



SWOT – A NOVEL PROGRAMMATIC APPROACH LEADING TO SUCCESS

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SWOT ST
MEETING
2024

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Hydrology,
Continental Cryosphere,
Water Cycle

CONTEXT – WHY SWOT

" At the cosmic scale, water is less abundant than gold"

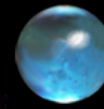
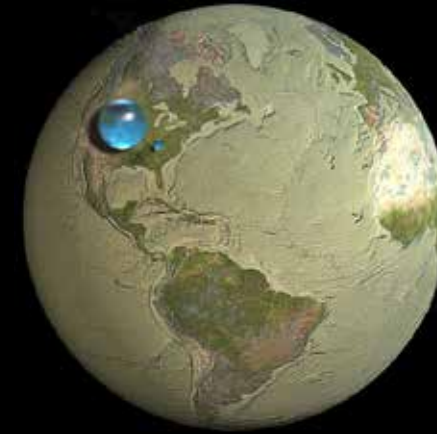
Hubert Reeves, Canadian astronomer

Challenging scientific objectives

- Understanding ocean mechanisms small mesoscale eddies, ocean/atmosphere coupling (climate issues) and ocean biology/dynamics coupling
- Understanding hydrological processes for the determination of water flows and stocks across continents

For strong societal benefits

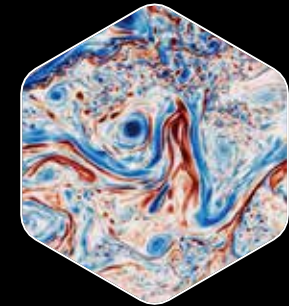
- Predict our environment in the coming days/weeks
- Predict and manage extreme events
- Understand and manage our needs for water and food



All water on, in, and above the Earth

- Liquid fresh water
- Fresh-water lakes and rivers

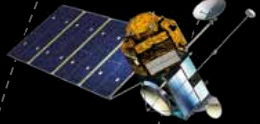
Howard Periman, USGS,
Jack Cook, Woods Hole Oceanographic Institution,
Adam Nieman
Data source: Igor Shiklomanov
<http://ga.water.usgs.gov/edu/earthhowmuch.html>



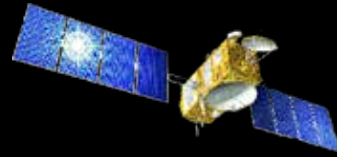
HISTORICAL PARTNERSHIP



NOAA



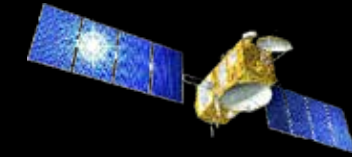
TOPEX/POSEIDON



JASON 1



JASON 2



JASON 3

Innovation in science, technology, physics, potential for applications

SWOT key milestones

1998

Wide Swath Ocean Altimeter selected

2005

Hydrosphere Mapper & WatER submitted to NRC Decadal Survey

2007

Joint CNES/NASA Science Working Group formed

2009

Start of Phase A (Concept)

2011

Decision of the French Government to fund SWOT (General Investment Program)

2022

Successful launch SWOT on science orbit then nominal orbit



2004

WSOA canceled

2005

Joint UE/US Hydro team formed



2007

Decadal Survey recommends SWOT as combined mission

2008

SWOT Kick-Off Start of Phase 0

2011

Start of AirSWOT development

2013

Start of Phase B (Detailed Definition)

2016

Start of Phase C/D (Design & Construction)



SUCCESS KEY – PREPARING FOR NEW DATA



- Major effort on the preparation of the downstream program: supporting science while preparing for the development of new services
- Strong relation with NASA Early Adopter Program

