Arctic Monitoring Forecasting Center

marine.copernicus.eu

Report from TOPAZ - Norway

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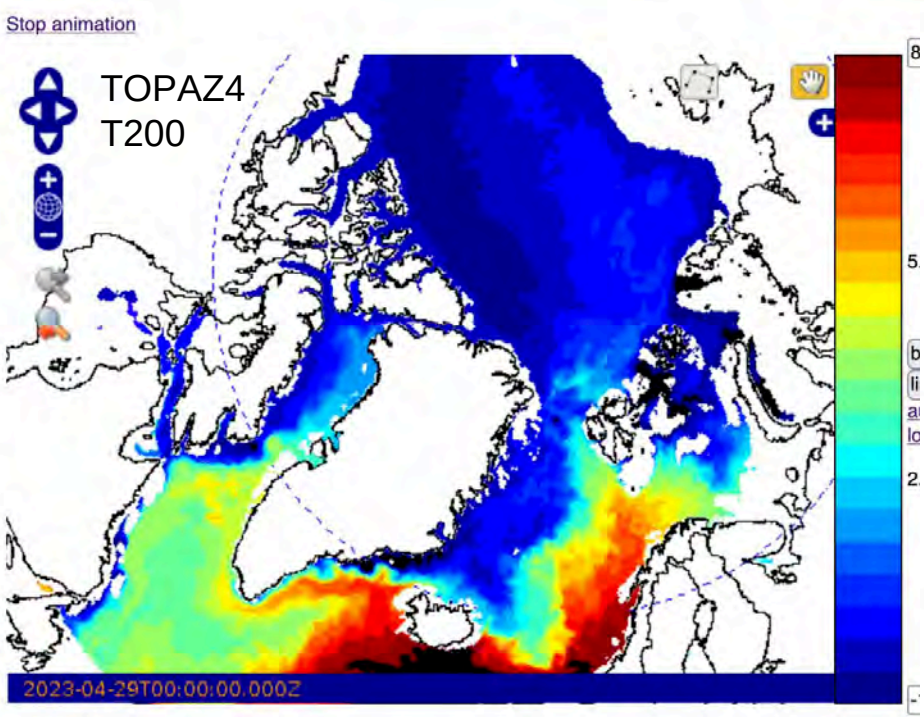
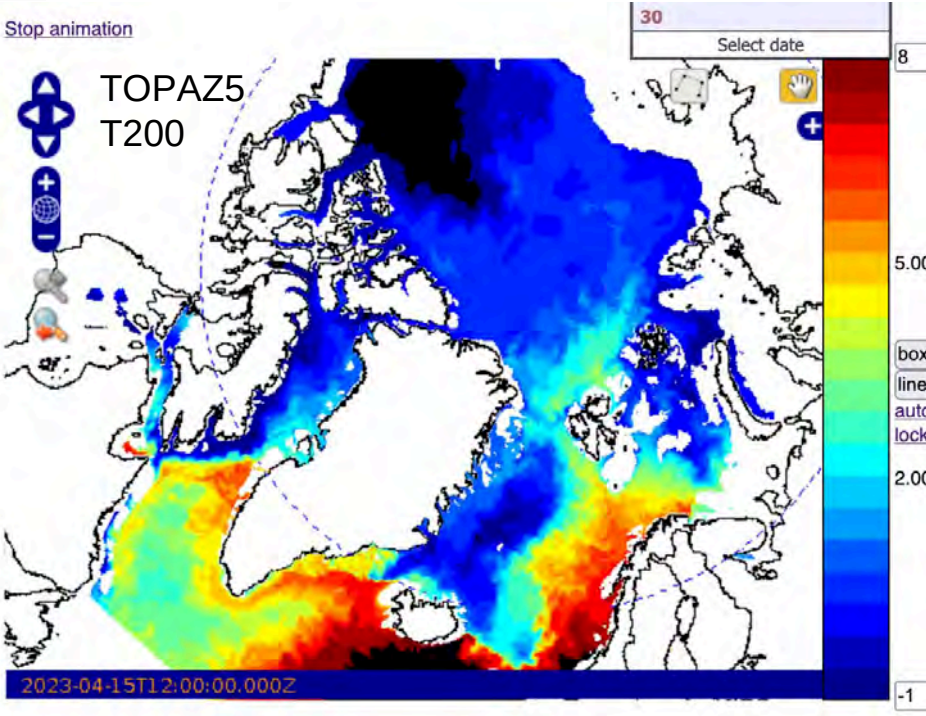
Next week: Moving from TOPAZ4 to TOPAZ5

