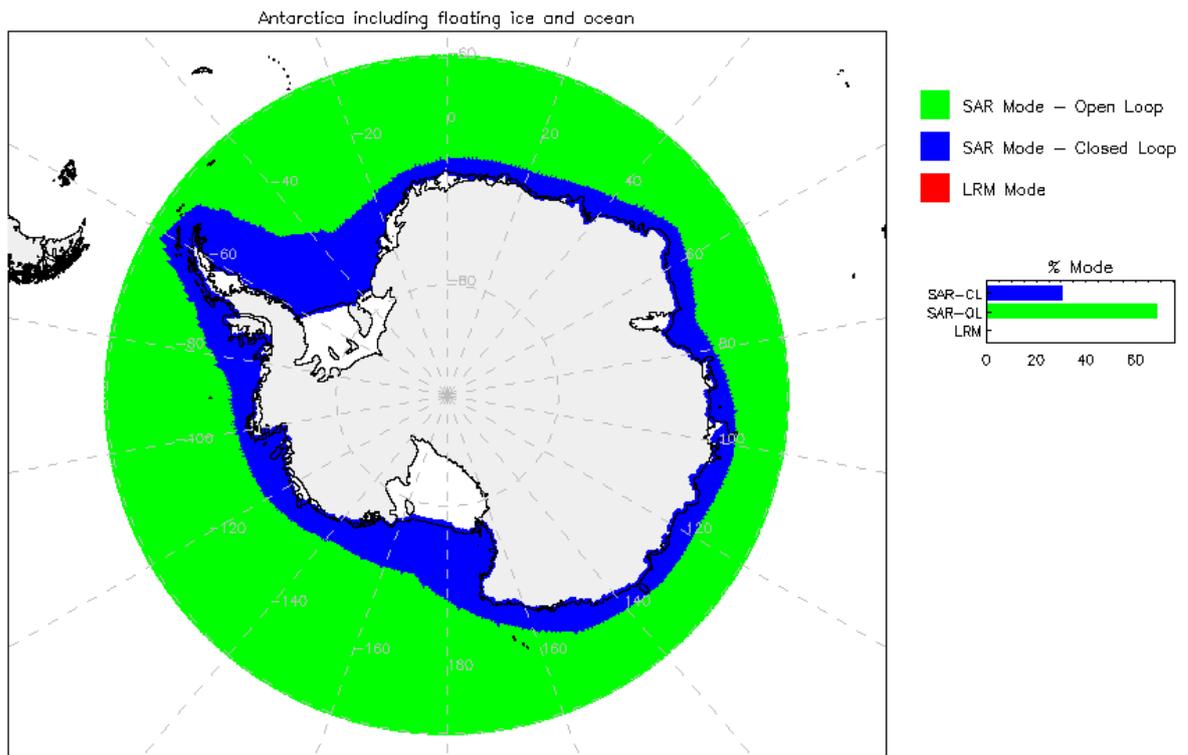


Figure 5: Map of SRAL mode over the Antarctic sea ice for cycle 16 NTC



Sentinel-3 MPC
S3-A Land and Sea Ice Cyclic Performance Report
Cycle No. 016

Ref.: S3MPC.UCL.PR.08-016
Issue: 1.0
Date: 02/06/2017
Page: 8

Flag: instr_op_mode_20_ku

Mode: all

Cycle: 16 NTC SR_2_WAT

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:27

IPF Version: IPF-SM-2 06.07

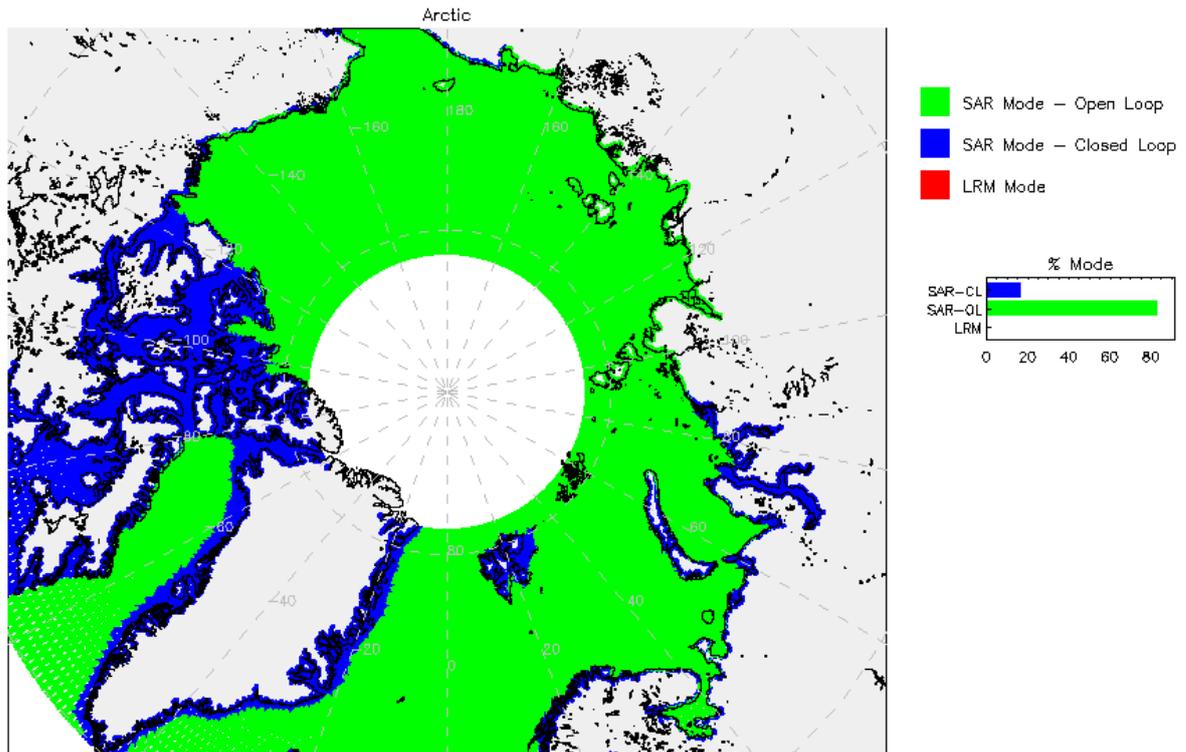


Figure 6: Map of SRAL mode over the Arctic sea ice for cycle 16 NTC

5 Availability of Polar Geophysical Corrections

In this section the availability of geophysical corrections to altimeter range contained in the L2 products over ice sheets, ice shelves and sea ice are analysed for this cycle. Missing or invalid geophysical corrections can cause errors in the final L2 elevation parameters, and erroneous steps in derived time series of ice sheet surface elevation change or sea ice freeboard.

5.1 Availability of Geophysical Corrections over Ice Sheets (NTC Products)

For polar ice sheets, the primary geophysical corrections applied to the range are model dry tropospheric, model wet tropospheric, GIM ionospheric, solid earth tide, pole tide and ocean loading tide.

For cycle 16 NTC the percentage availability of geophysical corrections over ice sheets was:

Correction	% Availability Antarctic Ice Sheet and ice shelves	% Availability Greenland Ice Sheet
Modelled Dry Tropospheric	100	100
Modelled Wet Tropospheric	100	100
GIM Ionospheric	100	100
Solid Earth Tide	100	100
Pole Tide	100	100
Ocean Loading Tide (sol 1)	100	100
Ocean Loading Tide (sol 2)	100	100

Table 2: % Availability of Geophysical Corrections over Ice Sheets (NTC)

5.2 Availability of Geophysical Corrections over Ice Shelves (NTC Products)

For polar ice shelves, the primary geophysical corrections applied to the range are as for ice sheets plus ocean tide and inverse barometric corrections.

For cycle 16 NTC the percentage availability of geophysical corrections over ice shelves was:

Correction	% Availability ice shelves
Ocean Tide (sol 1)	Not applied
Ocean Tide (sol 2)	100 ¹
Inverse Barometric	100

Table 3: % Availability of Geophysical Corrections over Ice Shelves (NTC)

¹For ice shelf studies it is recommended that users replace the ocean tide correction (Ocean Tide Solution 2 in cycle 16) where it is valid in the L2 NTC products over Antarctic ice shelves with a more accurate high resolution circumpolar ocean tide model correction such as the Circum Antarctic Tidal Simulation (CATS 2008a), *Padman et al (2008)*.

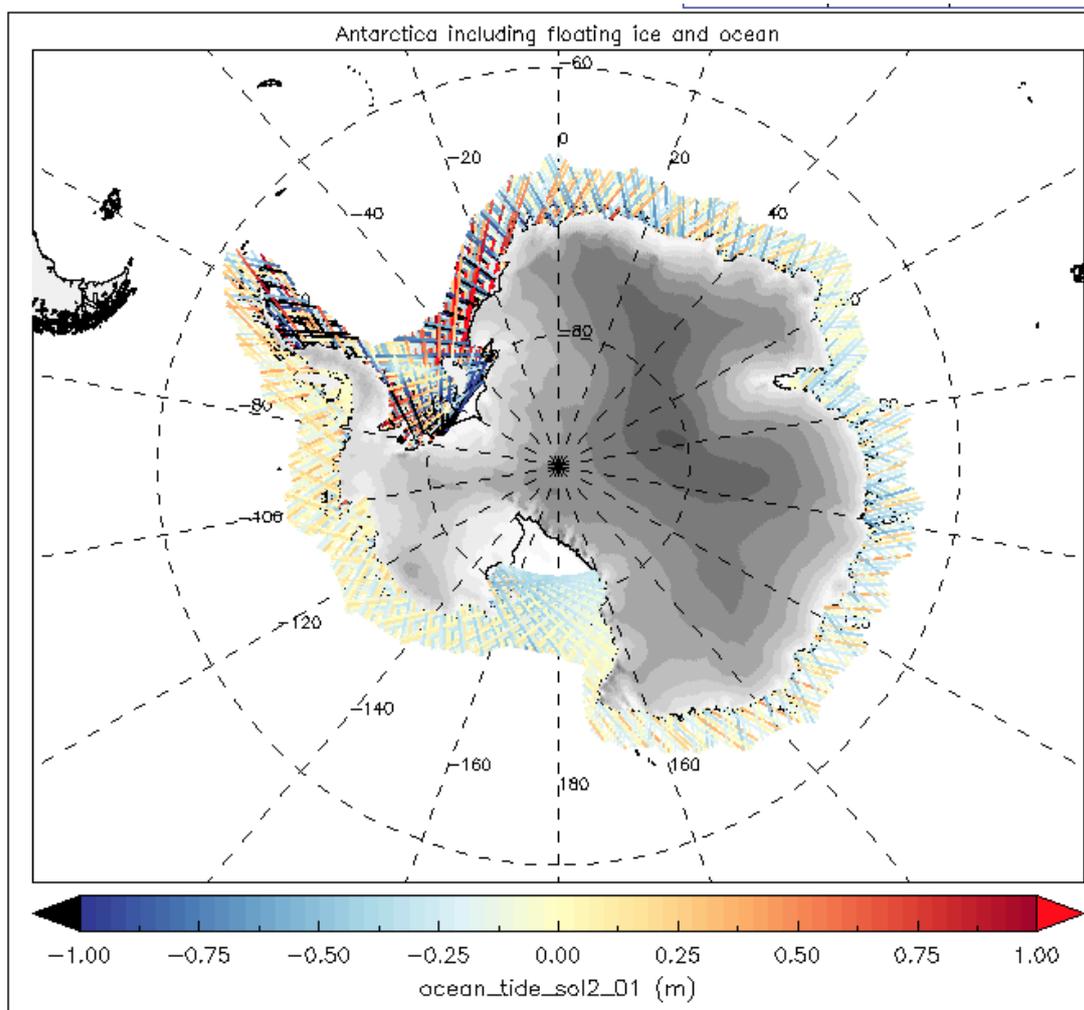


Figure 7: Map of Ocean Tide Correction (sol. 2) over Antarctic ice shelves in cycle 16 NTC

5.3 Availability of Geophysical Corrections over Sea Ice

Over sea ice the model dry tropospheric, model wet tropospheric, ionospheric, solid earth tide, pole tide and ocean tide and inverse barometric corrections are applied in the STC L2 Marine product.

For cycle 16 NTC the percentage availability of geophysical corrections over sea ice was:

Correction	% Availability Arctic Sea Ice	% Availability Antarctic Sea Ice
Modelled Dry Tropospheric	100	100
Modelled Wet Tropospheric	100	100
GIM Ionospheric	97.72 ¹	98.86 ¹
Altimeter Ionospheric 1Hz	69.36 ³	73.68
Altimeter Ionospheric 20Hz	65.53 ³	84.34
Solid Earth Tide	100	100
Pole Tide	100	100
Ocean Tide (sol 1)	99.39	100
Ocean Tide (sol 2)	94.50 ²	99.47
Inverse Barometric	100	100

Table 4: % Availability of Geophysical Corrections over Sea Ice (STC)

¹ The GIM ionospheric correction was unavailable in previous cycles as they are only produced for NTC and not NRT or STC products.

