



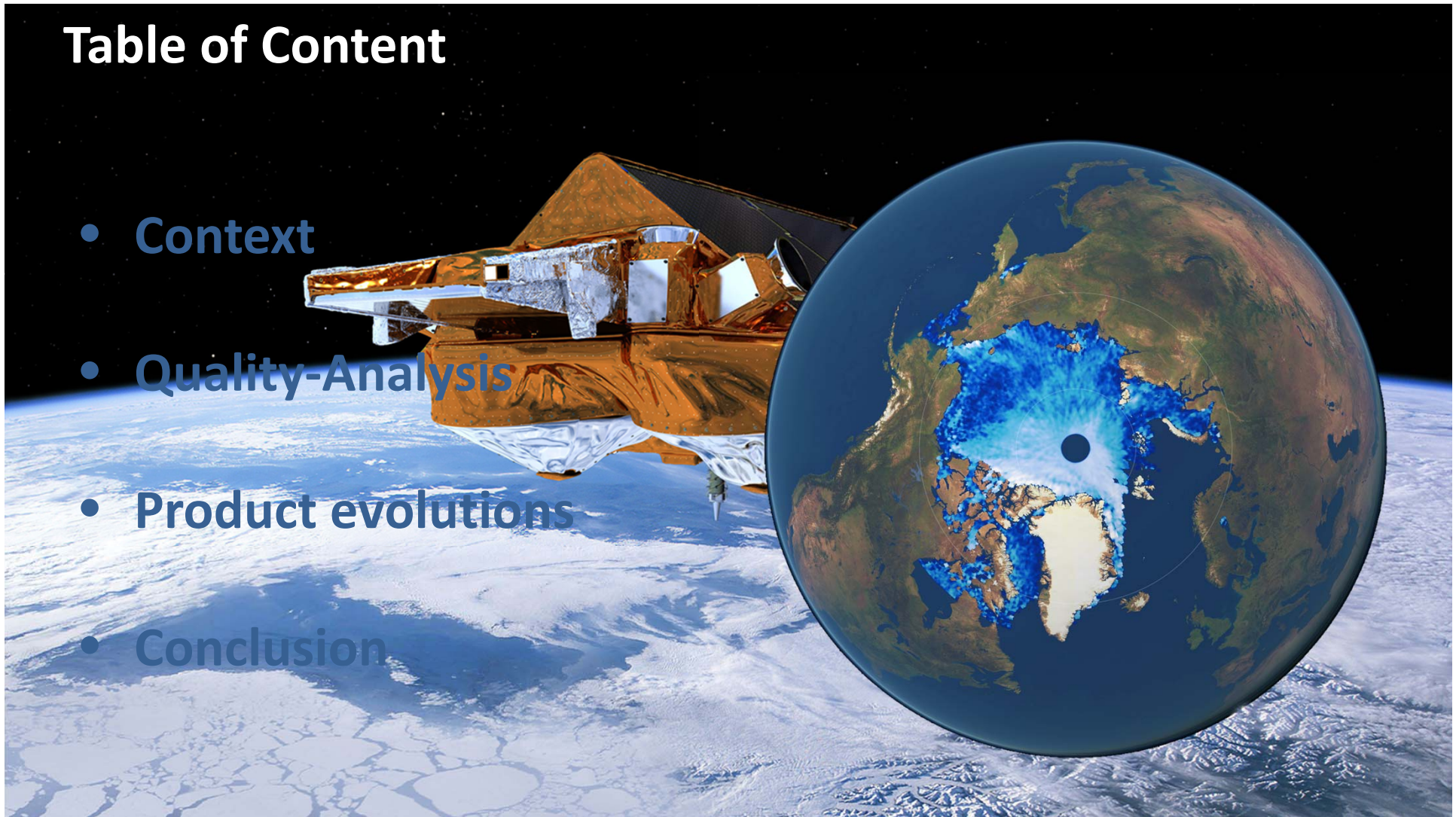
CryoSat

Mission overview and Data Quality Status

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Table of Content

- Context
- Quality-Analysis
- Product evolutions
- Conclusion



Mission Challenges

Quantify how the **thickness** of the land-ice and sea-ice is changing

Improvement of
Ocean & ice IPF



Data
Quality
Analysis



Achieve mission objectives

Antarctic & Greenland ice sheets trends, Variations of Arctic sea-ice thickness

Develop new applications

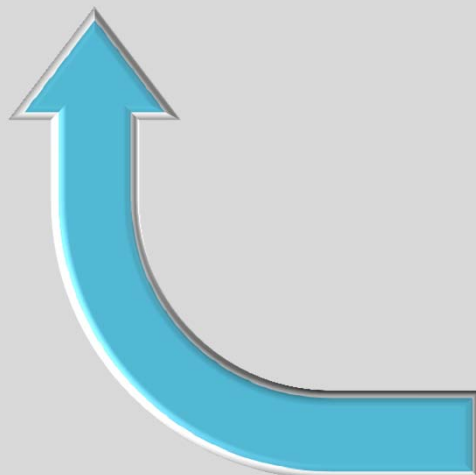
Oceanography, Hydrology, Geodesy

Raise future challenges