SUPPORT EXPERTS AND RESEARCHERS

- Support for hydrological and oceanographic research

1



OUTREACH

- Target market analysis
- Information and targeted communication

2



SIMULATION & IN SITU

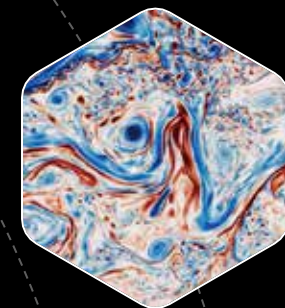
- Development of simulators to provide representative data
- Airborne campaign: AIRSWOT

3



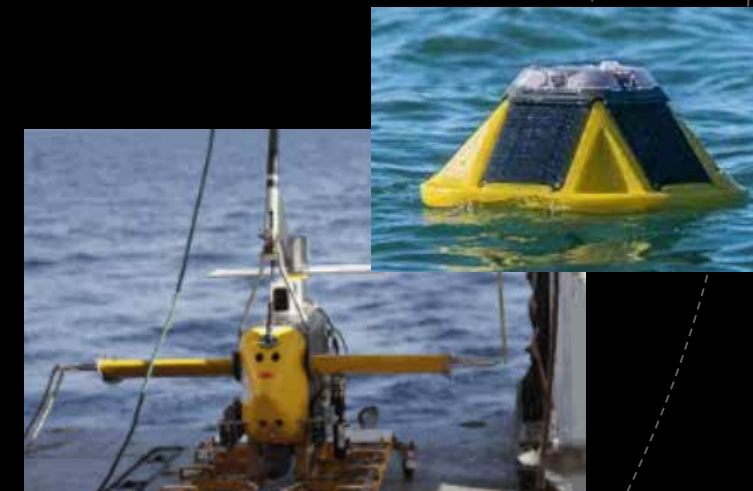
SUCCESS KEY – IN SITU STRATEGY

<https://www.swot-adac.org>



SWOT Adopt-a-Crossover Consortium => Unprecedented coordinated CALVAL

- | 30 experiments 21 Offshore & 9 coastal
- | Large number of scientific goals and regions
- | Strong international cooperations



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DATA PORTAL

- Multi-sensor platform
- DUACS/AVISO & hydroweb.next

DEVELOPMENT OF SERVICES AND APPLICATIONS

- Set up working groups for each target area, bringing together stakeholders to define and develop services

OUTREACH

- Target market analysis
- Information and targeted communication

SIMULATION & IN SITU

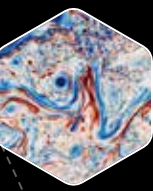
- Development of simulators to provide representative data
- Airborne campaign: AIRSWOT

- Transboundary river management
- Flood modeling
- Water volume management for urban, industrial, agricultural uses
- Hydropower production management
- Prevention of epidemic spread



