

→ Ocean Surface Topography Science Team Meeting

21 – 25 October | Chicago, Illinois, USA



Status & Evolutions of ESA CryoSat data products

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European Space Agency

CONTEXT

OCEAN DATA

ICE DATA

EVOLUTIONS

CONCLUSIONS

CryoSat Objectives



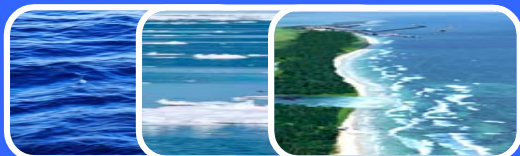
✧ Address key environmental and Climate issues

SECONDARY OBJECTIVE

PRIMARY MISSION OBJECTIVES

SECONDARY OBJECTIVE

Open Polar Coastal *Ocean topography*



GLOBAL & REGIONAL MSL TREND
/ CLIMATE (IPCC)

METEO (WAVE,WIND)

MESOSCALE , CROSS-SHELF
EXCHANGES & IMPACTS

Sea Ice *Freeboard*



REGIONAL TRENDS &
SEASONAL VARIATIONS

THERMOHALINE CIRCULATION
....

Land Ice *Ice Elevation*



ICE SHEET/CAPS/GLACIERS
THICKNESS VARIATIONS

CONTRIBUTION TO GLOBAL &
REGIONAL SEA-LEVEL ...

River & Lake *Water Height*



VARIATION OF INLAND WATER
STORAGE

RIVER DISCHARGES AND IMPACT
ON COASTAL ECOSYSTEM ...

INTERCONNECTED

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New Challenges



Swath Processing