Operational sea-ice monitoring over margins

Inputs from the Scientific Community

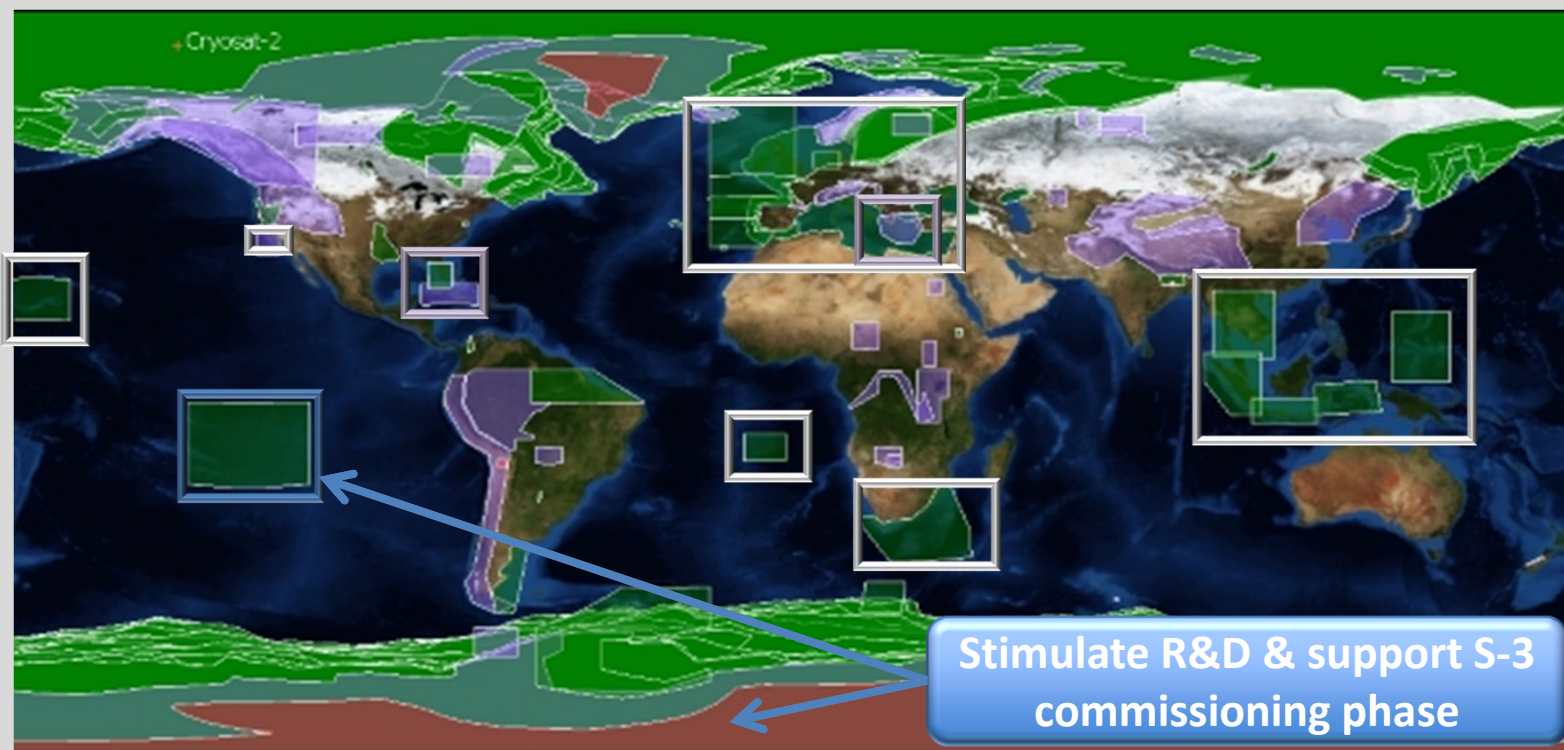
ESA and Partners



Users

Instrument and Geographical Mask

Ku-band pulse-limited radar altimeter operating in **3 Modes**



Land ice and Ocean: **LRM**
LRM

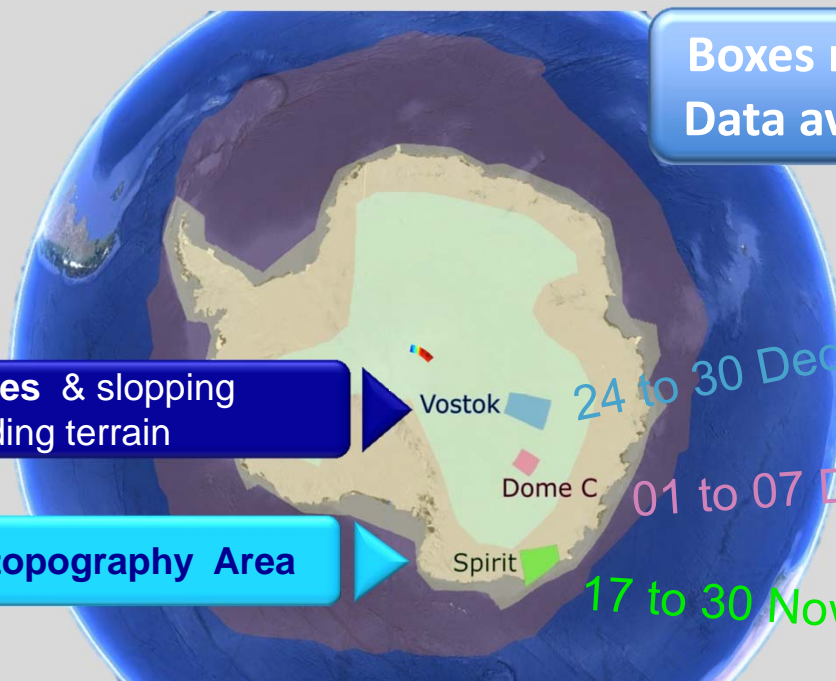
Sea-Ice Regions: **SAR**

Glacier + Ice Margins: **SARin SARin**

Stimulate R&D & support S-3 commissioning phase

CryoSat SAR Acquisitions over interior Land ice

In coordination with CNES, ESA's CryoSat mission carried out **SAR acquisitions over Antarctica** to support the development of the S-3 Processing Algorithms over land ice