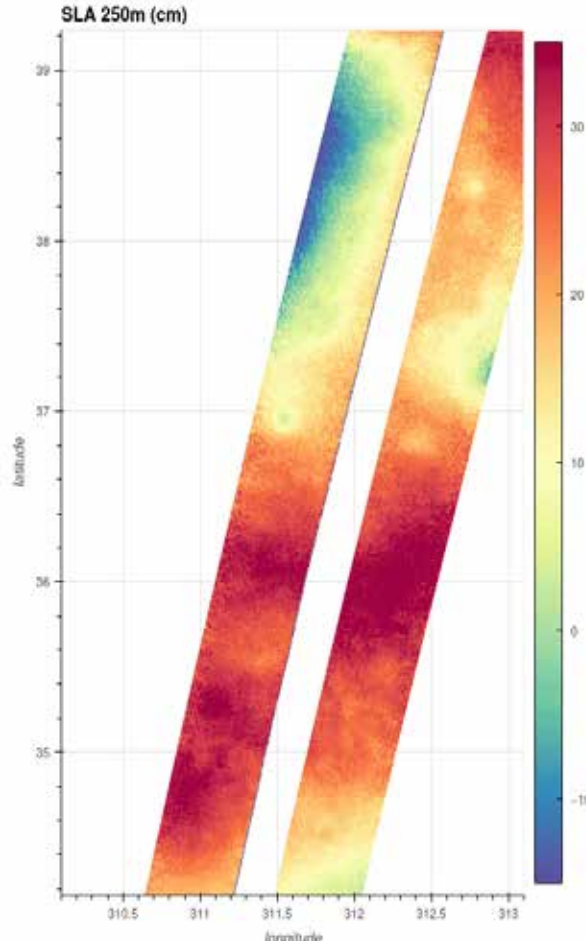
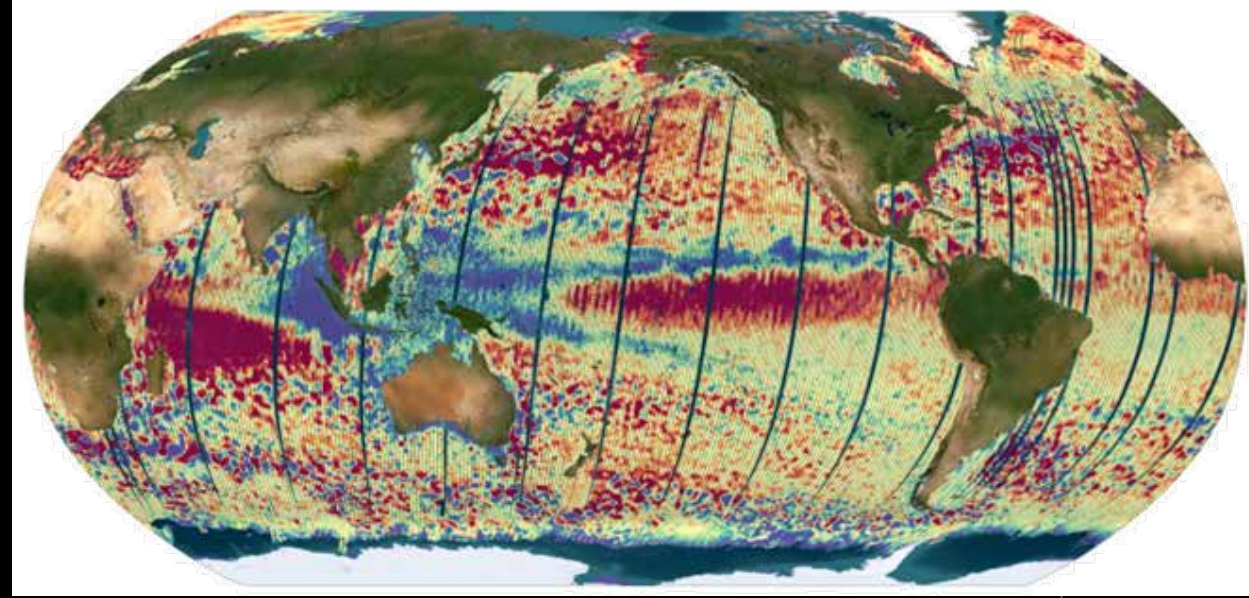
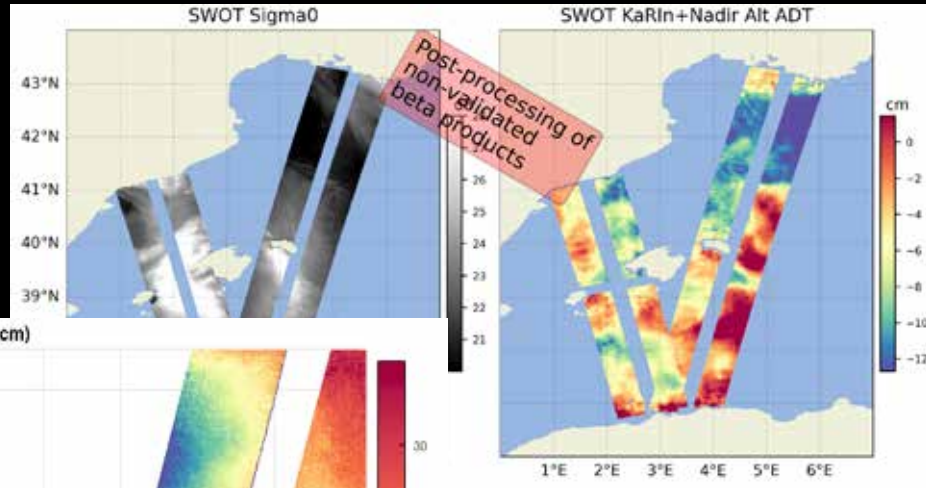
- Support to river and ocean navigation, to sea rescue operations
- Support to fishery activities
- Biodiversity
- Estuary management