² The Ocean Tide solutions over the Arctic showed missing values only very close to the coast:

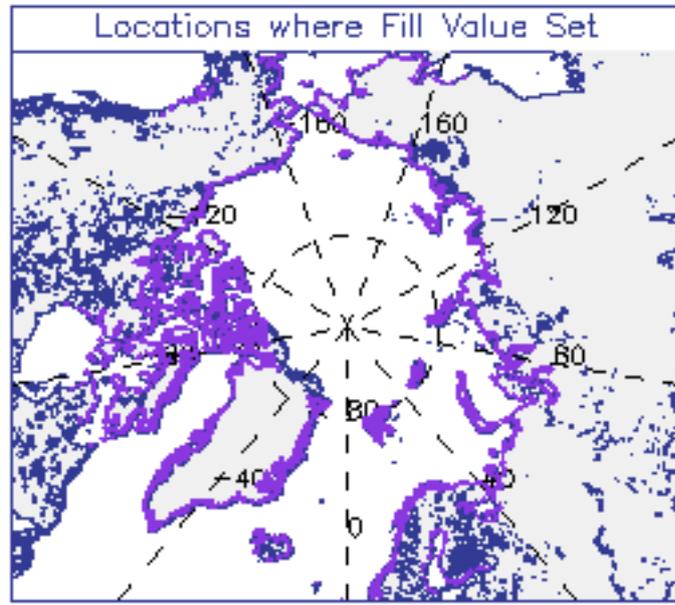


Figure 8: Map of Ocean Tide Correction (sol. 2) Failure Locations over Arctic in cycle 16 NTC

³ Altimeter derived ionospheric corrections showed failure over most regions of the Arctic and Antarctic oceans where sea ice is present:

5.4 Availability of Snow Density, Snow Depth and Sea Ice Concentration over Sea Ice

Correction	% Availability Arctic Sea Ice	% Availability Antarctic Sea Ice
Sea Ice Concentration ³	100	100
Snow Density ¹	100	100
Snow Depth	100	100 ²

Table 5: % Availability of Snow Density, Snow Depth, Sea Ice Concentration over Sea Ice

¹Snow Density is set to a single value of 400 Kg/m³ as expected.

² Snow depth over Antarctic sea ice is set to zero as expected.

³Sea Ice Concentration is derived from a dynamic 3 day average of sea ice concentration calculated from SSM/I daily brightness temperature data.

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6 Geophysical Parameter Monitoring for Land Ice

This section shows results and analysis of the primary L2 NTC parameters relating to land ice in cycle 16.

6.1 20Hz Ku Band Elevation (elevation_ice_sheet_20_ku)

20Hz Ku band surface elevation is the primary output of the land ice products over continental ice sheets and ice shelves.

Analysis of this parameter shows that the map of elevation is as expected but there is an unexpectedly high rate of parameter failure (37-51%) over the whole ice area in both Antarctica and Greenland. This is currently under investigation by the MPC and ESA but it is believed to be due to two main reasons:

1. An issue with the L1 SAR processing over areas of sloping terrain. This affects the stability of the waveform positioning within the range window, particularly in the continental margins. This results waveforms being located towards the edge of the range window or being truncated.
2. A SAR ice margin retracker tuning issue over areas of low slope. This was corrected mid way through this cycle with the introduction of IPF 6.0.7 and hence performance over low slope areas is improved in the second half of the cycle, and the overall improvement is of ~10% more measurements.

A small number of anomalous large negative values are also present. This is under investigation by the MPC.

The following maps show the 20Hz Ku band Elevation parameter plotted for the complete cycle.



S3A L2 Parameter:

elevation_ice_sheet_20_ku (m)

Mode: all

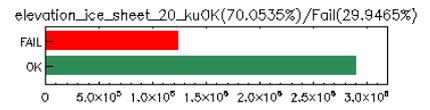
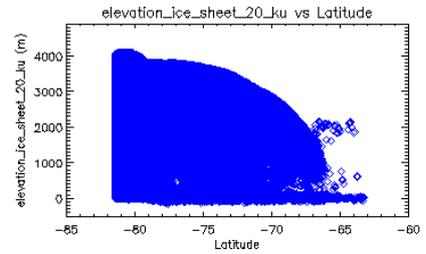
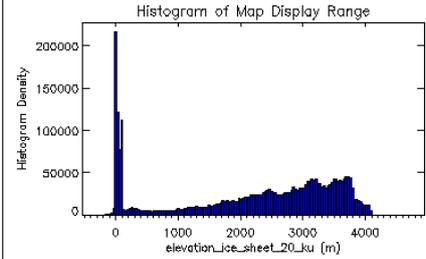
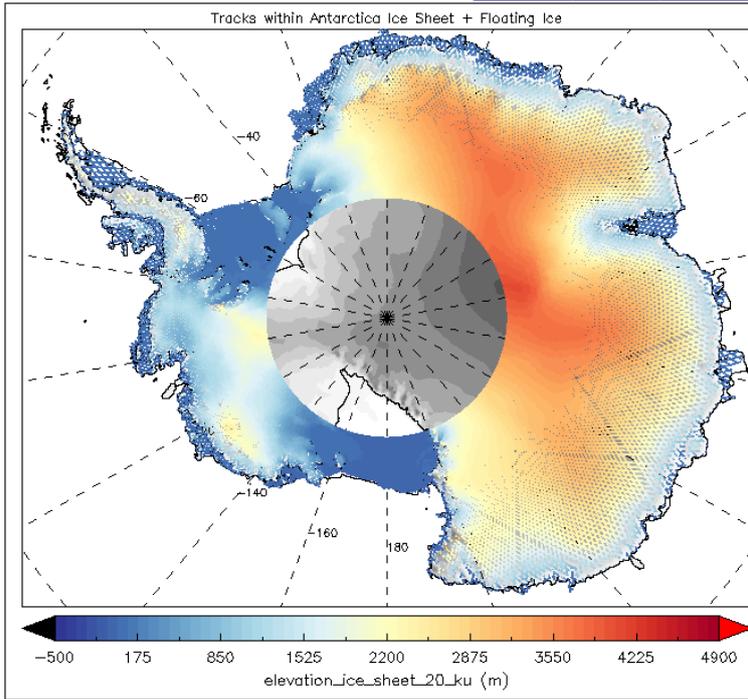
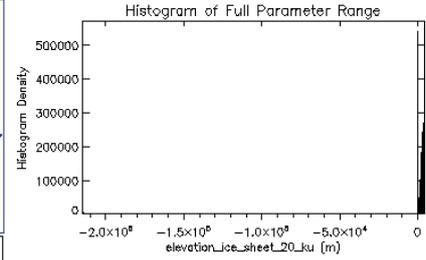
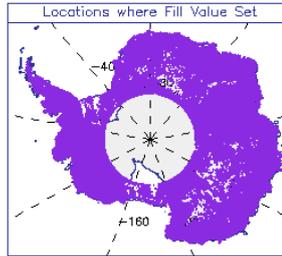
Cycle: 16 NTC SR_2 LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:32

IPF Version: IPF-SM-2_06.07



S3A L2 Parameter:

elevation_ice_sheet_20_ku (m)

Mode: all

Cycle: 16 NTC SR_2 LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T23:13

Last Time: 2017-04-21T22:22

IPF Version: IPF-SM-2 06.07

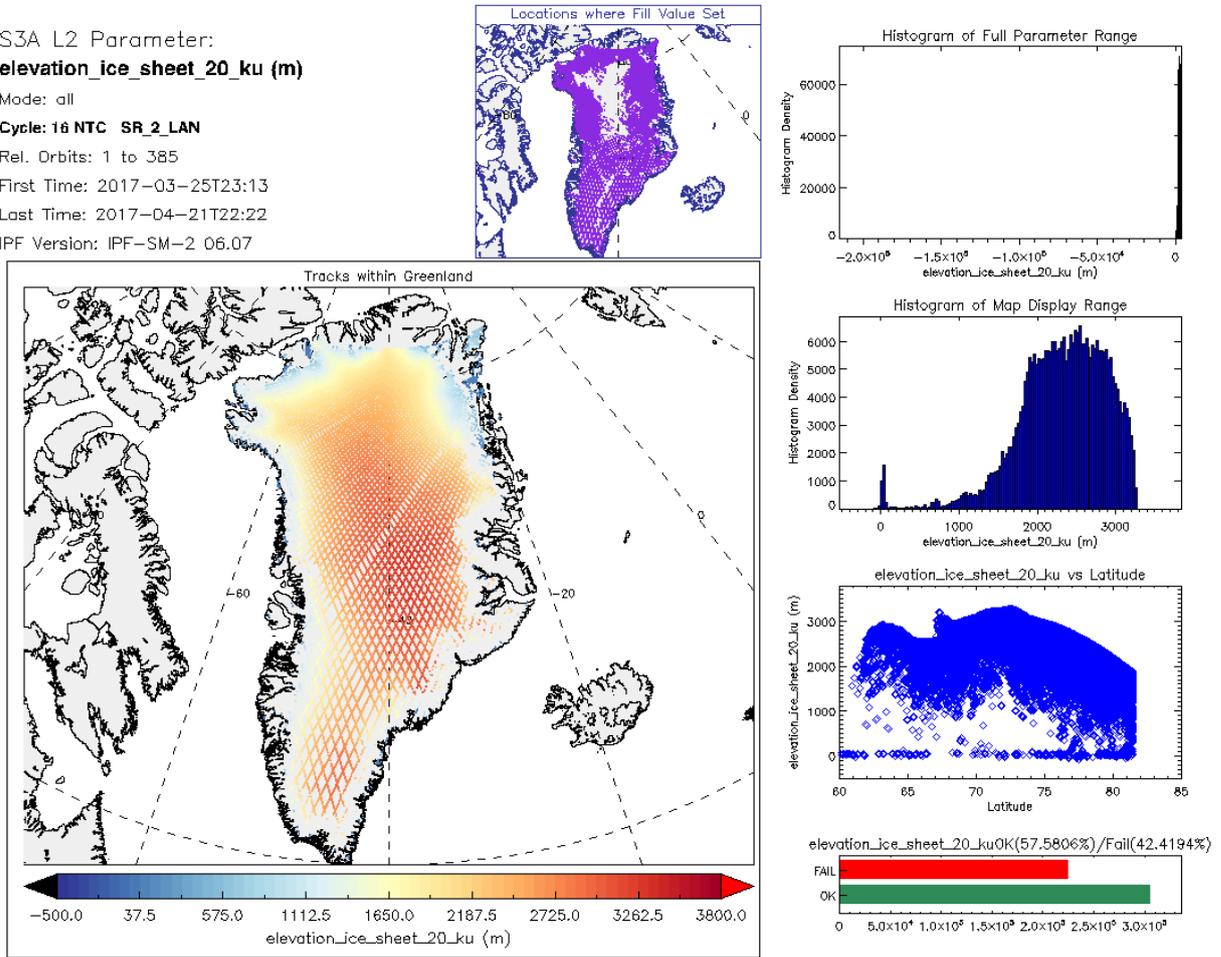


Figure 9: Map of 20Hz Ku band Ice Sheet Elevation over Antarctica and Greenland for cycle 16

6.2 20Hz Ku Band Ice Sheet Range (range_ice_sheet_20_ku)

The ice sheet range is retracked using the SAR ice margin retracker and is the primary range used to calculate elevation in the L2 product.

There are higher than expected rates of failure in this parameter over all ice areas. An explanation of this is given in the preceding section on ice sheet elevation.



S3A L2 Parameter:

range_ice_sheet_20_ku (km)

Mode: all

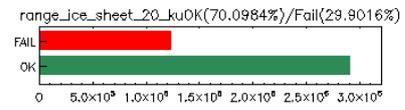
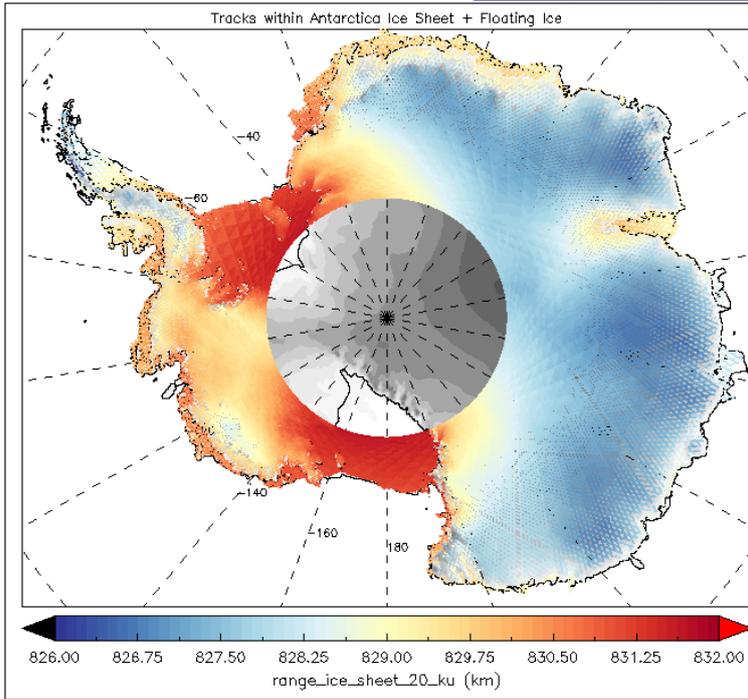
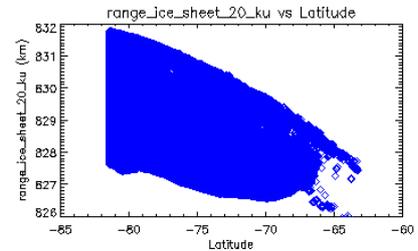
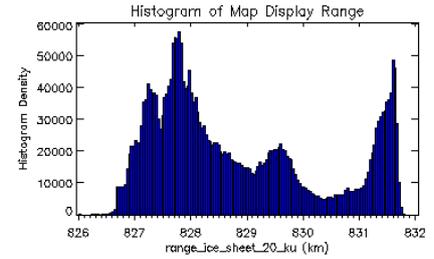
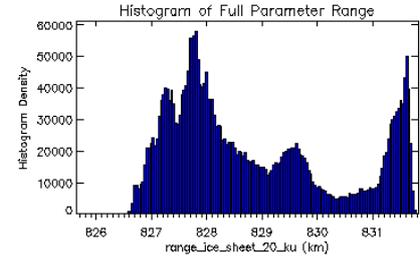
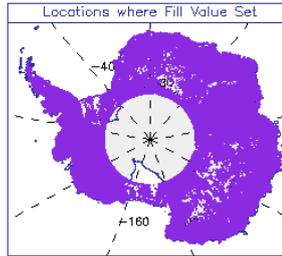
Cycle: 16 NTC SR_2 LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:32