Boxes reactivated during S-3 Commissioning
Data available to all registered CryoSat users

Flat zones & slopping surrounding terrain

Rough topography Area

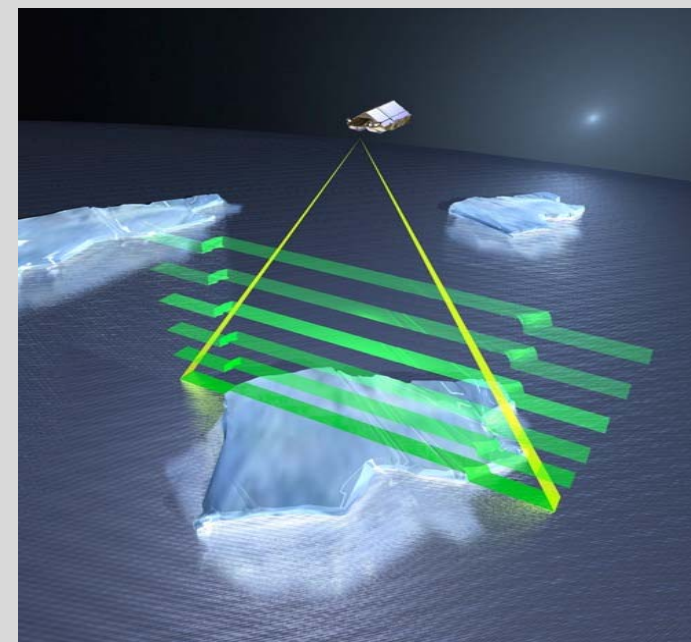
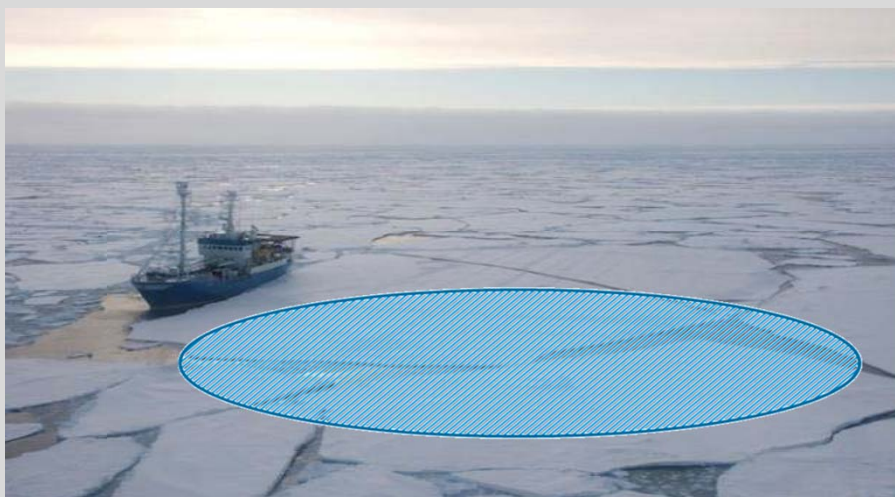
24 to 30 December 2014 + 16 to 23 May 2016