SUCCESS KEY – VALUE-ADDED PRODUCTS



March 2023 Swot
ADAC Bulletin

DUACS



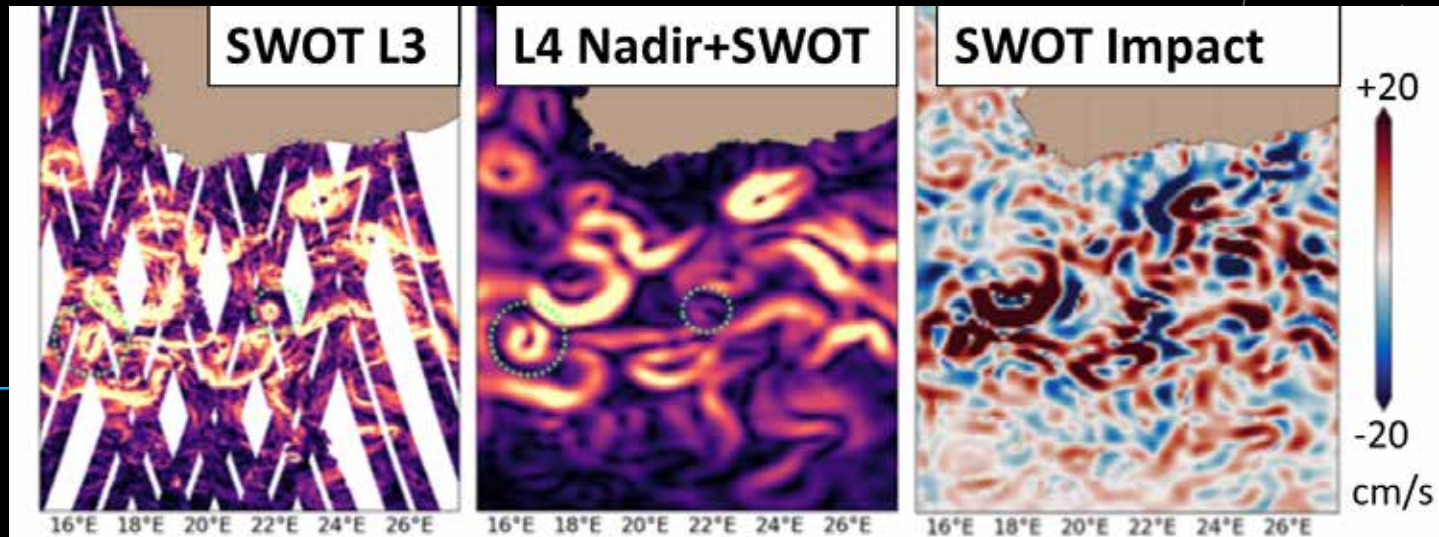
Sept 2023: 1 day phase
L3 Beta v0.3

April 2024 L3 v1.0 →

May 2024: L3 NRT