IPF Version: IPF-SM-2_06.07





S3A L2 Parameter:

sig0_ice_sheet_20_ku (dB)

Mode: all

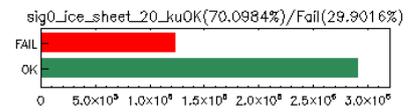
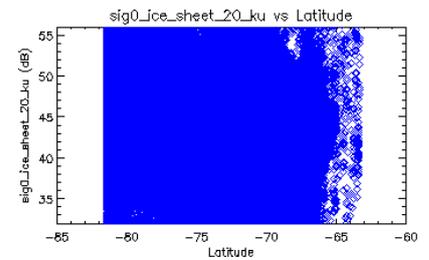
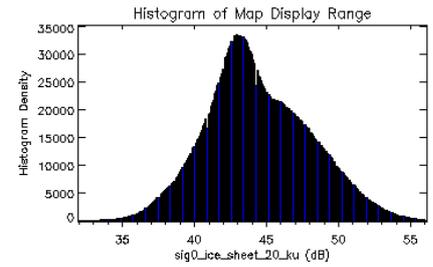
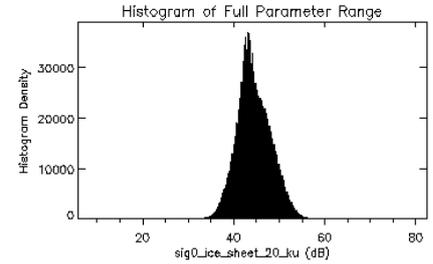
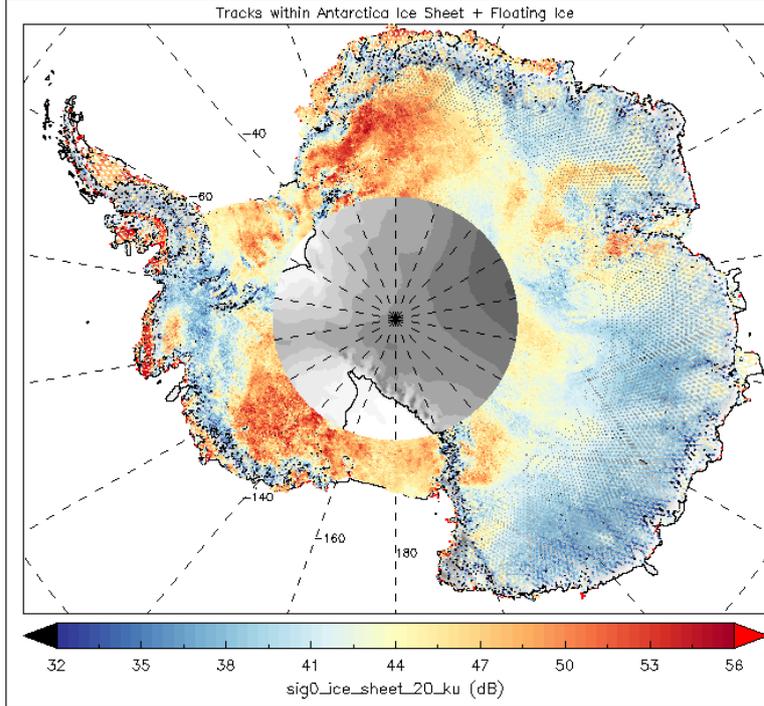
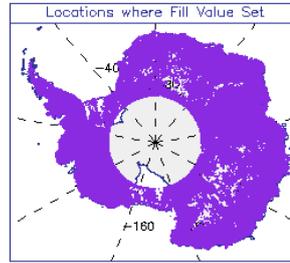
Cycle: 16 NTC SR_2_LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:32

IPF Version: IPF-SM-2 06.07



S3A L2 Parameter:
sig0_ice_sheet_20_ku (dB)
 Mode: all
 Cycle: 16 NTC SR 2 LAN
 Rel. Orbits: 1 to 385
 First Time: 2017-03-25T23:13
 Last Time: 2017-04-21T22:22
 IPF Version: IPF-SM-2 06.07

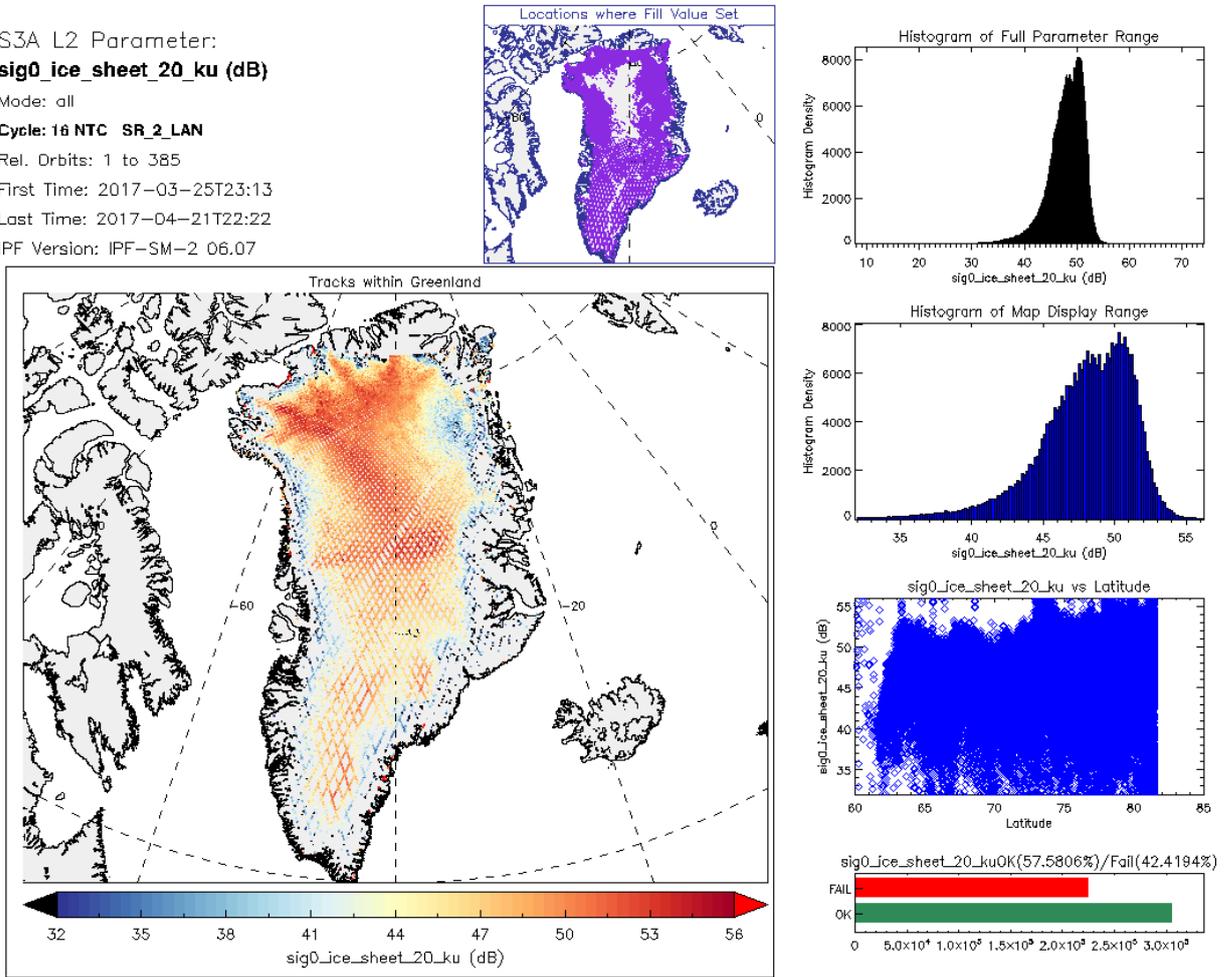


Figure 11: Maps of 20Hz Ku Band Ice Sheet Sigma0 (sig0_ice_sheet_20_ku)



6.4 20Hz Ku Band OCOG (Ice-1) Range (range_ocog_20_ku)

This parameter is the range derived from the OCOG (Ice-1) retracker. Note that there are low ~1% failures flagged with this parameter. The OCOG range defaults to the tracker range upon failure in IPF 6.0.6, but in IPF 6.0.7 failures are set by use of the fill value to indicate errors. There are much lower failure rates than for the SAR ice margin retracker. This is because the OCOG centre of gravity retracking algorithm will retrack a wider range of waveform shapes and leading edge positions than the model fit approach used by the SAR ice margin retracker. This results in greater measurement density, but in some areas lower accuracy.

S3A L2 Parameter:
range_ocog_20_ku (km)

Mode: all

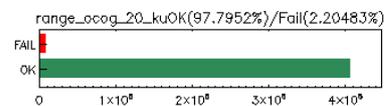
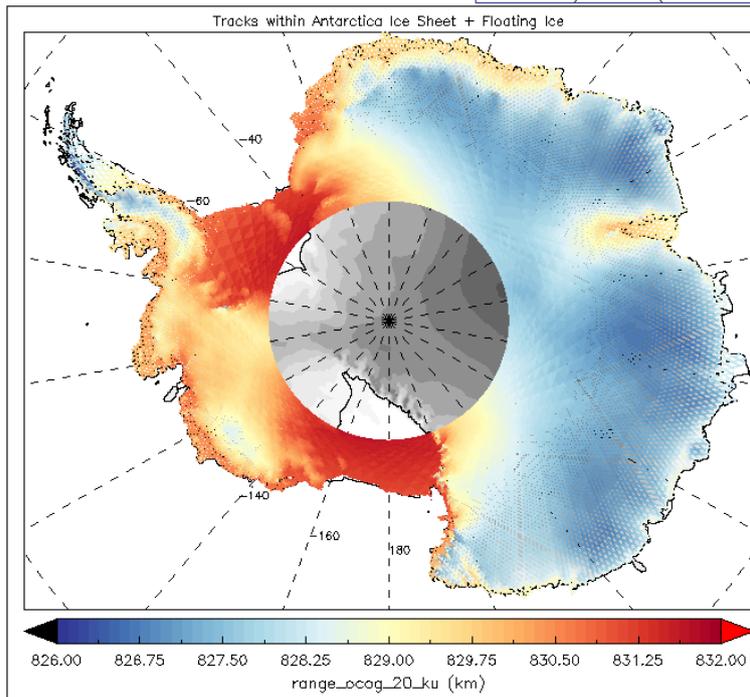
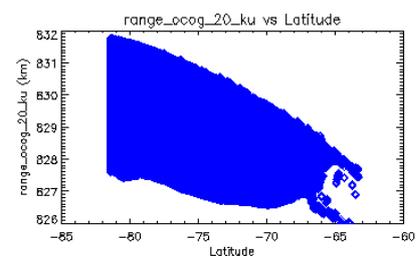
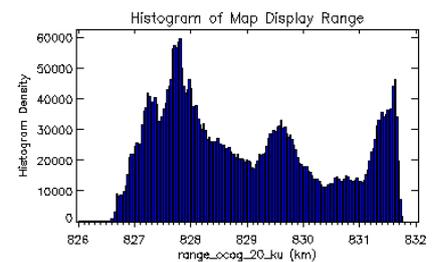
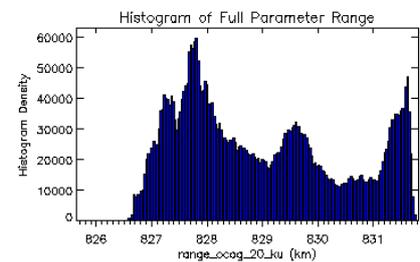
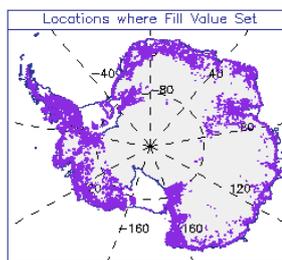
Cycle: 16 NTC SR_2_LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:32

IPF Version: IPF-SM-2 06.07



S3A L2 Parameter:
range_ocog_20_ku (km)