01 to 07 December 2014 + 02 to 09 May 2016

17 to 30 November 2014 + 06 to 20 June 2016

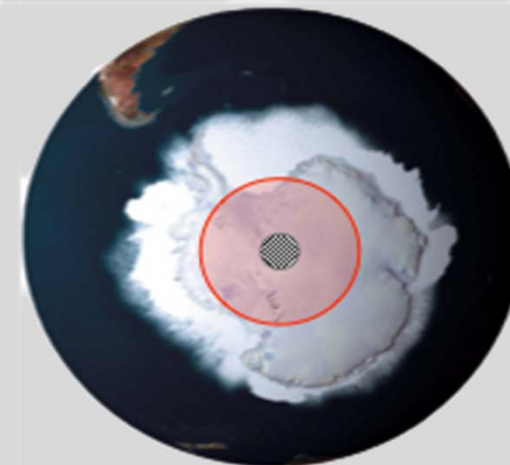
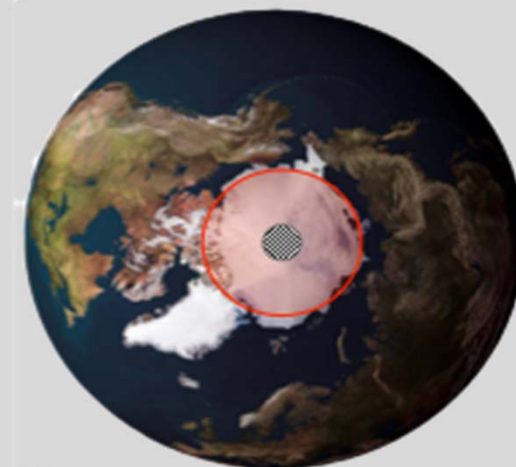
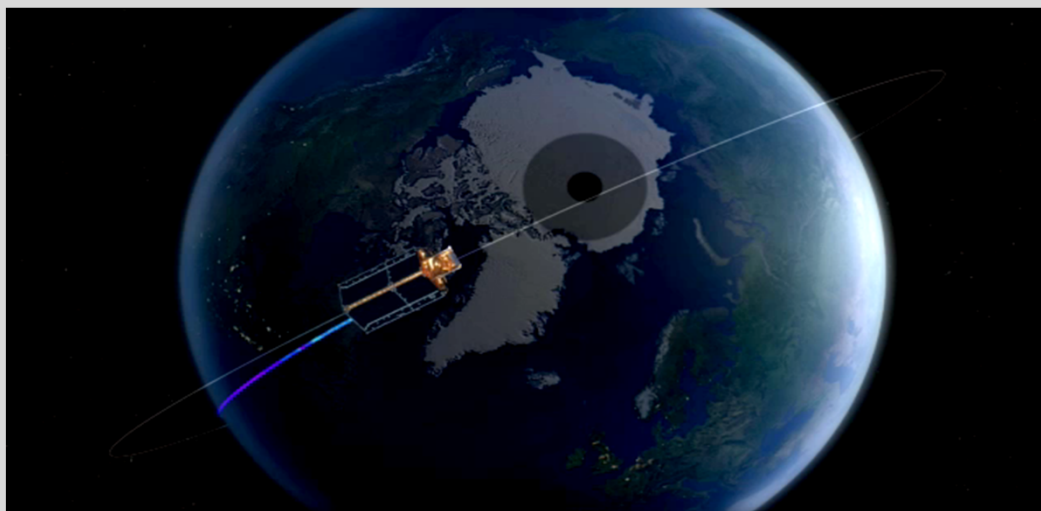
Fine Space Resolution

- SAR mode improves along track resolution with improvement in capacity to detect floes and leads
- SARIn mode improves across track resolution, designed for rugged terrain



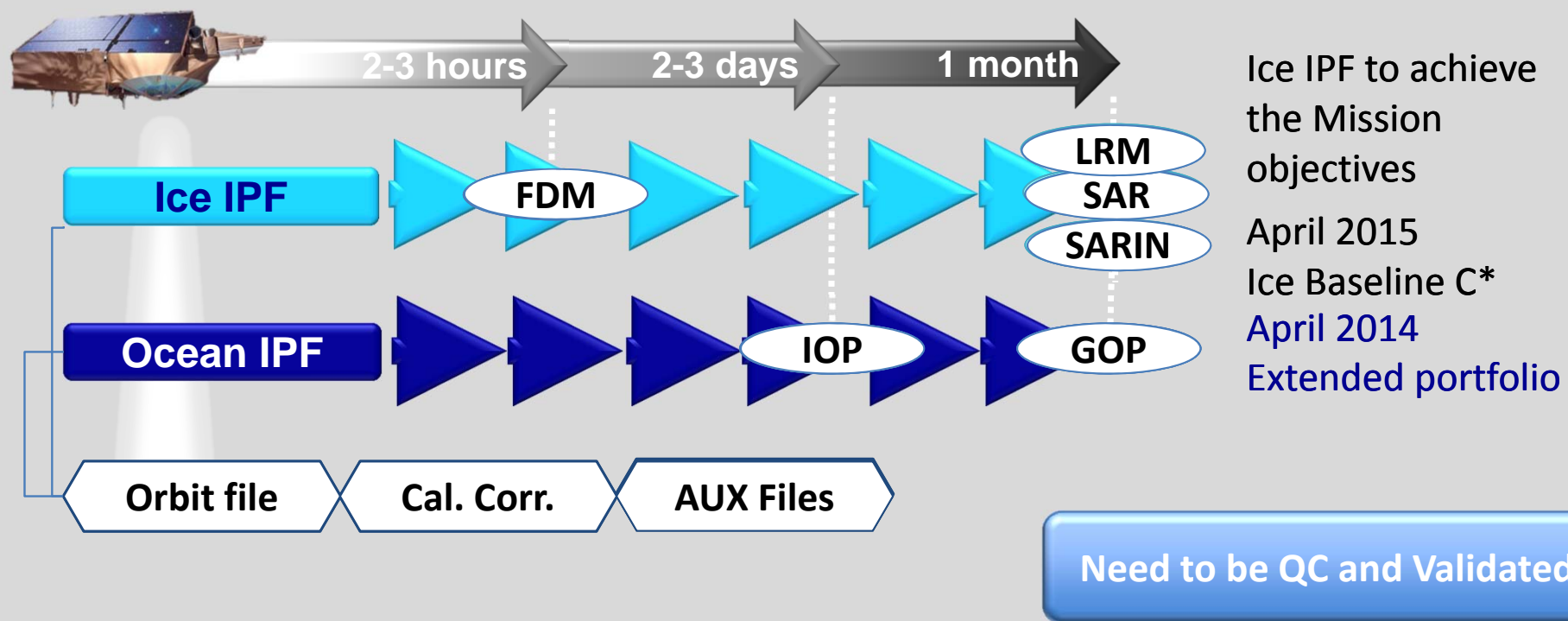
Optimized Orbit for Polar Science

- 92 degree orbit inclination to survey polar zones.
Increased coverage = 4.6 M km sq
- 369 day repeat with 30 day sub cycle provides dense across track sampling and captures temporal change