← June 2024:
L3 250-m

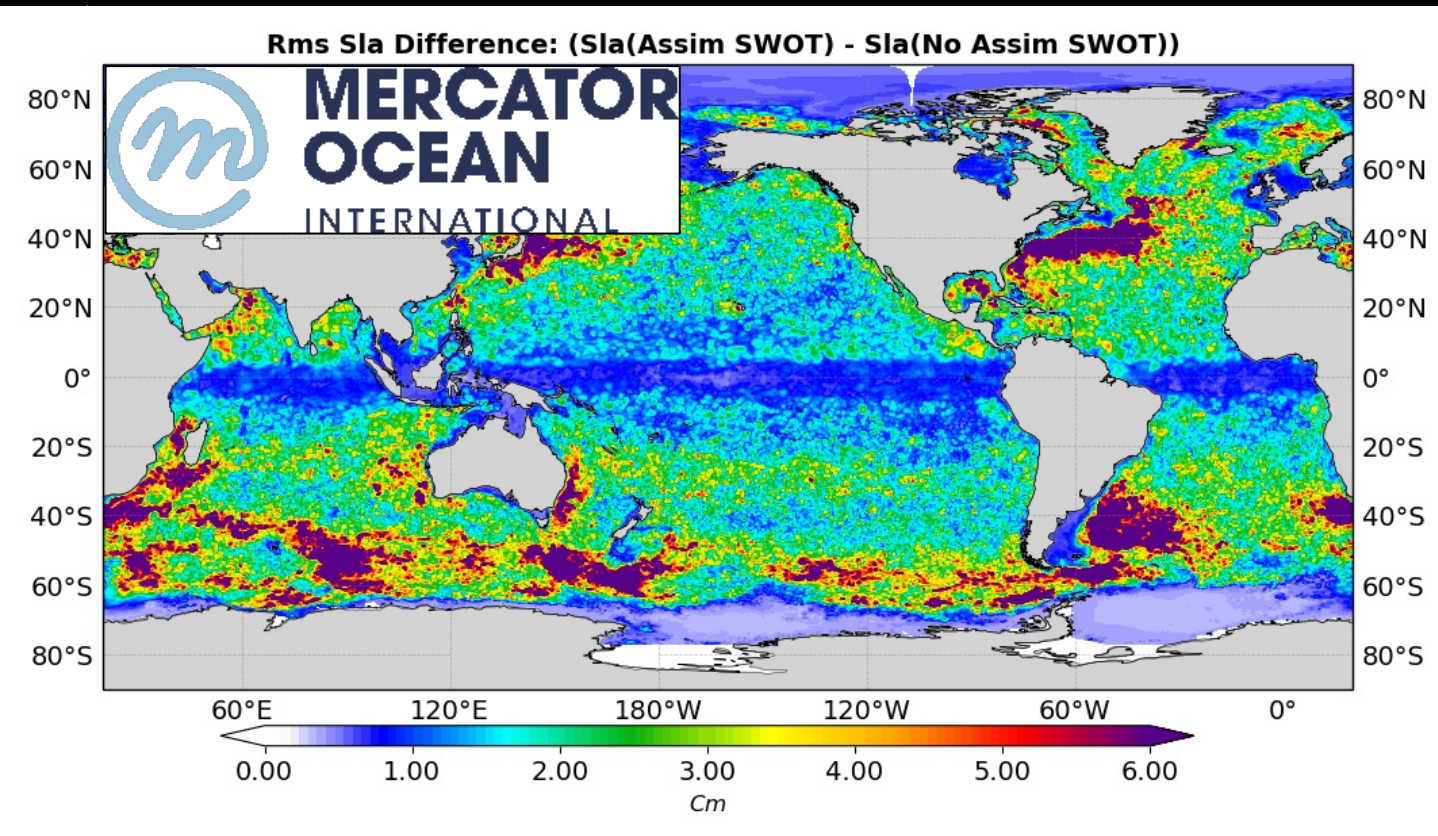
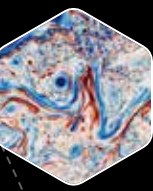
June 2024 →
L4 version 1 released
(SWOT+nadir altimetry
constellation)