Mode: all

Cycle: 16 NTC SR_2 LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T23:13

Last Time: 2017-04-21T22:22

IPF Version: IPF-SM-2 06.07

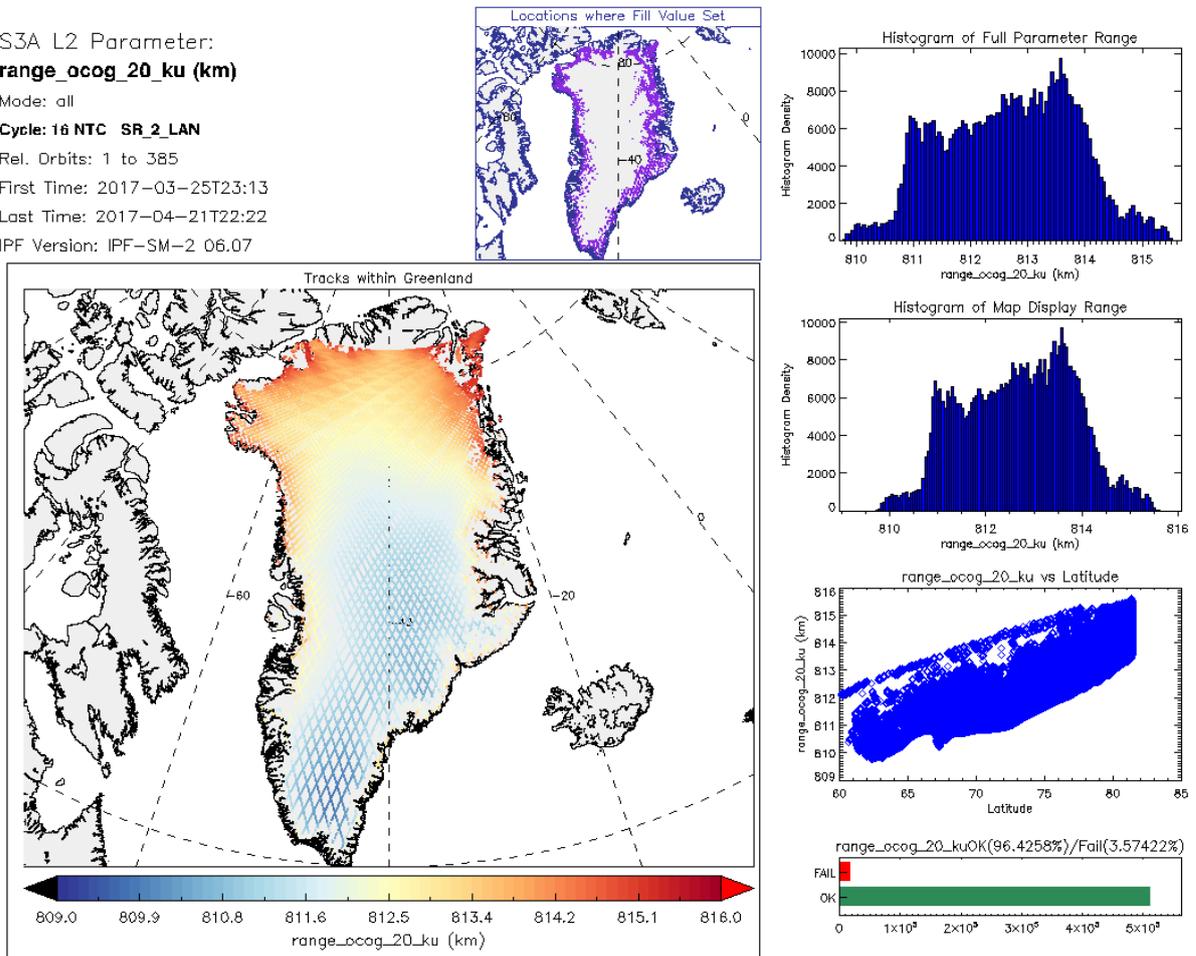


Figure 12: Maps of 20Hz Ku Band OCOG (Ice-1) Range (range_ocog_20_ku)

6.5 20Hz Ku Band OCOG (Ice-1) Sigma0 (sig0_ocog_20_ku)

The Ku band OCOG sigma0 backscatter parameter is derived from the OCOG (Ice-1) retracker. The map of sigma0 over the ice sheets shows similar patterns of backscatter values to previous missions. Backscatter values are controlled by surface roughness characteristics, surface slope and differences in surface and volume echo. Over the ice sheet margins backscatter is low due to high surface slope, and over the East Antarctic ice sheet it is also low due to strong winds causing high surface roughness. Over the West Antarctic ice sheet and areas of Dronning Maud land there are high backscatter returns due to very smooth surfaces. In Greenland the ice sheet surface is smoother due to lower winds and regular melt events causing higher backscatter values.

There are higher than expected rates of failure in this parameter over the margins, West Antarctica and the Antarctic Peninsula, but much lower failure rates than for the SAR ice margin retracker. This is because the OCOG centre of gravity retracking algorithm will retrack a wider range of waveform shapes than the model fit approach used by the SAR ice margin retracker. This results in greater measurement density, but in some areas lower accuracy.



S3A L2 Parameter:
sig0_ocog_20_ku (dB)

Mode: all

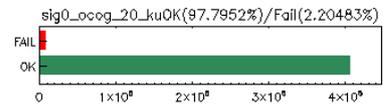
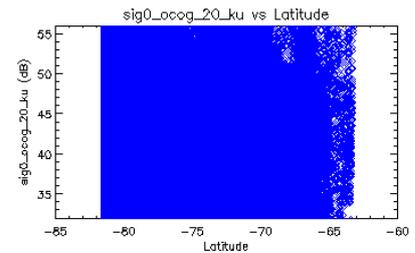
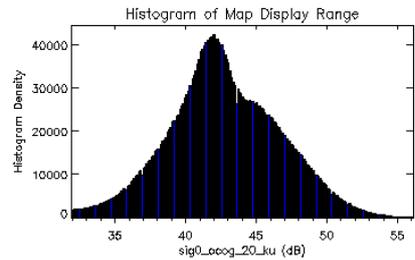
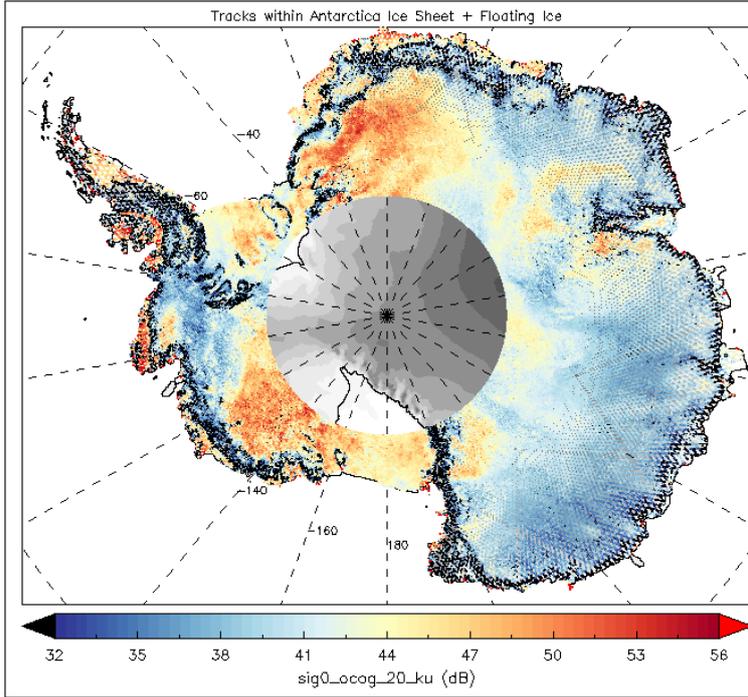
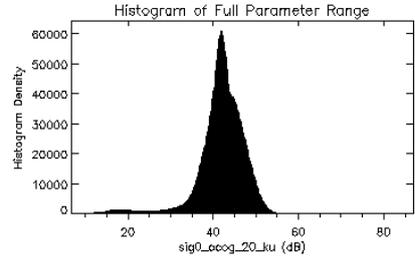
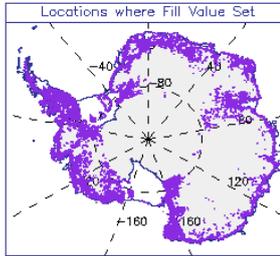
Cycle: 16 NTC SR_2_LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:32

IPF Version: IPF-SM-2 06.07





S3A L2 Parameter:

sig0_ocog_20_ku (dB)

Mode: all

Cycle: 16 NTC SR_2 LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T23:13

Last Time: 2017-04-21T22:22

IPF Version: IPF-SM-2 06.07

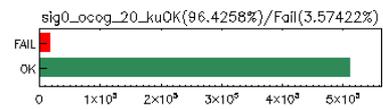
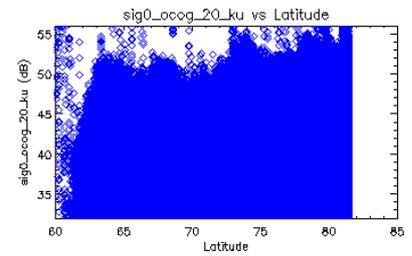
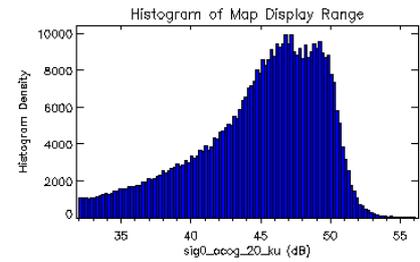
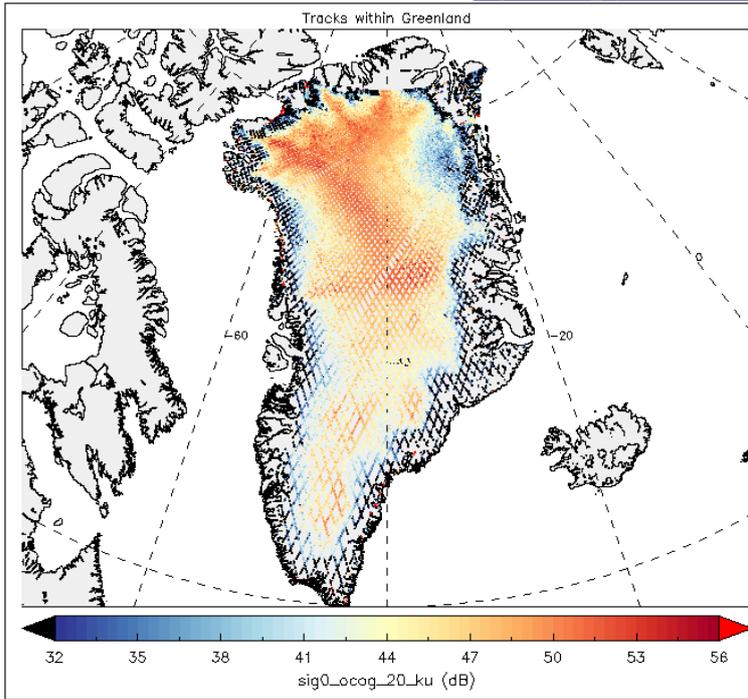
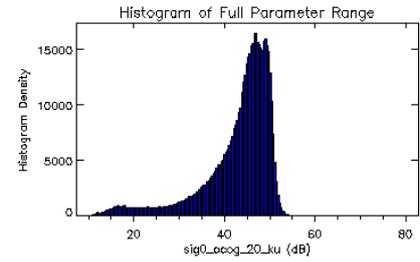
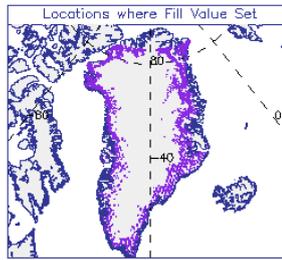


Figure 13: Maps of 20Hz Ku Band OCOG (Ice-1) Sigma0 (sig0_ocog_20_ku)



6.6 20Hz Ku Band PLRM Ice Range (range_ice_20_plrm_ku)

Range measurements derived from the PLRM waveforms and retracker show similar but slightly higher failure rates than for the SAR OCOG retracked range.