Assess time space variability of ice-sheet margins, glaciers and ice caps at high spatial resolution



Polar Oceanography

To assess mesoscale and large scale oceanic variations in Polar regions in support of climate and emerging operational services



Operations and Forecast

Assess the impact of product latency to support different operational and forecasting services

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2020-2021

LONG-TERM RECORDS

To extend the current data record into the next decade and improve the current geophysical retrievals and explore the option of generating new dataset from innovative methods



Cryosphere Meteorology

Assess the contribution to cryosphere meteorology: snow fall and melting on sea-ice and land-ice over Polar Regions



Antarctic Sea-ice

To demonstrate the capability of retrieving a sea-ice thickness in Antarctica oceans and other polar marginal zones



River and Lakes

To monitor inland water, river discharge, Lake Volume variations at high spatial resolution



CONTEXT

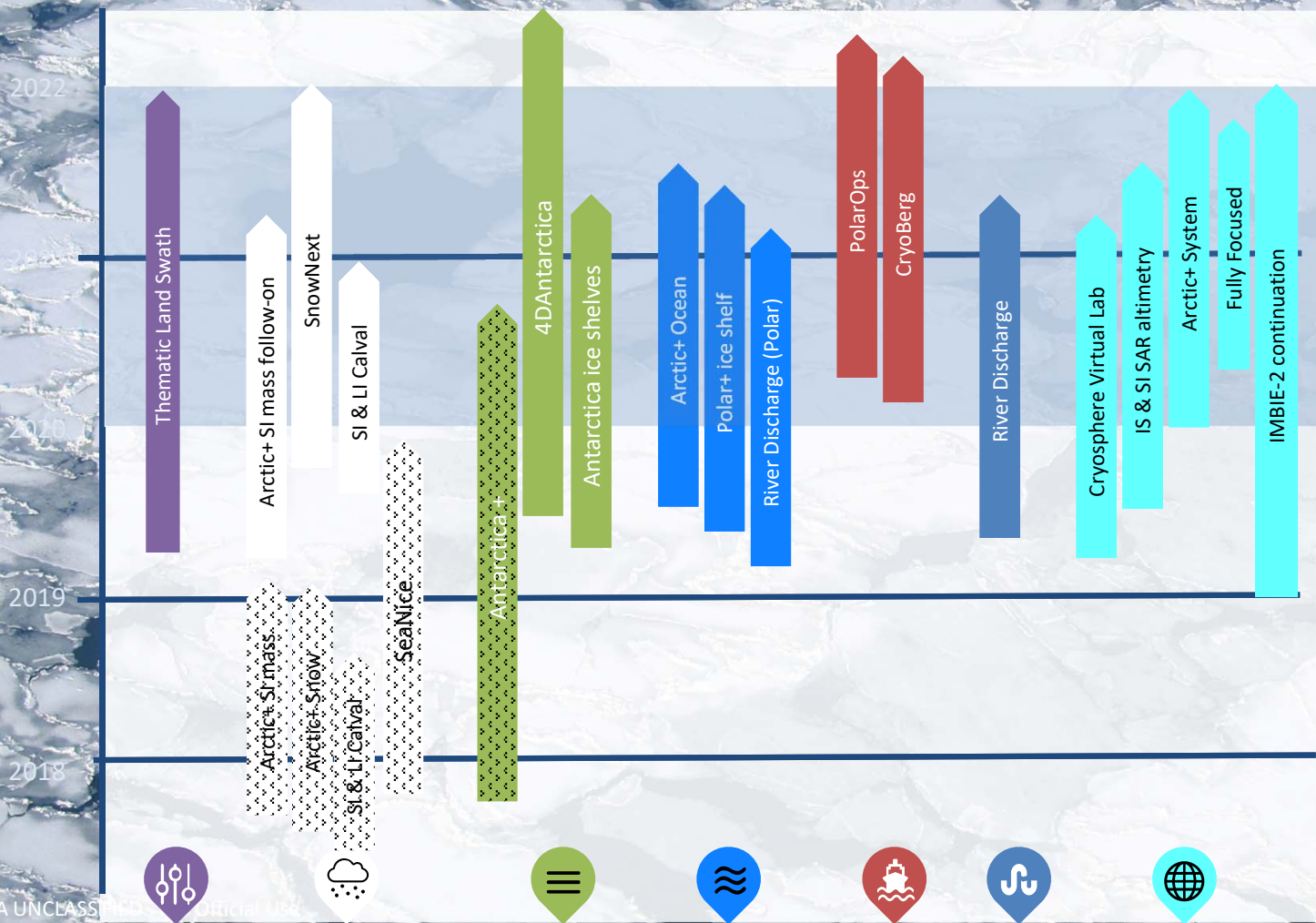
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Planned Projects