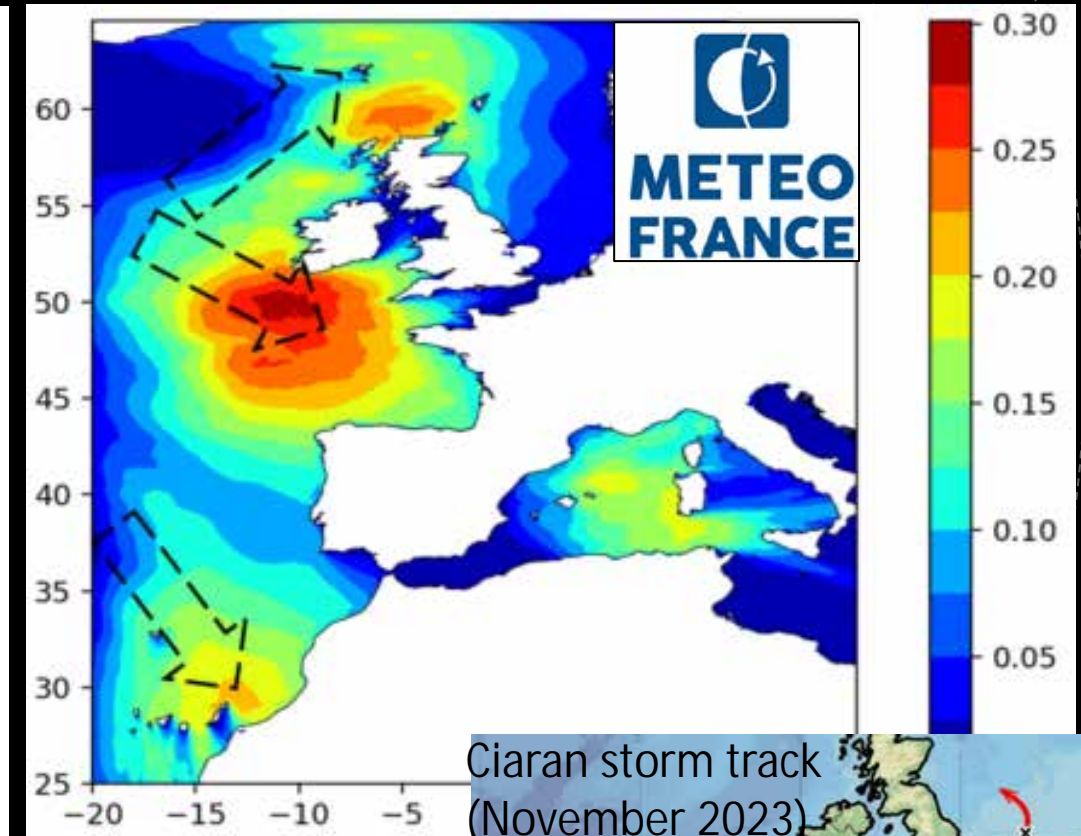
FIRST TESTS BY MARINE OPERATIONAL SERVICES

Positive impact of SWOT in the models (Topography and Waves)

Demonstration performed early in phase E1



Sea Level error reduction (Sep/Oct/Nov 2023)



Impact on SWH (m)

Ciaran storm track (November 2023)



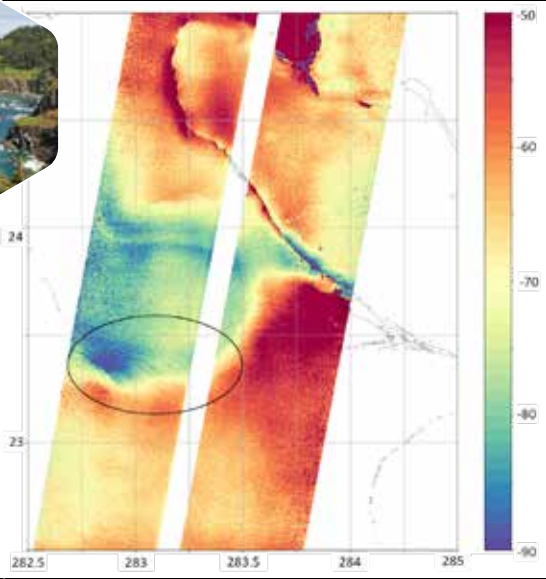
SUCCESS BEYOND EXPECTATIONS IN HYDROLOGY