CryoSat Processors

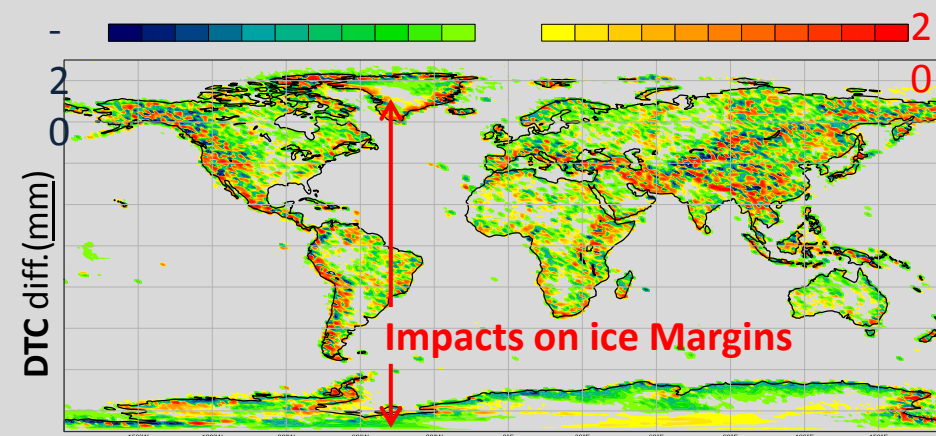
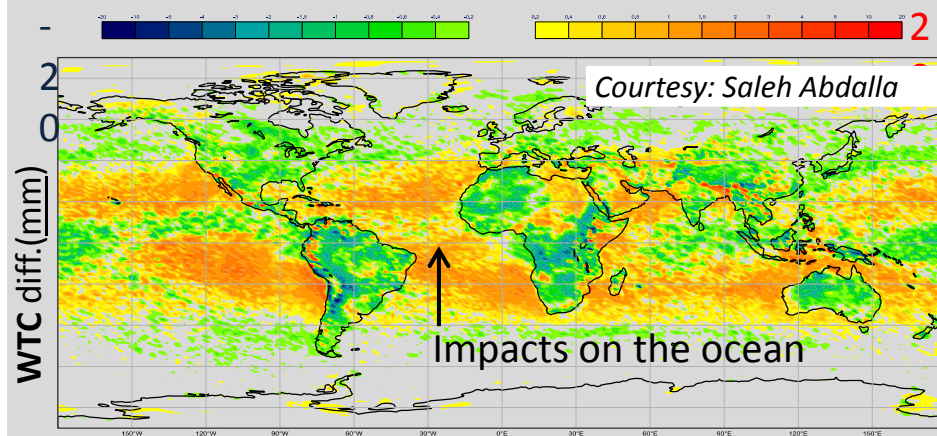
Data are processed both over ocean and ice surfaces with **2 independent** processors



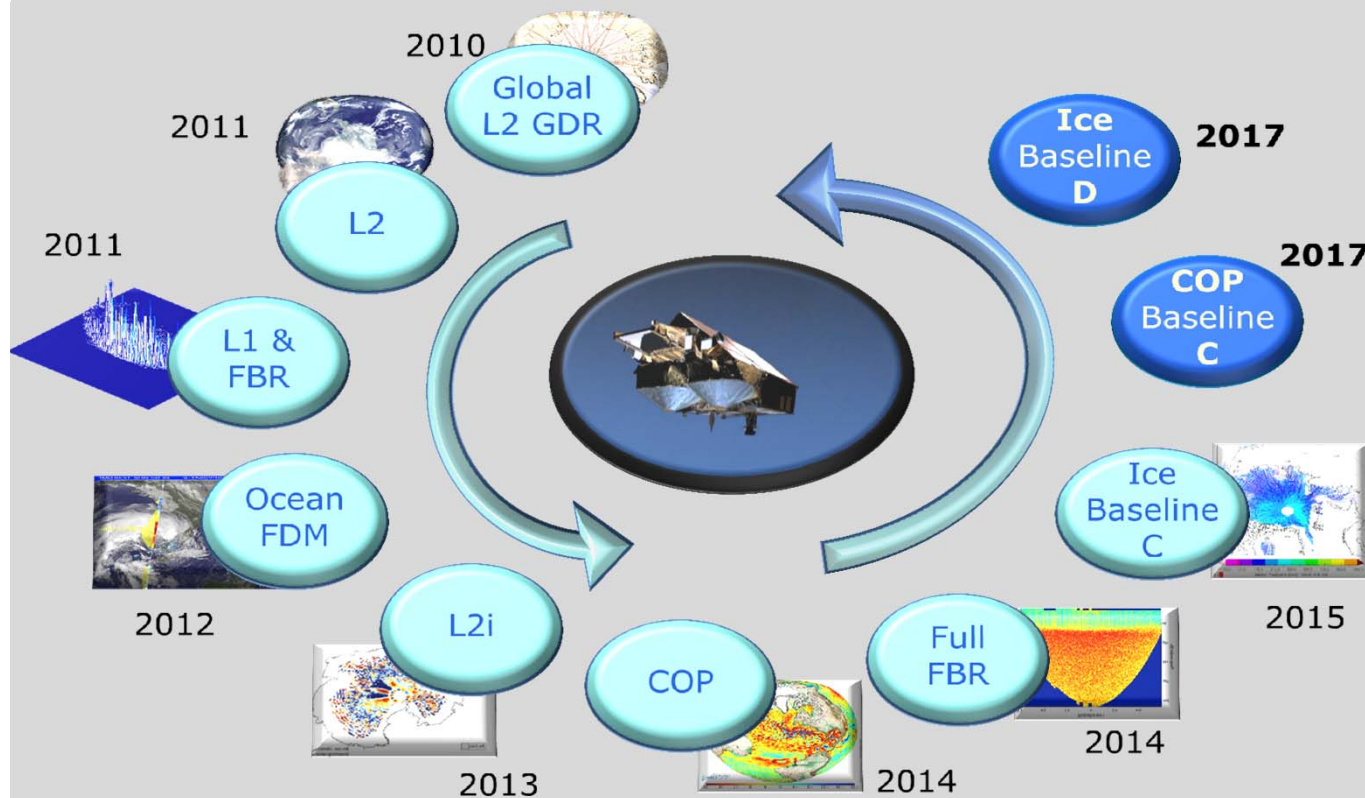
Ocean product Quality: Nominal but trend/bias to be investigated