S3A L2 Parameter:

range_ice_20_plrm_ku (km)

Mode: all

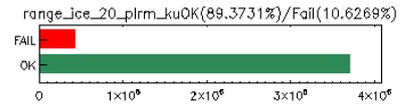
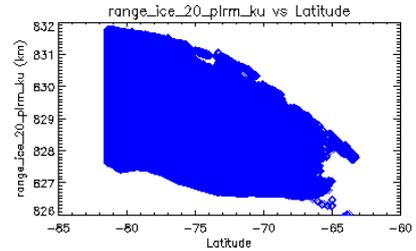
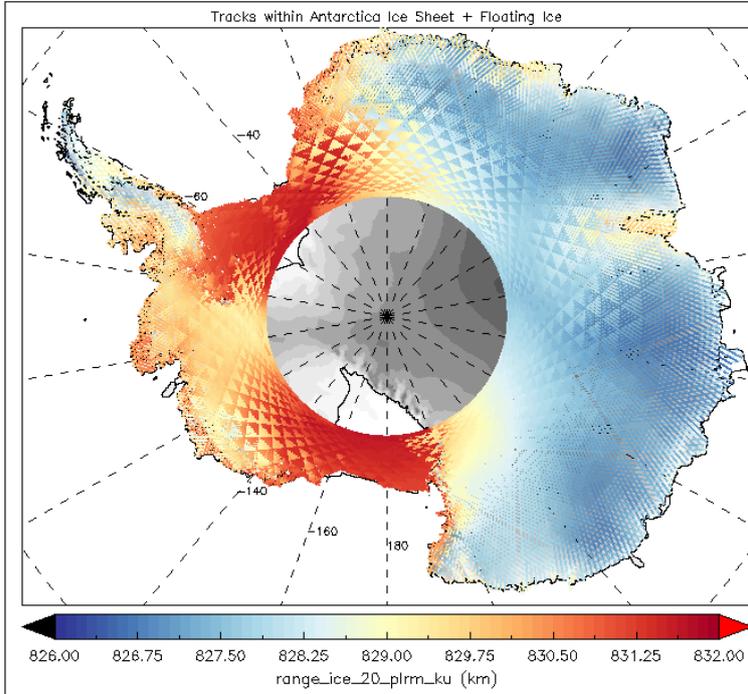
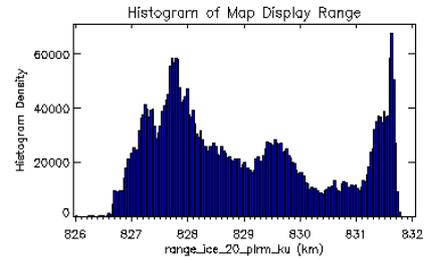
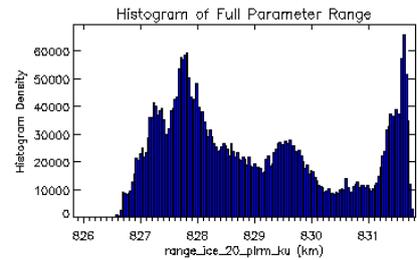
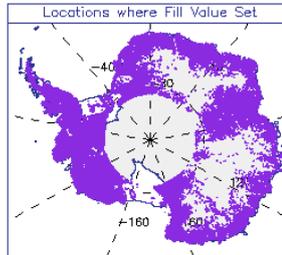
Cycle: 16 NTC SR_2_LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:32

IPF Version: IPF-SM-2_06.07



S3A L2 Parameter:
range_ice_20_plrm_ku (km)

Mode: all

Cycle: 16 NTC SR 2 LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T23:13

Last Time: 2017-04-21T22:22

IPF Version: IPF-SM-2 06.07

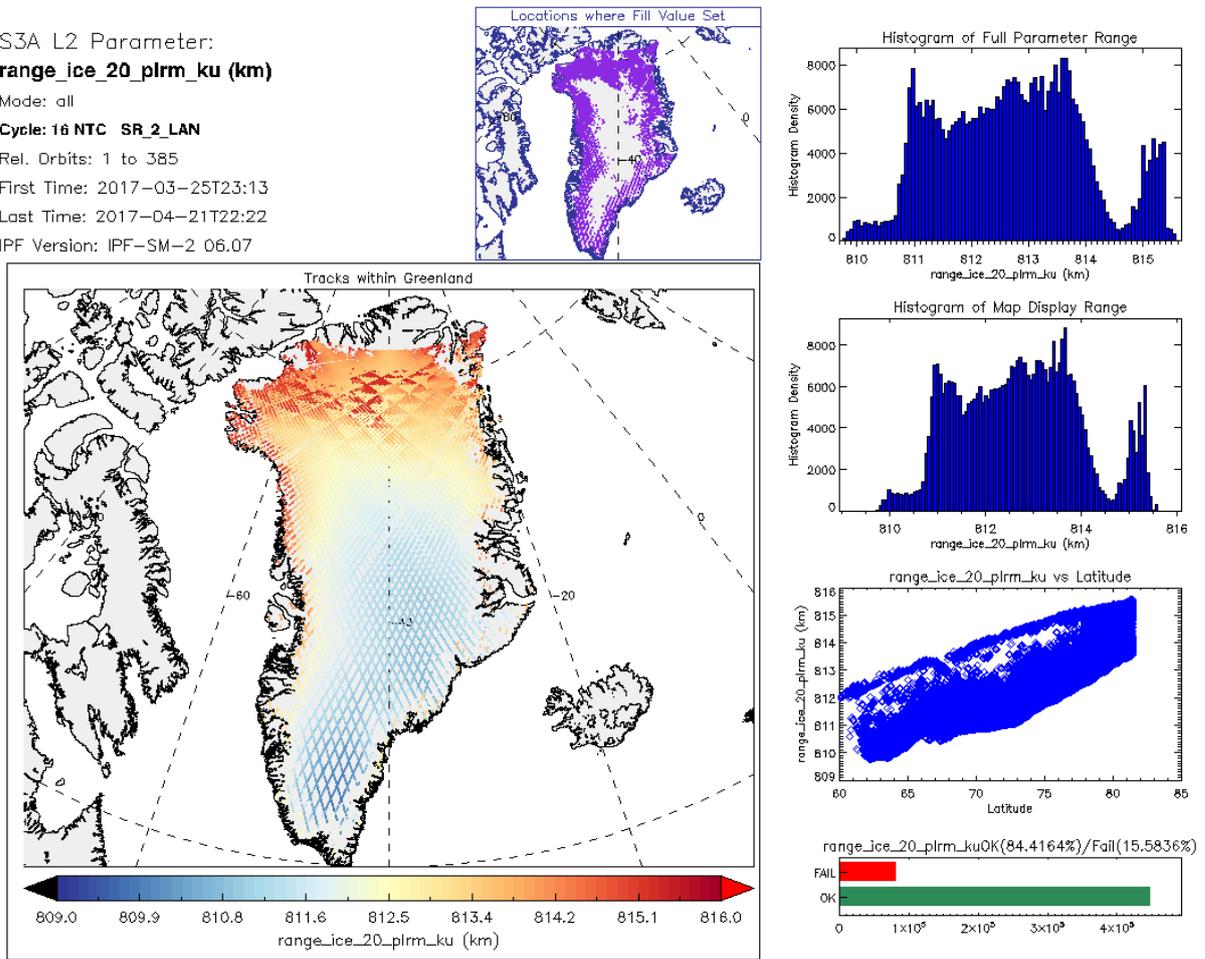


Figure 14: Maps of 20Hz Ku Band PLRM Ice Range (range_ice_20_plrm_ku)



6.7 20Hz Ku Band PLRM Sigma0 (sig0_ice_20_plrm_ku)

Backscatter sigma0 derived from the 20Hz Ku PLRM waveforms are shown below:

S3A L2 Parameter:

sig0_ice_20_plrm_ku (dB)

Mode: all

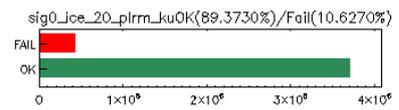
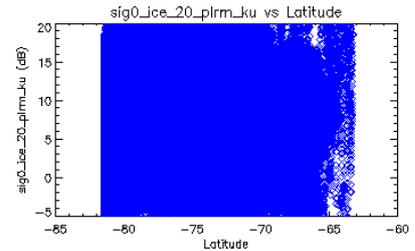
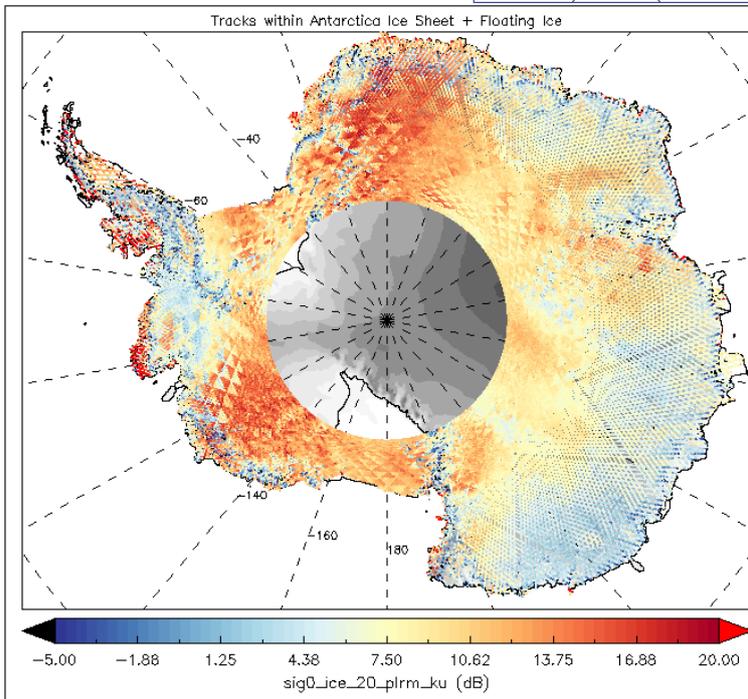
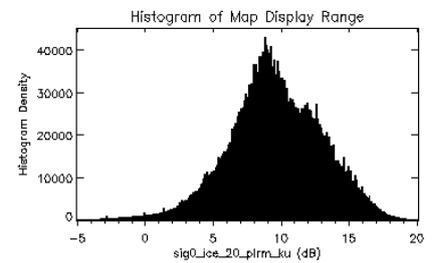
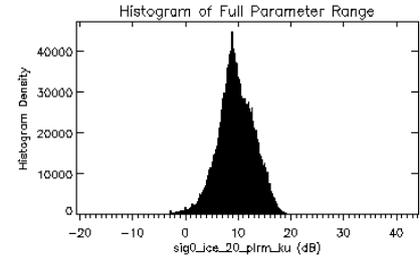
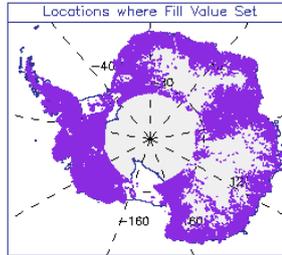
Cycle: 16 NTC SR_2 LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:32

IPF Version: IPF-SM-2_06.07





S3A L2 Parameter:

sig0_ice_20_plrm_ku (dB)

Mode: all

Cycle: 16 NTC SR_2 LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T23:13

Last Time: 2017-04-21T22:22

IPF Version: IPF-SM-2 06.07

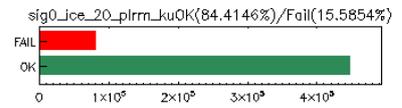
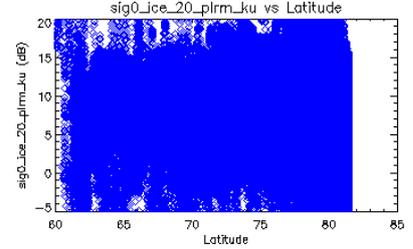
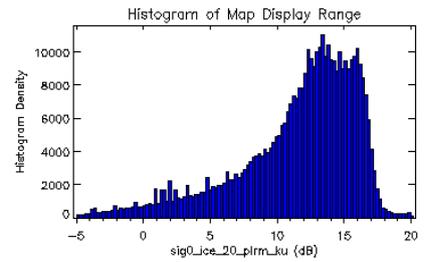
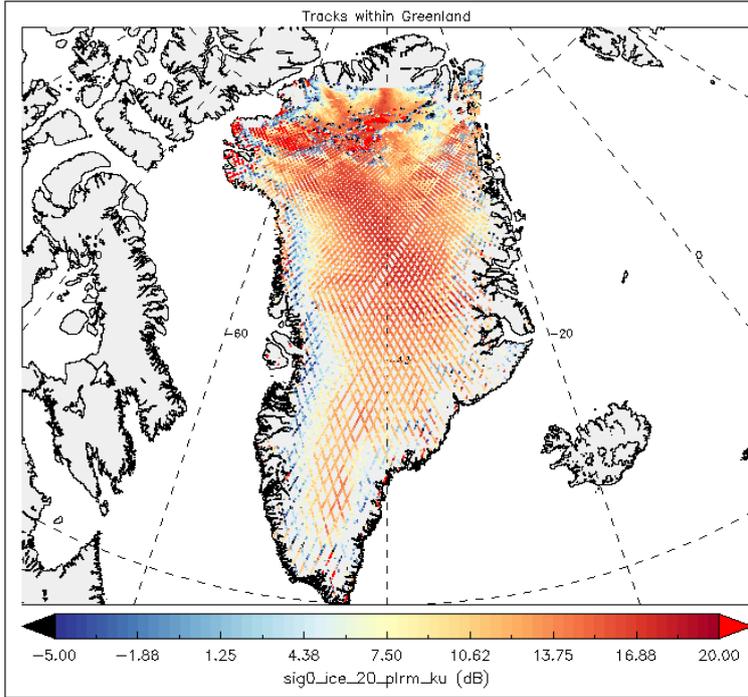
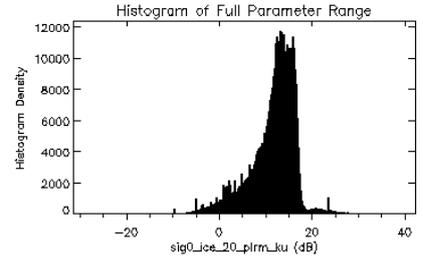
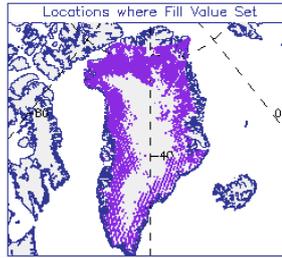


Figure 15: Maps of 20Hz Ku Band PLRM Sigma0 (sig0_ice_20_plrm_ku)



6.8 20Hz Ku Band Surface Class (surf_class_20_ku)

The 20Hz Ku surface classification parameter is derived from MODIS and GlobCover data. Users of the data requiring high resolution ice sheet glacier grounding line and calving front locations should consider applying their own surface type masks.