Swath Processing



Cryosphere Meteorology



Antarctic Sea-ice



Polar Oceanography



Operations and Forecast



River and Lakes



Long-term Records

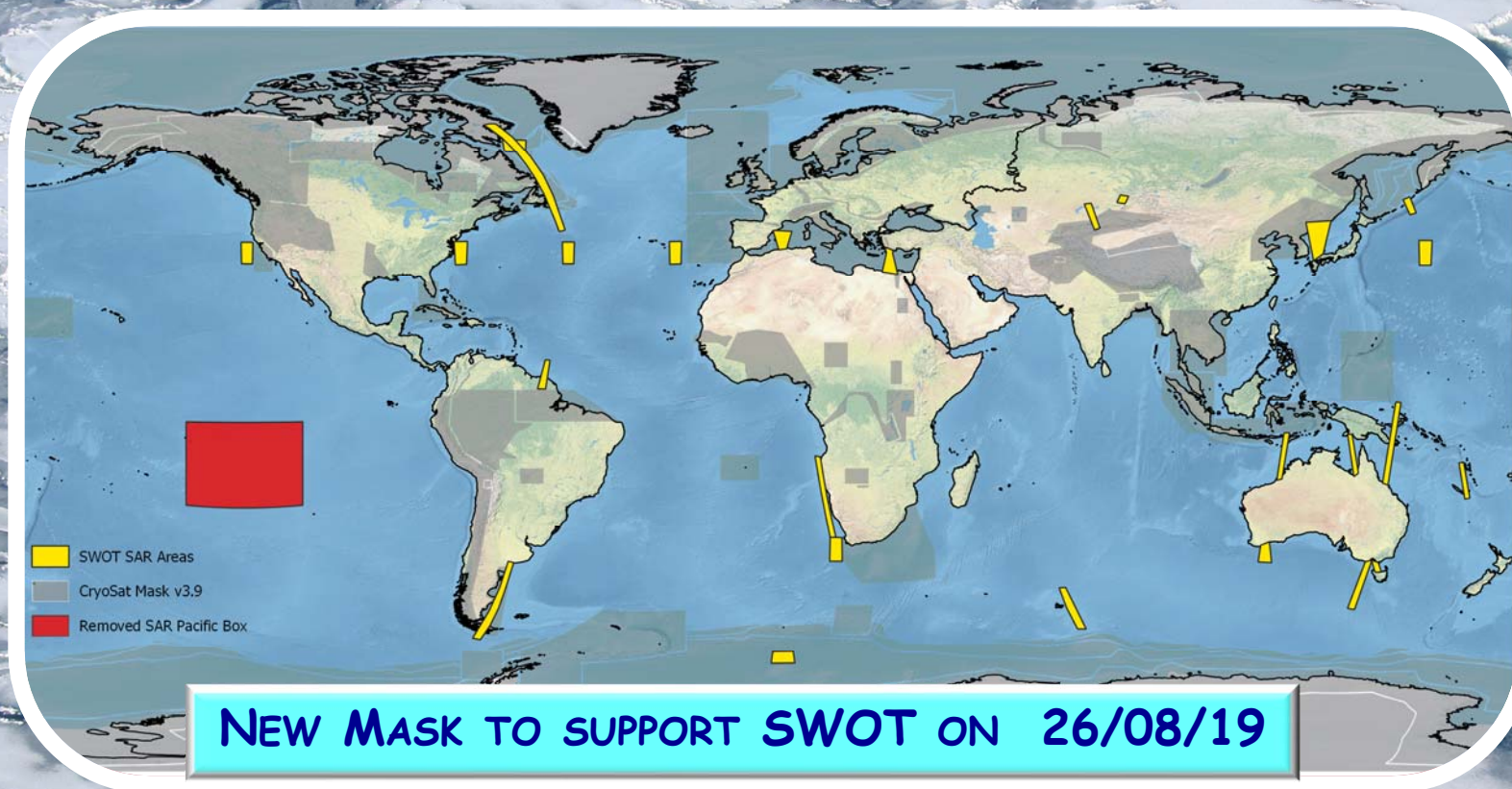
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Geographical mask