Ice product Quality: General improvements w.r.t. Baseline B over sea & land ice (but few issues to be fixed)

ECMWF Model changes (8 March 2016): Expected Improvements **but** spatial/temporal mm offsets on derived parameters (WTC, DTC etc.)



More informations on the CryoSat ESA Web news and associated ECMWF Quality Report



Driven by new user requirements & improved GS capacity

Data disseminated to users increases from 3GB/d to ~ 50GB/d

New Baselines & NetCDF for 2017

Baseline C COP: A Major Upgrade

Partially Based on R&D outcomes (CP40) & Up-to-date Geophysical Corrections

Why ?

Improve the capability of CryoSat over the Ocean

When ?

Started

Release : 2017-Q1

Repro. campaign: 2017-Q2

What ?

New Formats

Pole-to-pole

NetCDF

New Products

NRT Ocean
product

New Fields

4 new
parameters

Improved
Processing

SAMOSA-SAR(In)
Tuned WD, SSB

Updated
corrections

6 Updated
Models

Ice Baseline D

Preparatory Phase still requiring **CryoSat User feedback** and **Recommendations**

Why ?

Improve the CryoSat Data quality over the ice Areas

When ?

asap

Release : 2017-Q3

Repro. campaign: 2018-Q1

What ?

New Format

New Product

Improved Processing and corrections

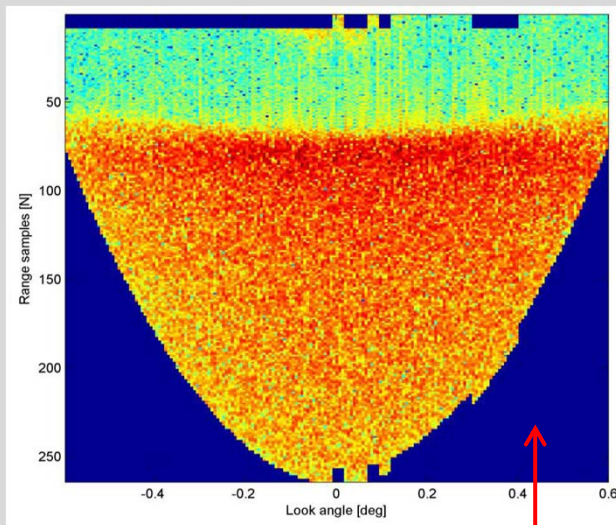
NetCDF

L1B-S Stack
Product

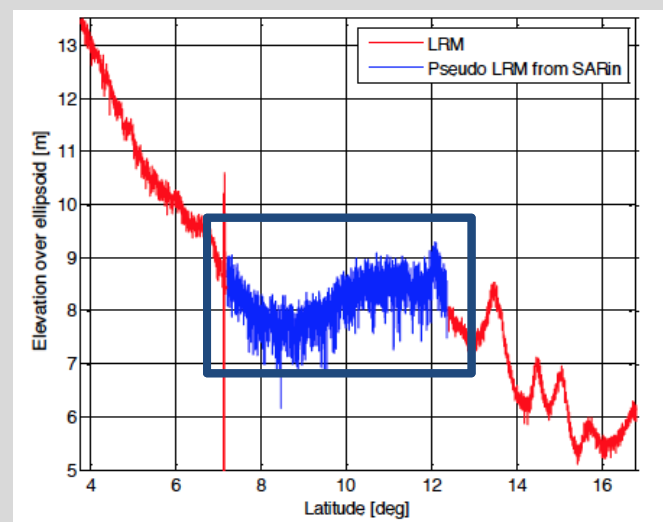
> 20 Evolutions and bug fixing planned
> 10 Evolutions currently undergoing R&D

Ice Baseline D – Examples of Planned evolutions

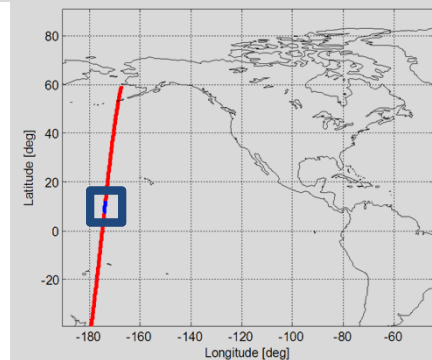
- **Multilook Without Zero** (samples out of acquisition window)
- **Pseudo LRM Processing from SARin** (QWG#6 recommendation): To prepare mode-mask switch to SARin over land-ice area and ensure time-series continuity