Flag: surf_class_20_ku

Mode: all

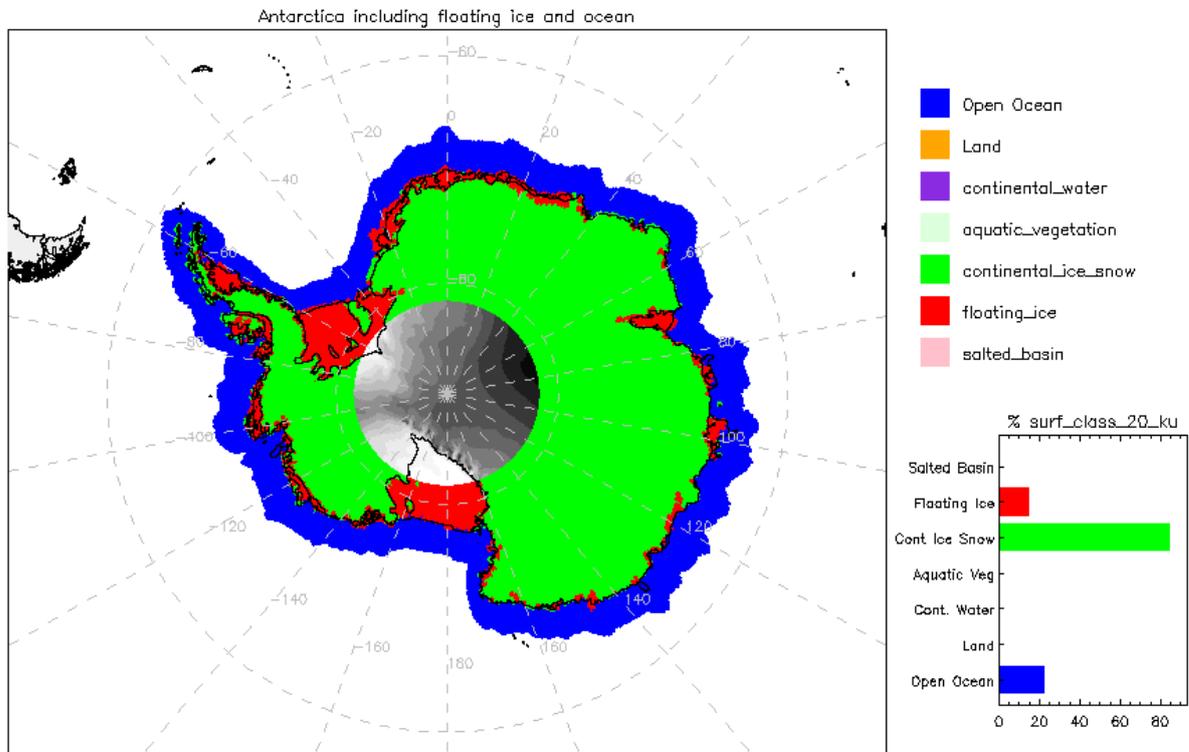
Cycle: 16 NTC SR_2_LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:32

IPF Version: IPF-SM-2 06.07





Flag: surf_class_20_ku

Mode: all

Cycle: 16 NTC SR_2_LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:32

IPF Version: IPF-SM-2 06.07

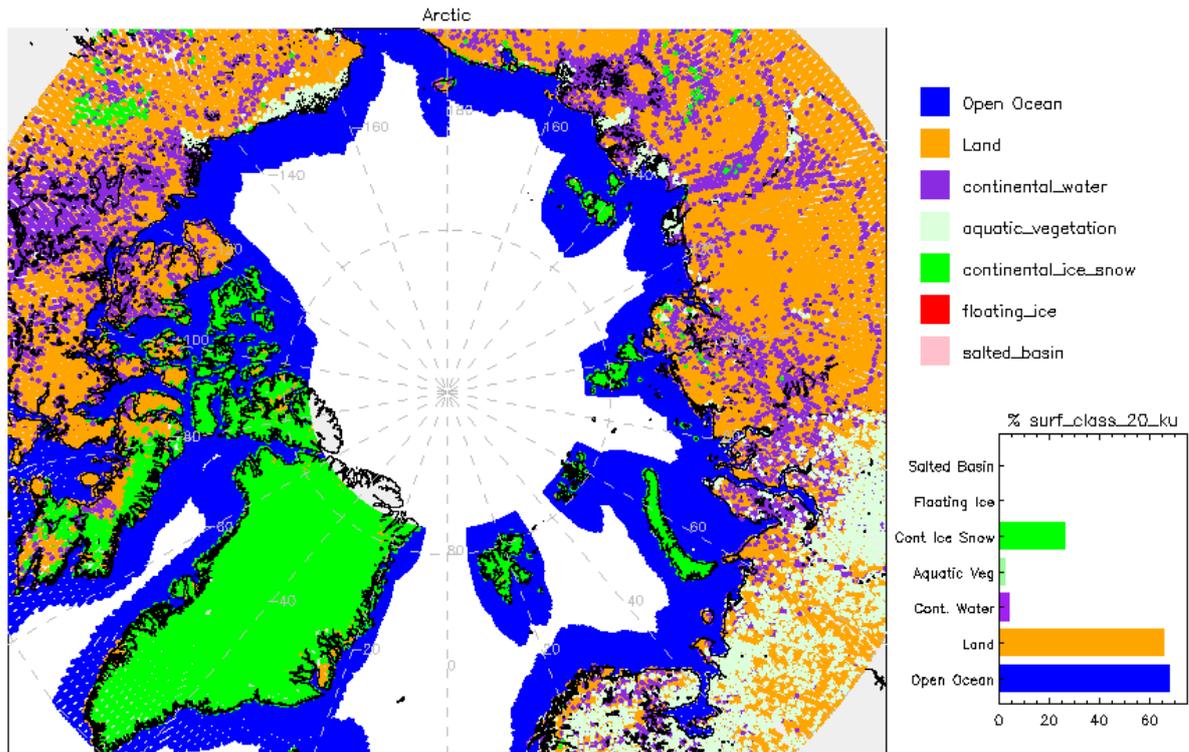


Figure 16: Maps of 20Hz Ku Band Surface Class (surf_class_20_ku)



7 Slope Correction Assessment

A slope correction is applied to 20Hz Ku band elevation over ice sheets to relocate the SAR echo to the point of closest approach across track.

In cycle 16, due to the high failure rate of the SAR Ice Margin retracker, the slope correction is not performed on more than 30-42% of range measurements over the ice sheets.

Flag: slope_failure

Mode: all

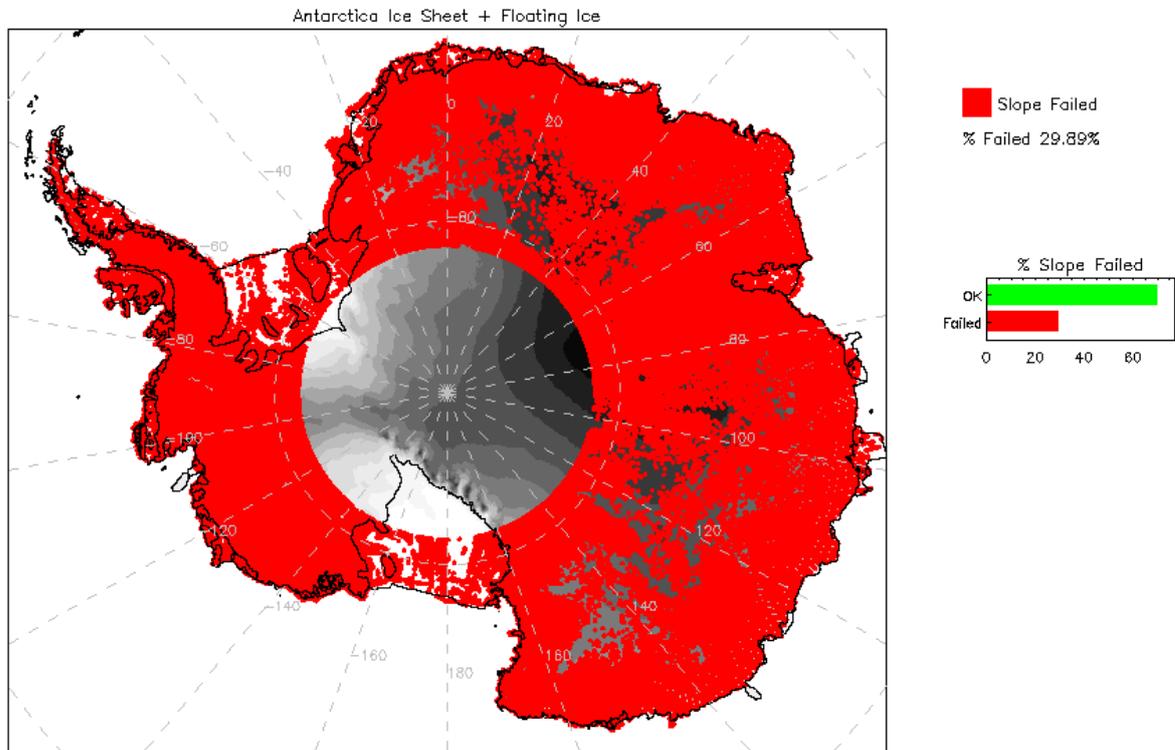
Cycle: 16 NTC SR_2_LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:32

IPF Version: IPF-SM-2 D6.07





Flag: slope_failure

Mode: all

Cycle: 16 NTC SR_2_LAN

Rel. Orbits: 1 to 385

First Time: 2017-03-25T23:13

Last Time: 2017-04-21T22:22

IPF Version: IPF-SM-2 06.07

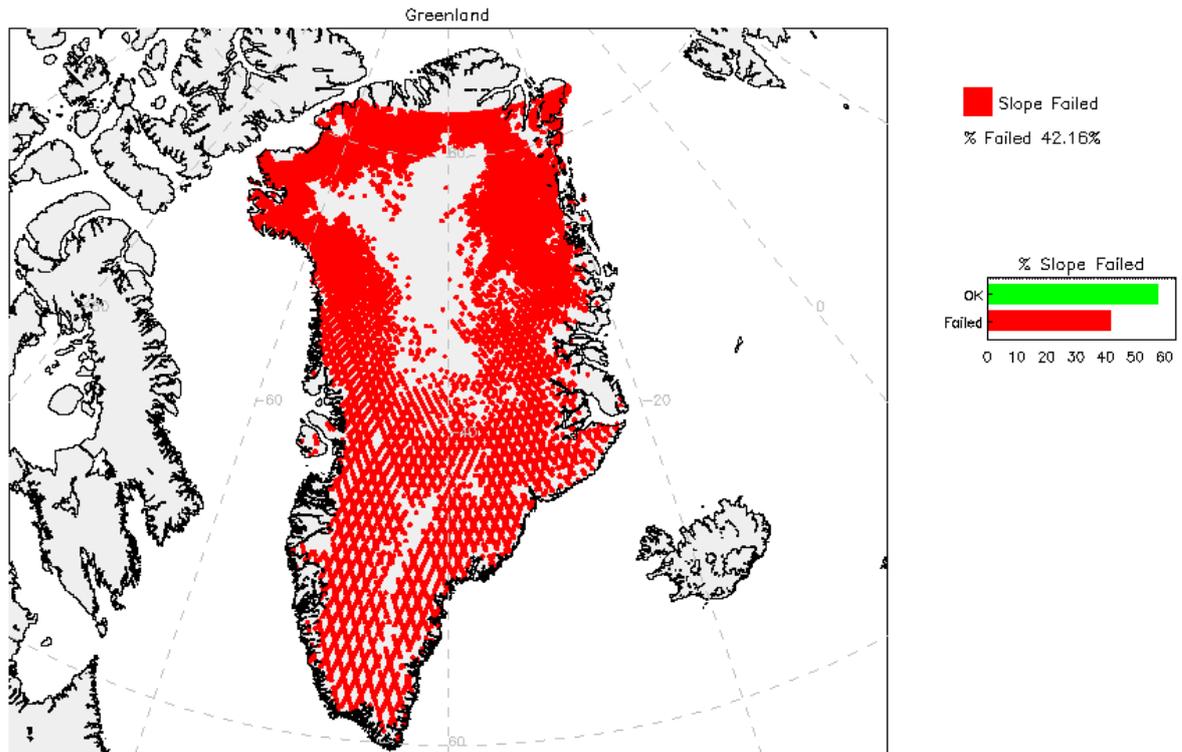


Figure 17: Maps of Slope Correction Failure Locations

A full assessment of the slope correction will be added to the report once the failure rate has been reduced.



8 Geophysical Parameter Monitoring for Sea Ice

This section shows results and analysis of the primary L2 STC parameters relating to sea ice in cycle 16.

8.1 20Hz Ku Band Altimeter Derived Surface Type (surf_type_class_20_ku)

This parameter is the output of the sea ice echo discriminator. Whilst the map of surface type looks reasonable, validation of the data has shown that the discriminator requires some further tuning and that results from this parameter should not be used for this product version of cycle 16.