- Single flying Ku-band radar altimeter operating in different 3 modes



Land ice and
Ocean: **LRM**

Sea-Ice Regions:
SAR

Glacier + Ice
Margins: **SARin**

STIMULATE R&D AND PREPARE FUTURE OCEAN & ICE TOPOGRAPHIC MISSIONS

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ESA operational processors



2 independent processors for ice and ocean surfaces

NO REGISTRATION

3h

3 Days

1 month



LRM_0
SAR_0
SIN_0

ICE IPFs



FDM_1B FDM_2

SAR_1B SAR_2

SIN_1B SIN_2

NEW !!!

LRM_FB LRM_1B LRMI2 LRM_2

SAR_FB SAR_1B SARI2 SAR_2 GDR_2

SIN_FB SIN_1B SINI2 SIN_2

LRM_0
SAR_0
SIN_0

OCEAN IPFs



NOPM1B NOPM_2

NOPR1B NOPR_2

NOPN1B NOPN_2

IOPM1B IOPM_2

IOPR1B IOPR_2 IOP_2

IOPN1B IOPN_2

GOPM1B GOPM_2

GOPR1B GOPR_2 GOP_2

GOPN1B GOPN_2

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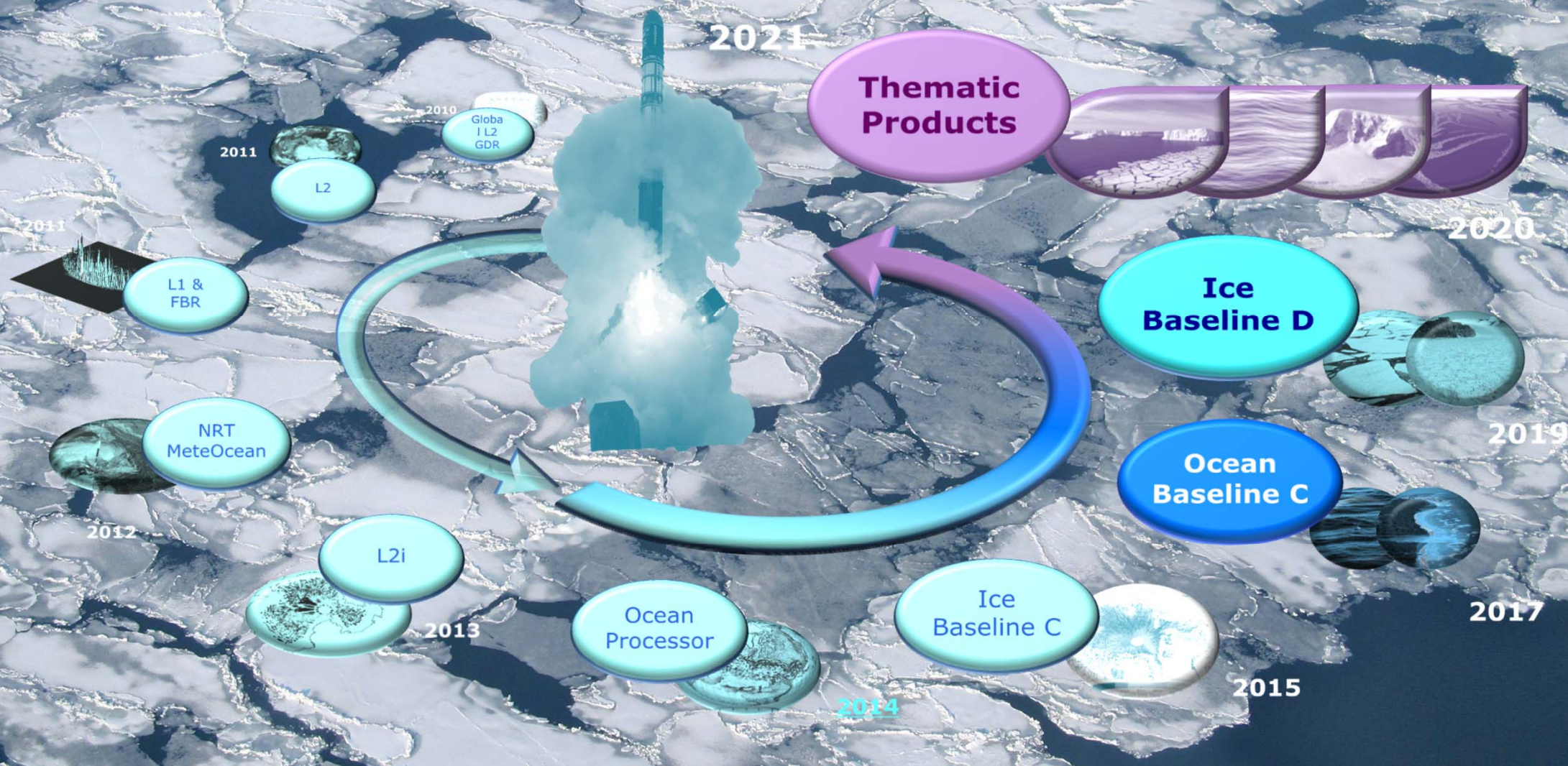
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ESA product evolutions



CONTEXT

OCEAN DATA

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EVALUATIONS

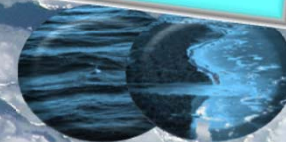
CONCLUSIONS

Ocean Baseline C

SEE POSTERS MELONI ET AL & WEBB ET AL



✧ Major evolution when compared to COP Baseline B bringing several improvements & including **netCDF** format



▶ **NETCDF - V4 FORMAT**

SAR/SARIN PROCESSING

6 UPDATED MODELS

NEW PARAMETERS

ISSUES FIXED

The operational COP Baseline C data **QUALITY STATUS REMAINS GOOD**

MODE-DEPEND + ASC/DESC BIAS have been detected and are under investigation & should be mitigated by empirical correction (mid-term)

REPROCESSING CAMPAIGN (CNES) is on-going and should be finished on Q4 2019, no major issues observed

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Ice Baseline D

SEE PAPER MELONI ET AL (JUST SUBMITTED)

- ✧ The ice Baseline-D includes a significant number of fixes and **science algorithm evolutions** with respect to the ice Baseline-C.