New Baseline-D approach : exclude the zero values

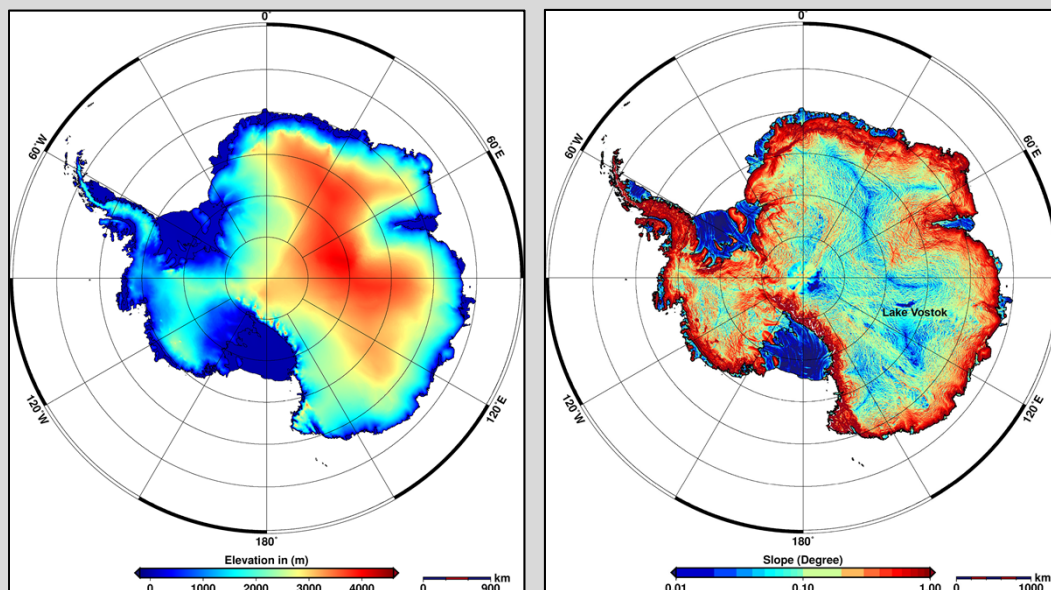


Good continuity at LRM / PLRM transitions

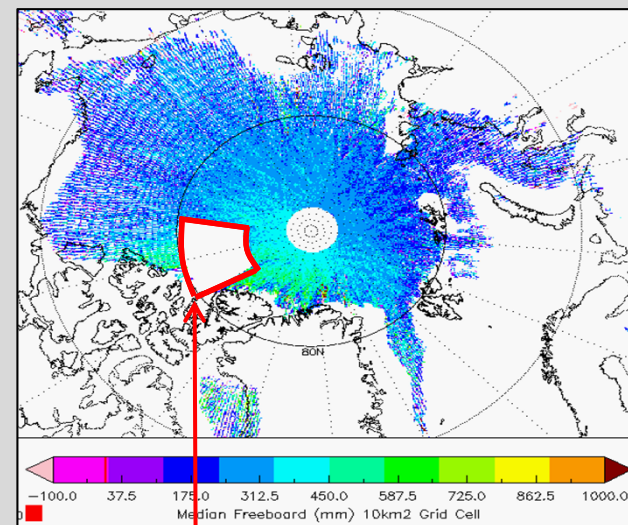


Ice Baseline D – Examples of Planned evolutions

- Use of the most updated DEM (TBD) for LRM surface slope corrections & SARin processing
- Freeboard in SARin sea-ice areas: compute missing values for sea-ice areas over the Arctic Ocean and all margins in Polar regions (“Coastal” Freeboard)



Example of recent Elevation & slope Model (Helm et al, 2014)



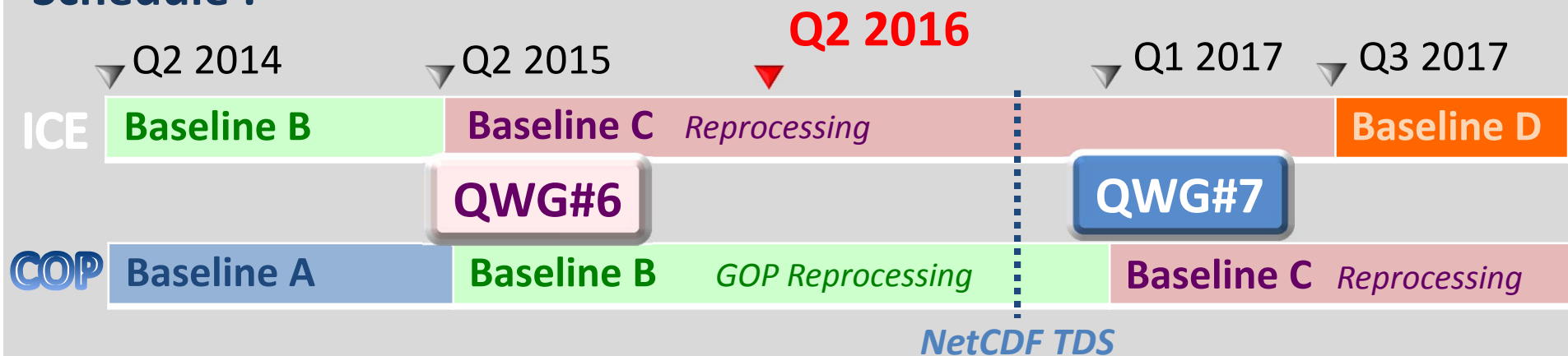
Area previously operating in SARIn with no freeboard