Flag: surf_type_class_20_ku

Mode: all

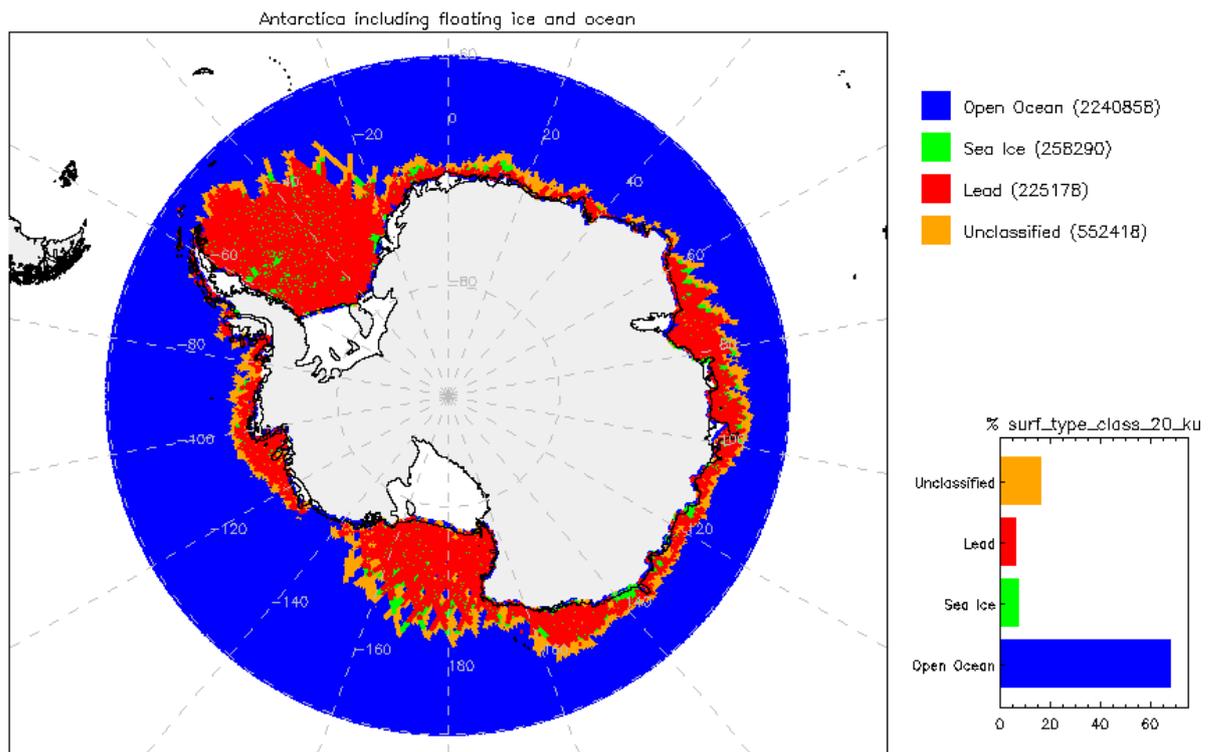
Cycle: 16 NTC SR_2_WAT

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:27

IPF Version: IPF-SM-2 06.07





Flag: surf_type_class_20_ku

Mode: all

Cycle: 16 NTC SR_2_WAT

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:27

IPF Version: IPF-SM-2 06.07

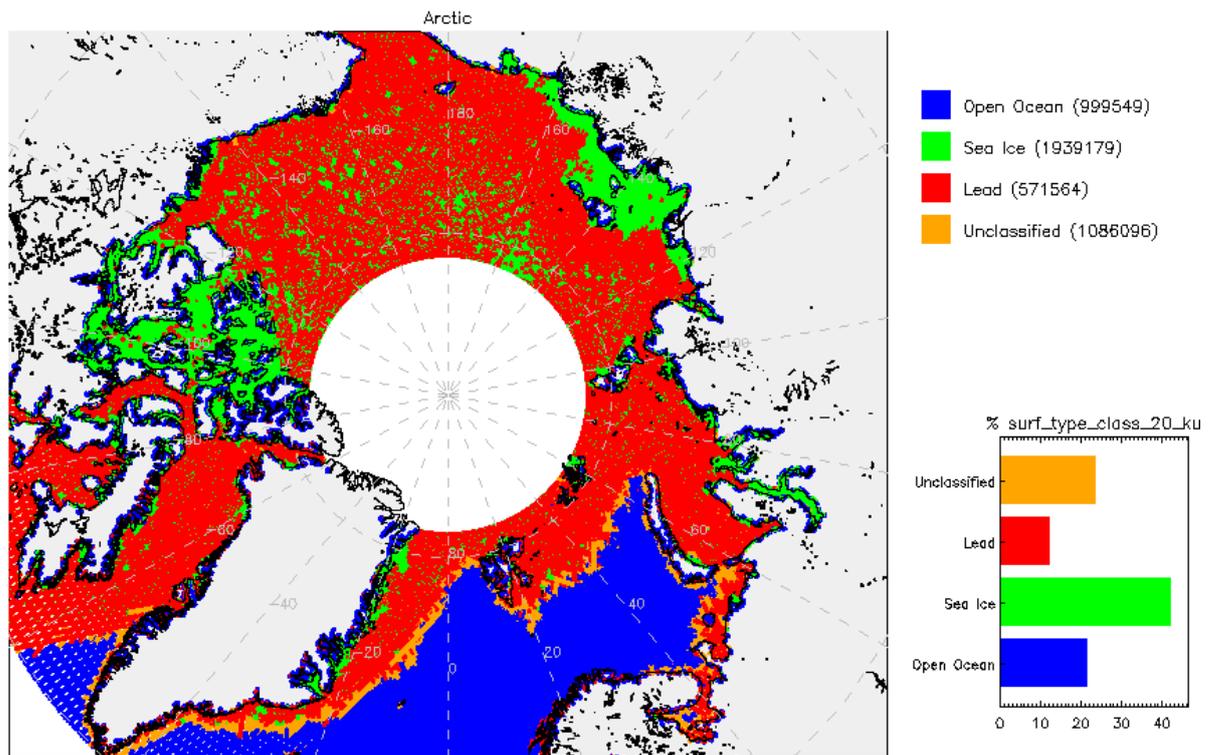


Figure 18: Maps of 20Hz Ku Band Altimeter Derived Surface Type (surf_type_class_20_ku)



8.2 20Hz Ku band Freeboard (freeboard_20_ku)

The histogram of freeboard results from this cycle show a greater proportion of negative freeboard values and a wider spread of freeboard than would be expected. Although negative freeboard is possible due to snow loading, this spread of values is likely to be erroneous. This is most likely to due to incomplete tuning of the surface type discriminator algorithm causing incorrect classification of leads as floes and a possible unresolved sea ice lead and floe retracker bias.

S3A L2 Parameter:
freeboard_20_ku (m)

Mode: all

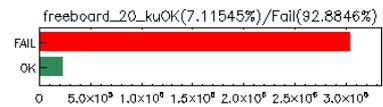
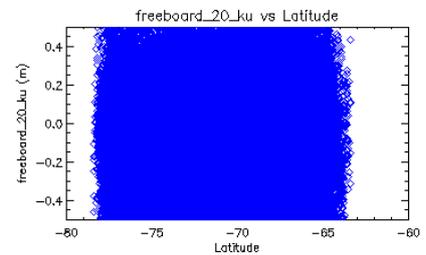
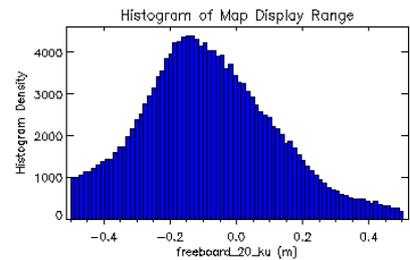
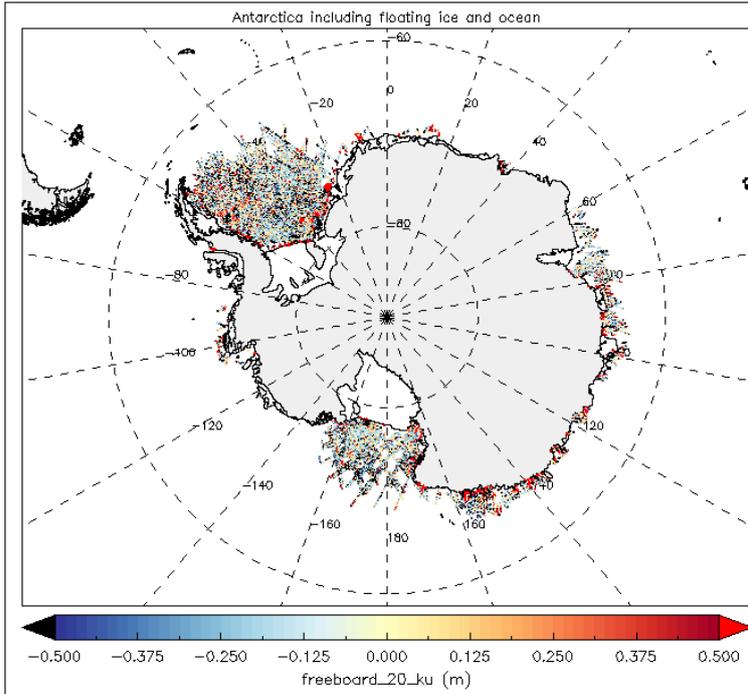
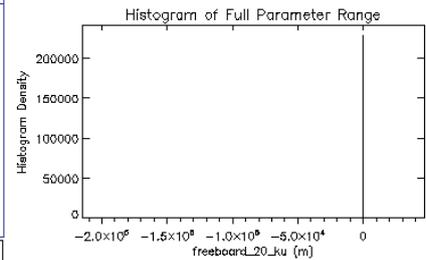
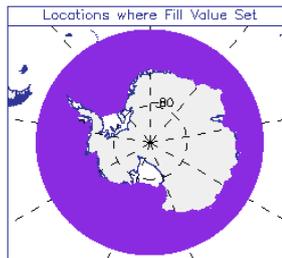
Cycle: 16 NTC SR_2_WAT

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:27

IPF Version: IPF-SM-2 06.07



S3A L2 Parameter:
freeboard_20_ku (m)
 Mode: all
 Cycle: 16 NTC SR_2_WAT
 Rel. Orbits: 1 to 385
 First Time: 2017-03-25T22:22
 Last Time: 2017-04-21T21:27
 IPF Version: IPF-SM-2_06.07

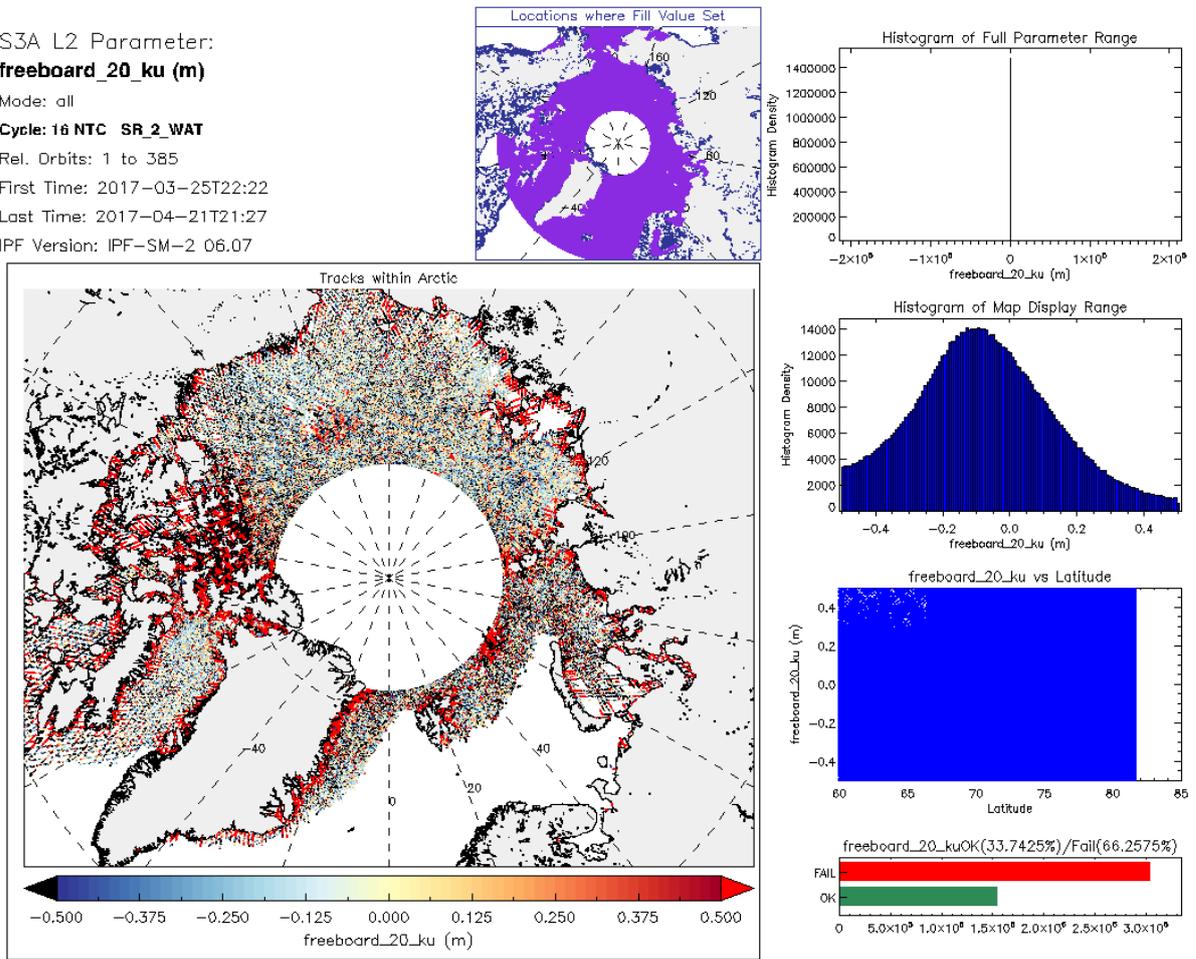


Figure 19: Maps of 20Hz Ku band Freeboard (freeboard_20_ku)

8.3 20Hz Ku Band Interpolated Sea Surface Height Anomaly (int_sea_ice_ssha_20_ku)

Analysis of this parameter will be added in future cycles once the sea ice discrimination has been tuned.