▶
NETCDF -
V4 FORMAT

PREVIOUS
ISSUES FIXED

UPDATED
SLOPE MODEL

IMPROVED
FREEBOARD

NRT L1/L2
PRODUCTS

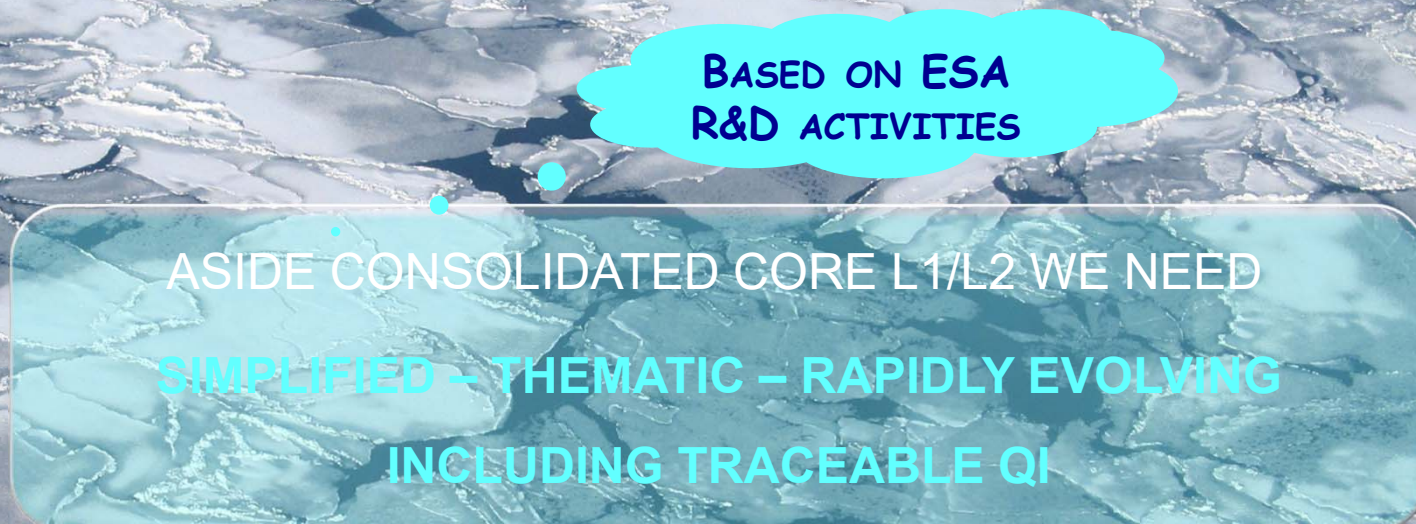
6 month TDS have generated and made available to experts for **IN-DEPTH VALIDATION**

QWG FULLY ENDORSED the implementation of Baseline-D into operations (switch on 28 April 2019, NRT since 07 August).

REPROCESSING CAMPAIGN is on-going and should be finished on Q3 2020

CryoSat Thematic Product

✧ L1 & L2 Products can not fulfill all needs of thematic end-users



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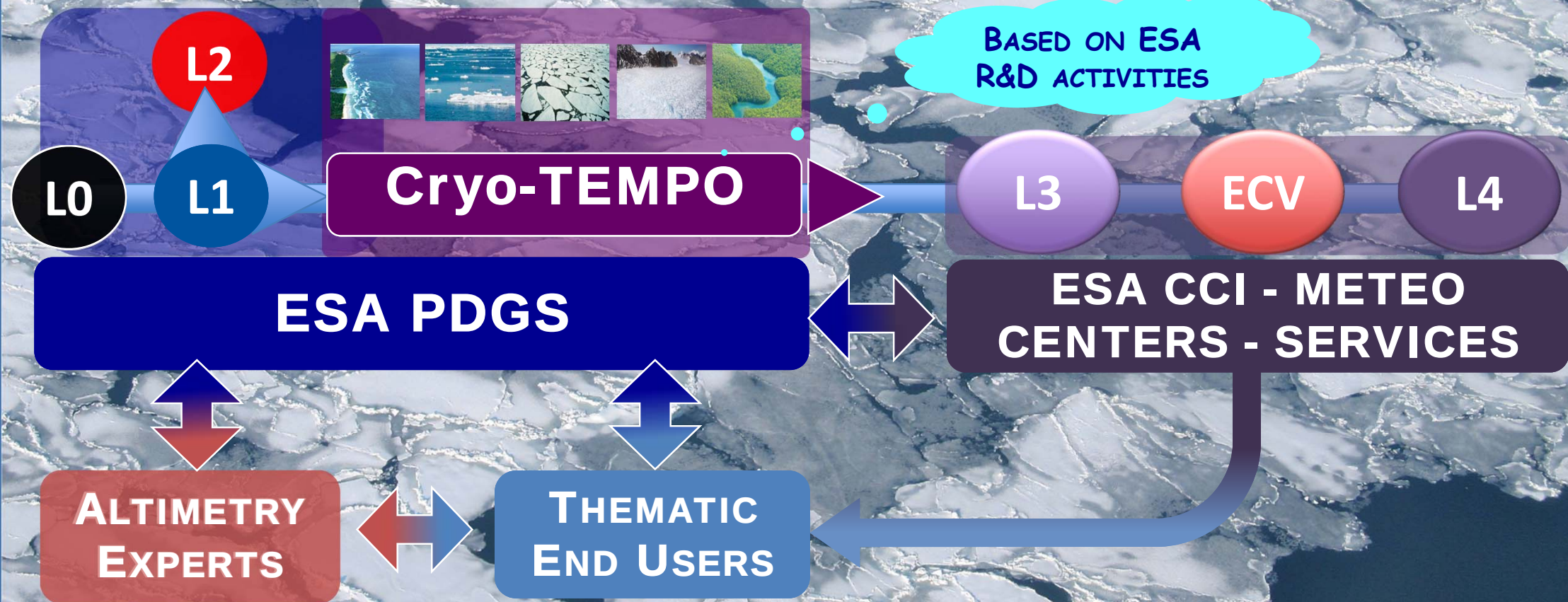
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✧ L1 & L2 Products can not fulfill all needs of thematic end-users