- **SWOT** works extremely well on large lakes & rivers
 - 100 m rivers & 250 m² lakes
 - Mission requirements
 - Global inventory of surface water
- **SWOT** outperforms its optional goals
 - 50 m rivers & 100 m² lakes
 - Better monitoring of water cycle
 - Thousands of Canadian/Russian lakes
- **SWOT** delivers on frozen lakes & rivers
 - Ice is bright enough for heights
 - Frozen/Liquid state from

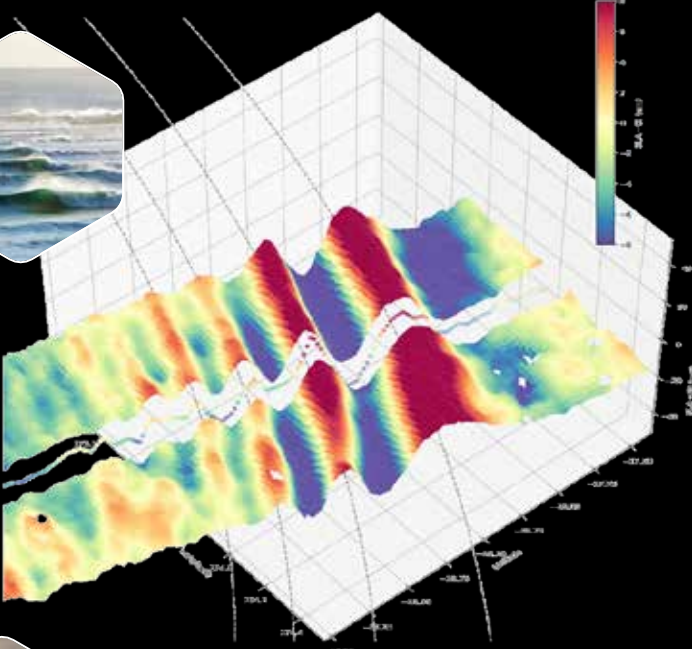
AND EVEN MORE...



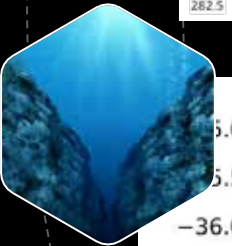
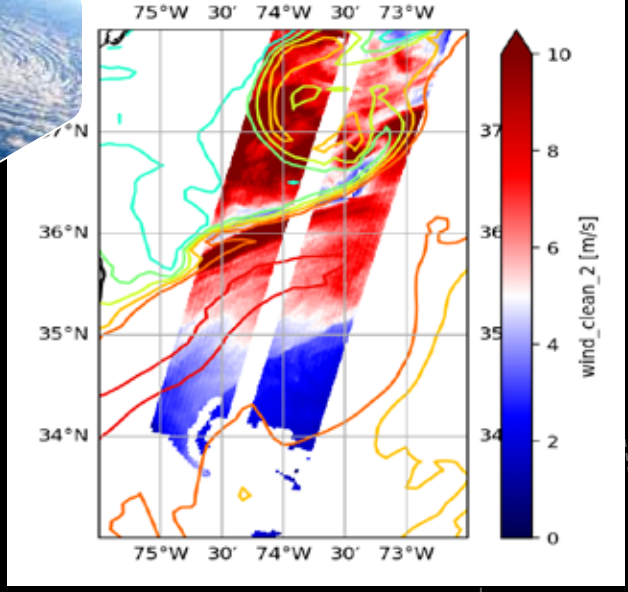
Coastal