8.4 Sea Surface Height Anomaly (sea_ice_ssha_20_ku)

Analysis of this parameter will be added in future cycles cycles once the sea ice discrimination has been tuned.



8.5 20Hz Ku band Sea Ice Concentration (sea_ice_concentration_20_ku)

Sea ice concentration data is available in 100% of records in the STC product in cycle 16. Sea Ice Concentration is derived from a dynamic 3 day average of sea ice concentration calculated from SSM/I daily brightness temperature data and this map is consistent with external sea ice extent maps for this period.

S3A L2 Parameter:

sea_ice_concentration_20_ku (%)

Mode: all

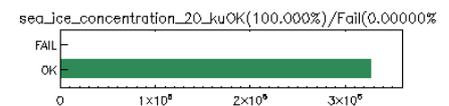
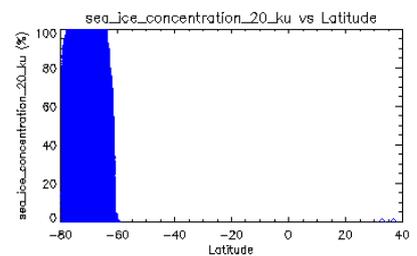
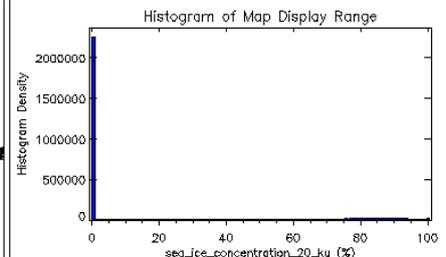
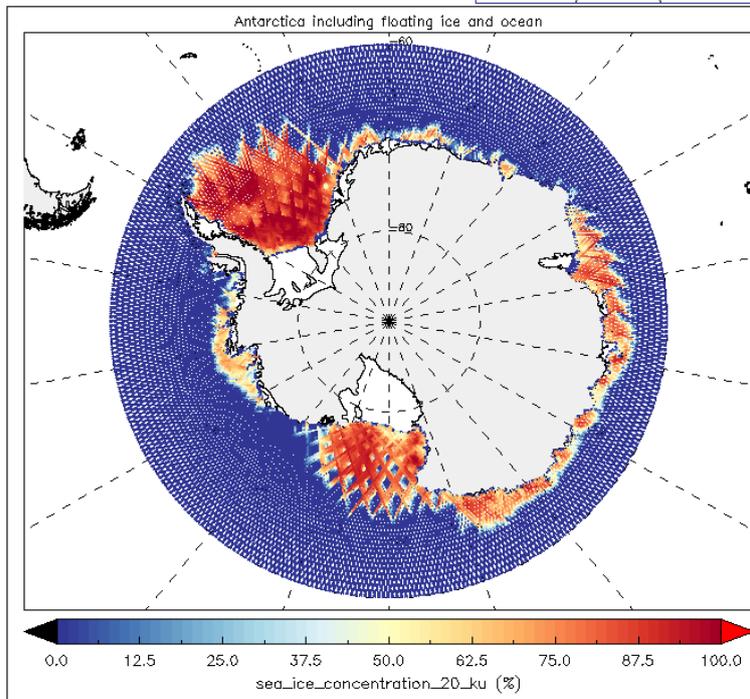
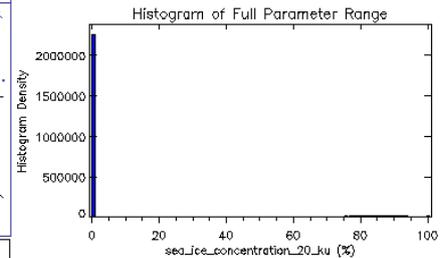
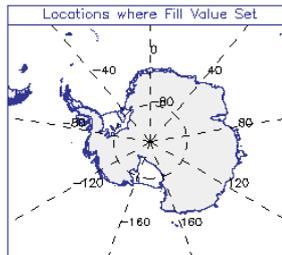
Cycle: 16 NTC SR_2_WAT

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:27

IPF Version: IPF-SM-2_06.07





S3A L2 Parameter:

sea_ice_concentration_20_ku (%)

Mode: all

Cycle: 16 NTC SR_2_WAT

Rel. Orbits: 1 to 385

First Time: 2017-03-25T22:22

Last Time: 2017-04-21T21:27

IPF Version: IPF-SM-2_06.07

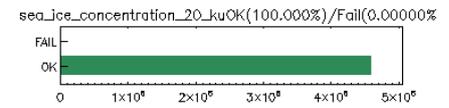
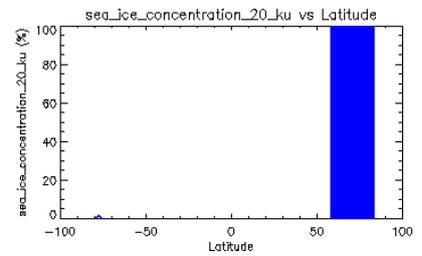
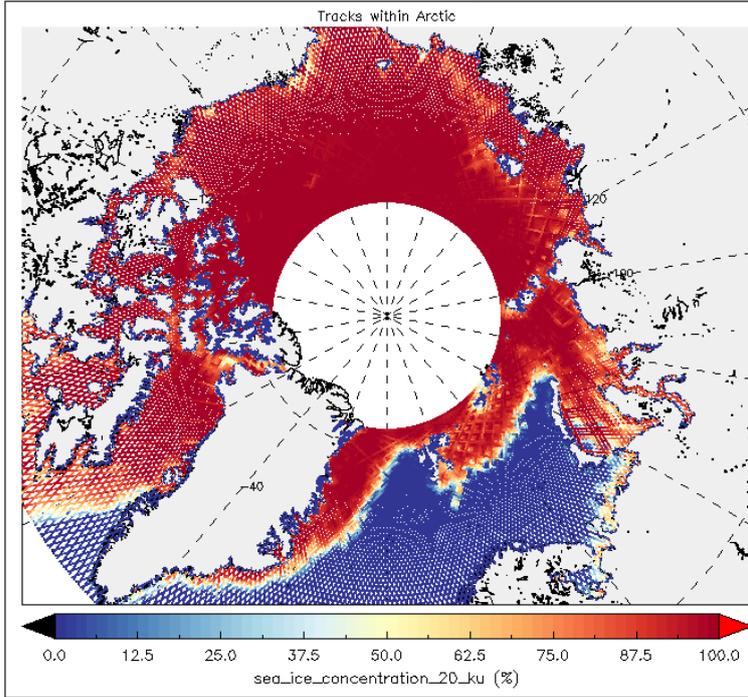
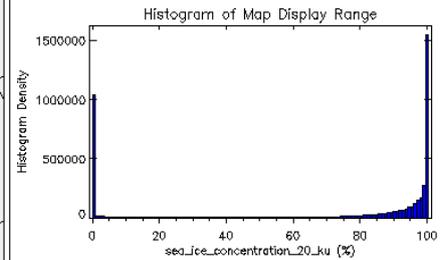
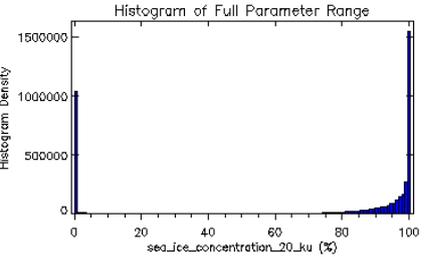
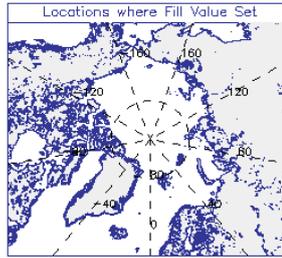


Figure 20: Maps of 20Hz Ku band Sea Ice Concentration (sea_ice_concentration_20_ku)

	<p>Sentinel-3 MPC</p> <p>S3-A Land and Sea Ice Cyclic Performance Report</p> <p>Cycle No. 016</p>	<p>Ref.: S3MPC.UCL.PR.08-016</p> <p>Issue: 1.0</p> <p>Date: 02/06/2017</p> <p>Page: 38</p>
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9 Crossover Analysis

Measuring the elevation residual at orbit crossover points is a primary method of assessing the performance of the altimeter and the processing chain. Over time intervals where there is no expected change in the surface elevation, the elevation difference at a crossover provides a measure of altimeter and chain performance, height error and antenna polarity issues.

Due to the reported high failure rates with the 20Hz Ku band Elevation parameter in this cycle, the density of measurements is too low to produce meaningful crossover results that can be compared with previous missions. As soon as the failure rate is reduced to nominal levels then a crossover analysis result will be reported in this section for this cycle.

 <p>SENTINEL 3 Mission Performance Centre</p>	<p style="text-align: center;">Sentinel-3 MPC</p> <p style="text-align: center;">S3-A Land and Sea Ice Cyclic Performance Report</p> <p style="text-align: center;">Cycle No. 016</p>	<p>Ref.: S3MPC.UCL.PR.08-016 Issue: 1.0 Date: 02/06/2017 Page: 39</p>
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10 Repeat Track Analysis

Repeat track analysis is a method of processing several years of operational altimetry data to produce gridded maps of temporal change in the ice sheet's surface elevation and mass balance since the start of mission. These can be validated against known ice sheet dynamics and other external sources of temporal change data.

Since cycle 16 is the third cycle since the start of the operational phase there is not a long enough time series of stable measurements to produce a repeat track analysis. This analysis will be added to reports from cycles in 2018 once at least a year of stable data is available.

 <p>SENTINEL 3 Mission Performance Centre</p>	<p>Sentinel-3 MPC</p> <p>S3-A Land and Sea Ice Cyclic Performance Report</p> <p>Cycle No. 016</p>	<p>Ref.: S3MPC.UCL.PR.08-016</p> <p>Issue: 1.0</p> <p>Date: 02/06/2017</p> <p>Page: 40</p>
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11 Long Term Monitoring

In this section the long term performance statistics of Sentinel-3A parameters over land ice and sea ice will be analysed to indicate the stability of the instrument and ground processing. As cycle 16 is the second cycle in the routine operations phase, no long term statistics are available for this cycle.

 <p>SENTINEL 3 Mission Performance Centre</p>	<p style="text-align: center;">Sentinel-3 MPC</p> <p style="text-align: center;">S3-A Land and Sea Ice Cyclic Performance Report</p> <p style="text-align: center;">Cycle No. 016</p>	<p>Ref.: S3MPC.UCL.PR.08-016</p> <p>Issue: 1.0</p> <p>Date: 02/06/2017</p> <p>Page: 41</p>
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12 Events

List of all events happened during the cycle affecting the Land and Sea Ice validation:

1. This is the first complete cycle produced using IPF 6.0.7. There were changes in land ice retracker thresholds between this IPF version and preceding versions which affects measurement density and quality.

	<p>Sentinel-3 MPC</p> <p>S3-A Land and Sea Ice Cyclic Performance Report</p> <p>Cycle No. 016</p>	<p>Ref.: S3MPC.UCL.PR.08-016</p> <p>Issue: 1.0</p> <p>Date: 02/06/2017</p> <p>Page: 42</p>
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13 Conclusions

For Level-2 NTC Land products over polar ice sheets, maps of L2 ice sheet elevation and sigma0 backscatter show expected patterns of spatial variability over the ice sheet topography and surface types as compared to previous missions, but there are 30-50% higher than expected levels of retracker and tracker failure in the primary 20Hz Ku band ice sheet elevation and range parameters over all areas (ice sheet interior and margins) resulting in lower than expected measurement density. This is currently under investigation by the MPC and ESA. During this cycle IPF version changes were implemented that affect data measurement density over the ice sheets and it is recommended that data from each IPF version is currently considered separately.

For Level-2 STC Marine products, the sea ice freeboard and surface discrimination parameters requires further tuning and we recommend that they are not used in this cycle.

 <p>SENTINEL 3 Mission Performance Centre</p>	<p style="text-align: center;">Sentinel-3 MPC</p> <p style="text-align: center;">S3-A Land and Sea Ice Cyclic Performance Report</p> <p style="text-align: center;">Cycle No. 016</p>	<p>Ref.: S3MPC.UCL.PR.08-016 Issue: 1.0 Date: 02/06/2017 Page: 43</p>
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14 Appendix A

Other reports related to the STM mission are:

- ❖ S3-A SRAL Cyclic Performance Report, Cycle No. 016(ref. S3MPC.ISR.PR.04-016)
- ❖ S3-A MWR Cyclic Performance Report, Cycle No. 016 (ref. S3MPC.CLS.PR.05-016)
- ❖ S3-A Ocean Validation Cyclic Performance Report, Cycle No. 016 (ref. S3MPC.CLS.PR.06-016)
- ❖ S3-A Land and Sea Ice Cyclic Performance Report, Cycle No. 016 (ref. S3MPC.UCL.PR.08-016)

All Cyclic Performance Reports are available on MPC pages in Sentinel Online website, at:
<https://sentinel.esa.int>

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