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CryoSat Thematic Product

✦ Implementations wrt the CryoSat PDGS environment

ESA PDGS

END
USERS

L0

IPF1

L1

IPF2

L2

Cryo-TEMPO

+ QCV reports

Processed out of the PDGS

Distributed via the PDGS

CRYO-TEMPO PROCESSING FACILITIES

COASTAL SEA



POLAR SEA



SEA ICE



LAND ICE



RIVER & LAKE



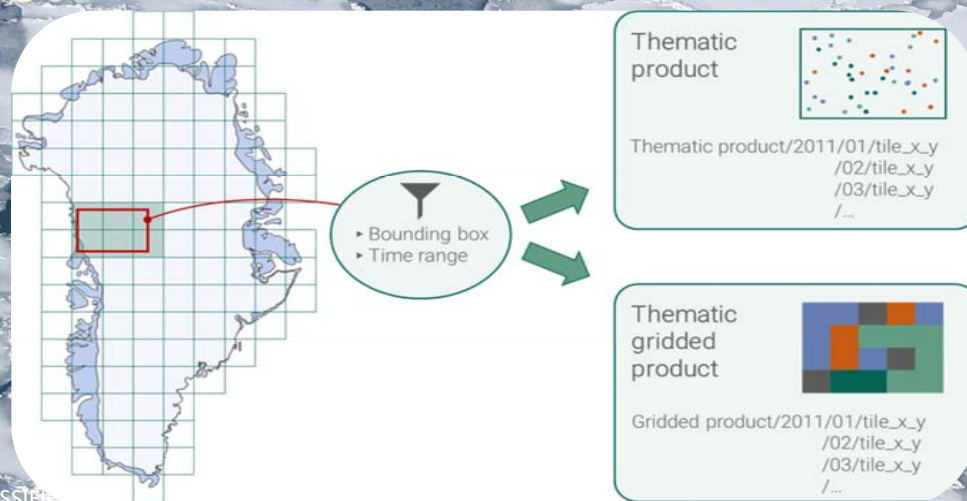
ITT: Q4-19

KO: Q2-20

1st CryoSat Thematic Product



- ✧ Global CryoSat Swath Processing
- Operational Elevation Products Over Ice Sheets, Ice Caps and Glaciers
- Heritage from ESA CryoTop projects
- Point Cloud & Gridded Product



GOING LIVE EARLY 2020

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Conclusive statements

CryoSat is in **EXCELLENT SHAPE**. There were no technically limiting factors or programmatic constraints that has restrict its extension until **DECEMBER 2021**

The quality of CryoSat ice and ocean data is excellent and allows to fully achieve the mission objectives and **LARGELY BEYOND** ...

The mission provides a unique and systematic observational capability for pan-Arctic **SEA ICE** thickness and for **ICE SHEET** mass balance.

The mission also supports **WIDER SCIENTIFIC** and **OPERATIONAL APPLICATIONS** in oceanography, meteorology, hydrology, and for maritime services.

CryoSat is a key component of cooperation with partner agencies operating and planning complementary (**ICESAT-2**) & future missions (**CRISTAL, SWOT**).



CRYOSAT 10th ANNIVERSARY SCIENCE CONFERENCE

20–23 April 2020 | Taormina, Italy

DEADLINES

- | | |
|------------------------------|------------------|
| • Abstract Submission Opens | 21 October 2019 |
| • Registration Opens | 4 November 2019 |
| • Abstract Submission Closes | 20 December 2019 |
| • Draft Programme | 17 February 2020 |
| • Registration Closes | 15 March 2020 |
| • Final Programme | 31 March 2020 |

www.cryosat10years.org