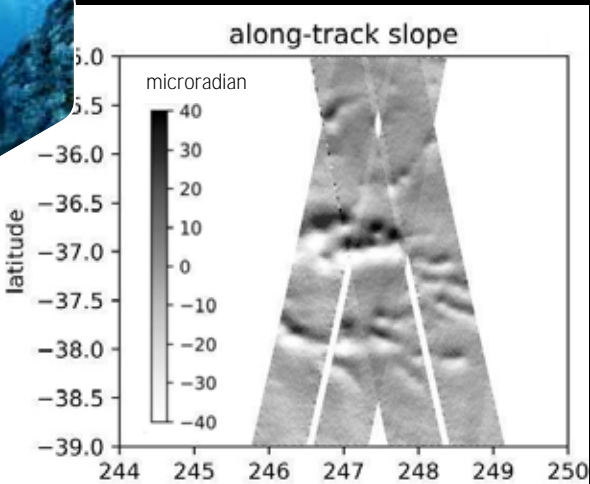
Waves



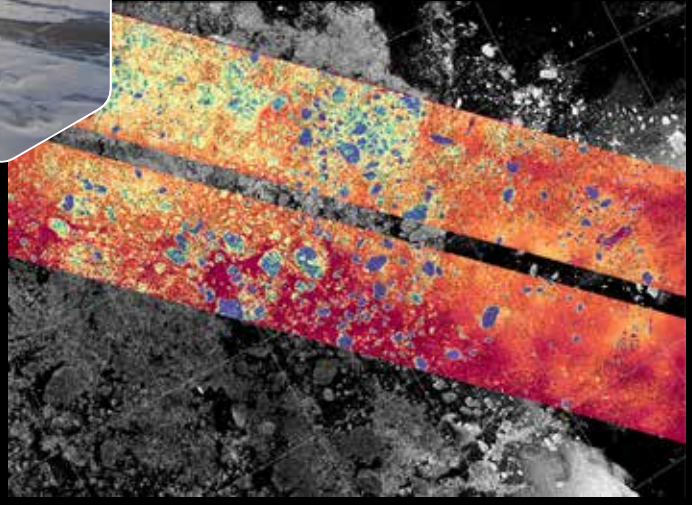
Wind



Marine Geodesy



Polar

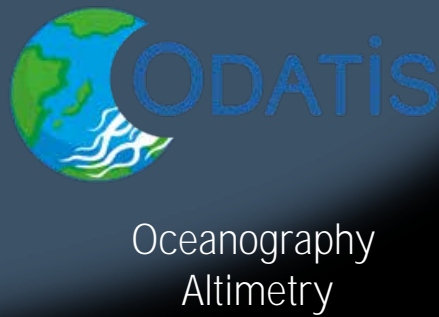
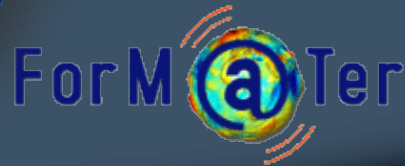


DEM



SUCCESS KEY – INTEGRATED DATA PORTAL

- Integrated approach of the Earth System with DataTerra to serve the science community and answer society issues
 - Multi-source, multi-sensor data for use at different spatial, spectral and temporal scales
 - Combination of satellite, in-situ and numerical modeling data
 - Support European and International partnerships, fundamental to a global approach
- Free hosting on CNES Cloud and HPC infrastructure (with a SWOT virtual lab)



CONCLUSION – MESSAGES

- SWOT is a game changer mission to understand the Water Cycle
- Strong historical partnership CNES-NASA for more than 30 years
 - Altimetry international partnership with NOAA, EUMETSAT, UKSA, CSA
 - Spirit of collaboration: additive skills, building trust, valuing diversity, common vision & ambitions
- Crucial preparation with integrated project team, scientists (joint science Team) & downstream ecosystems
- First extraordinary results obtained rapidly thanks to this preparation
- Opens the era of swath altimetry (S3NG-T and beyond)
- This innovative programmatic approach has set an example for future missions





THANK YOU
TO THE PROJECT
&
SCIENCE TEAM