Ice Baseline D/E – Examples of Potential evolutions to be assessed

- **High resolution Polar Tide Model** and **MSS**
- Doppler **ambiguity masking**, stack weighting or antenna pattern compensation
- Surface Type detection / Waveform classifications
- **Snow Depth correction** dedicated to sea-ice areas (Ka vs Ku ? *In situ* ? Models ?)
- Additional **sea-ice “Physical” retracker** (i.e. Samosa)
- Additional **land ice retracker** following **CryoVal project** recommendations

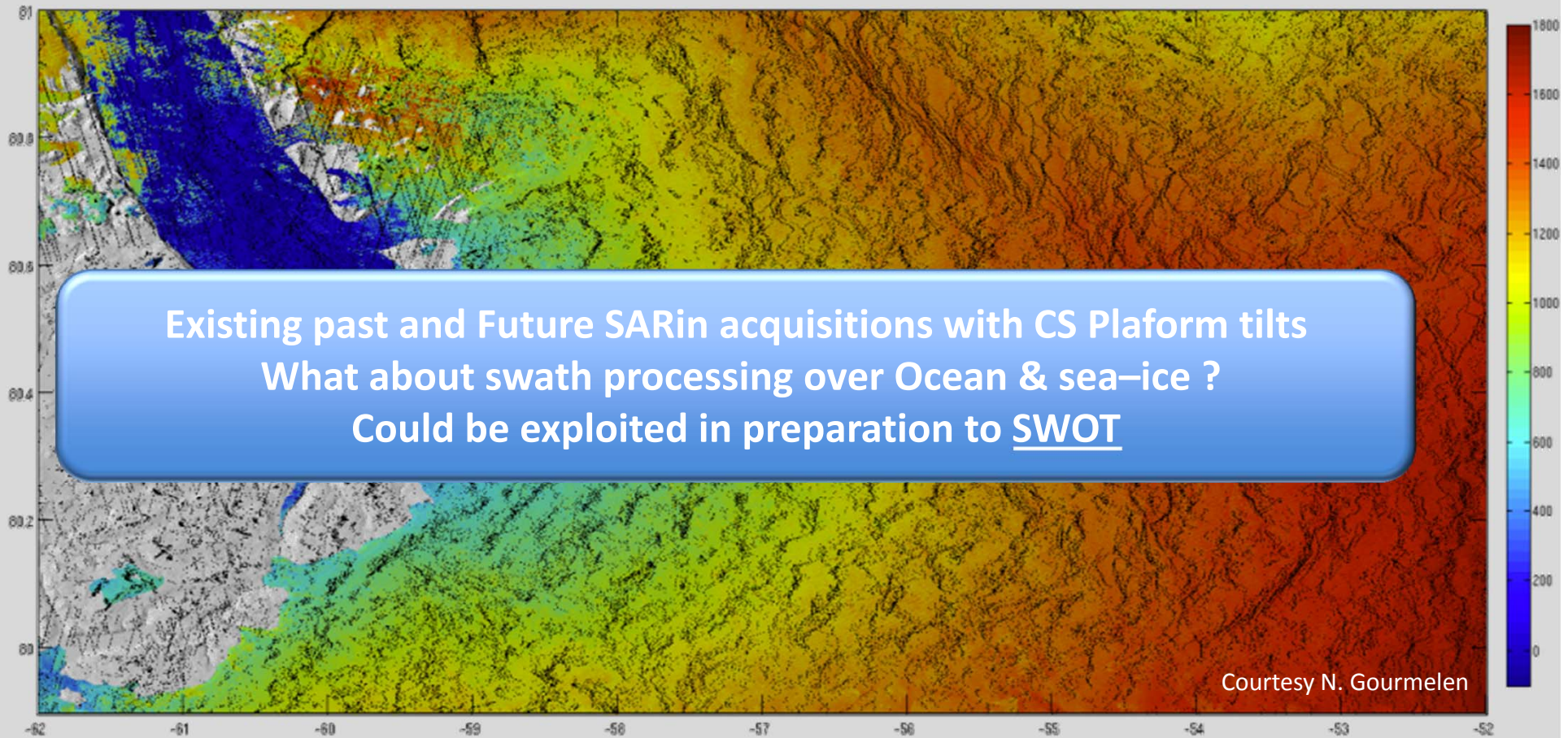
Additional suggestions / recommendations from you would be welcomed

Schedule :



Outlook for the future:

- Better characterisation of snow load and **Antarctica sea-ice**
- Stimulate R&D for new Cryosat **sea-ice products** and **operational applications** (assimilation into numerical modeling)
- New exploitation activities focusing of **SARIN interferometric measurements** both over land, ocean and coastal zones



CryoSat Science Meeting and geodetic mission



cryosat science meeting and geodetic missions
20-24 March 2017 | Banff, Alberta | Canada

European Space Agency

[List of events](#)

- Home ▶
- Venue ▶

North-American CryoSat Science Meeting and Geodetic Missions Workshop

**20-24 March 2017
Banff, Alberta, Canada**



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www.cryosat2017.org

**End of June: Abstract
submission opened**



Advances in Space Research
CryoSat Special Issue
Spring 2017