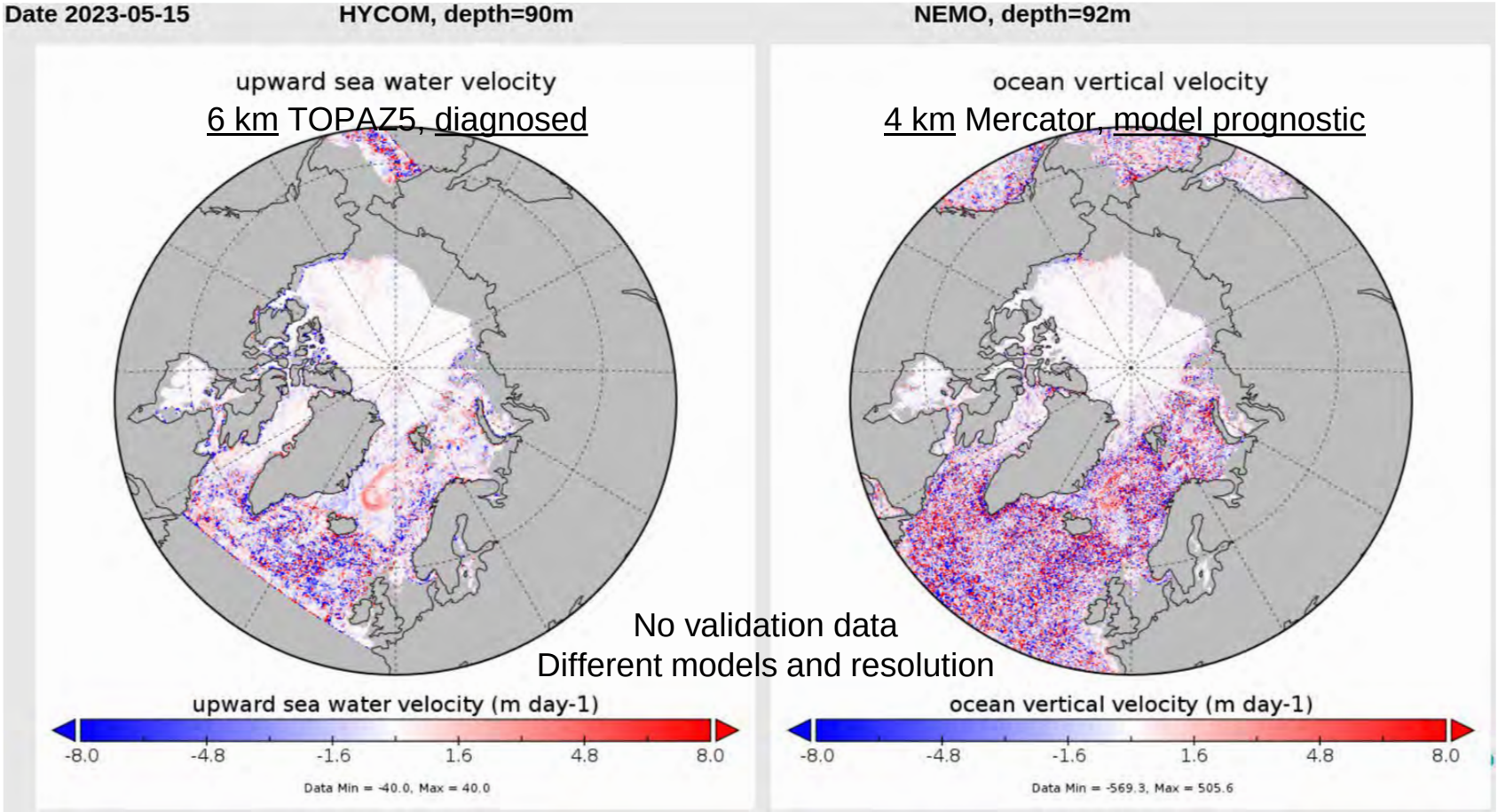
HYCOM v2.2.37 to v2.2.98
NERSC-CICE to CICE V5.1 via ESMF
Online BGC coupling: ECOSMO-II via FABM

12 km -> 6 km resolution
28 -> 50 z-isopycnic layers
Lateral bc from Mercator

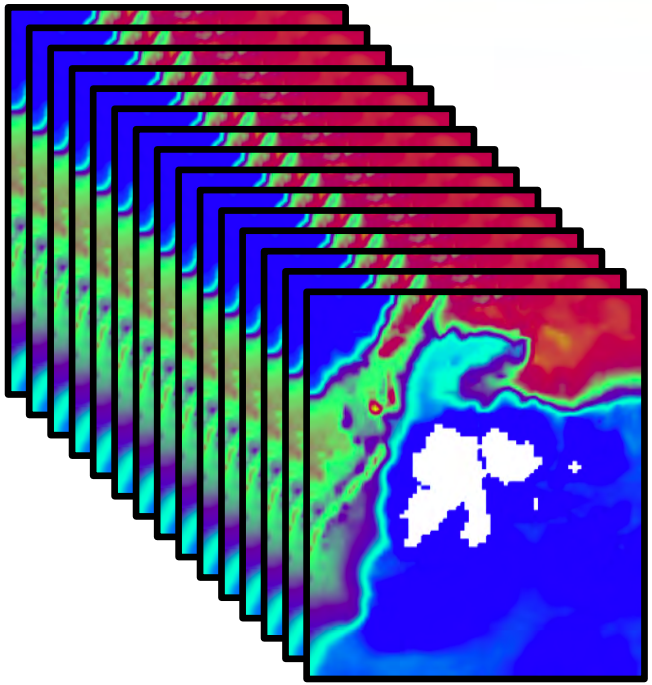


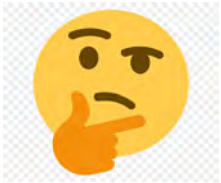


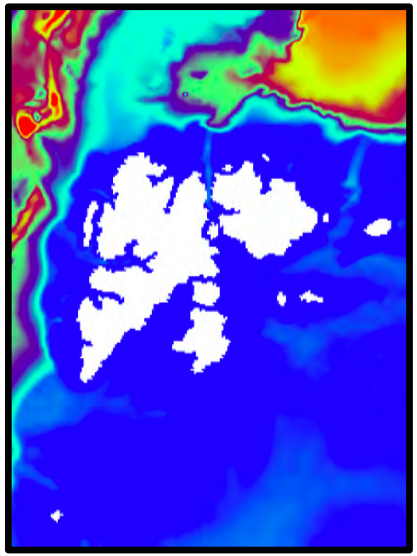
Products and services: addition of vertical velocities



Plans – 2023







Bathymetry extract near Spitzbergen, for illustration

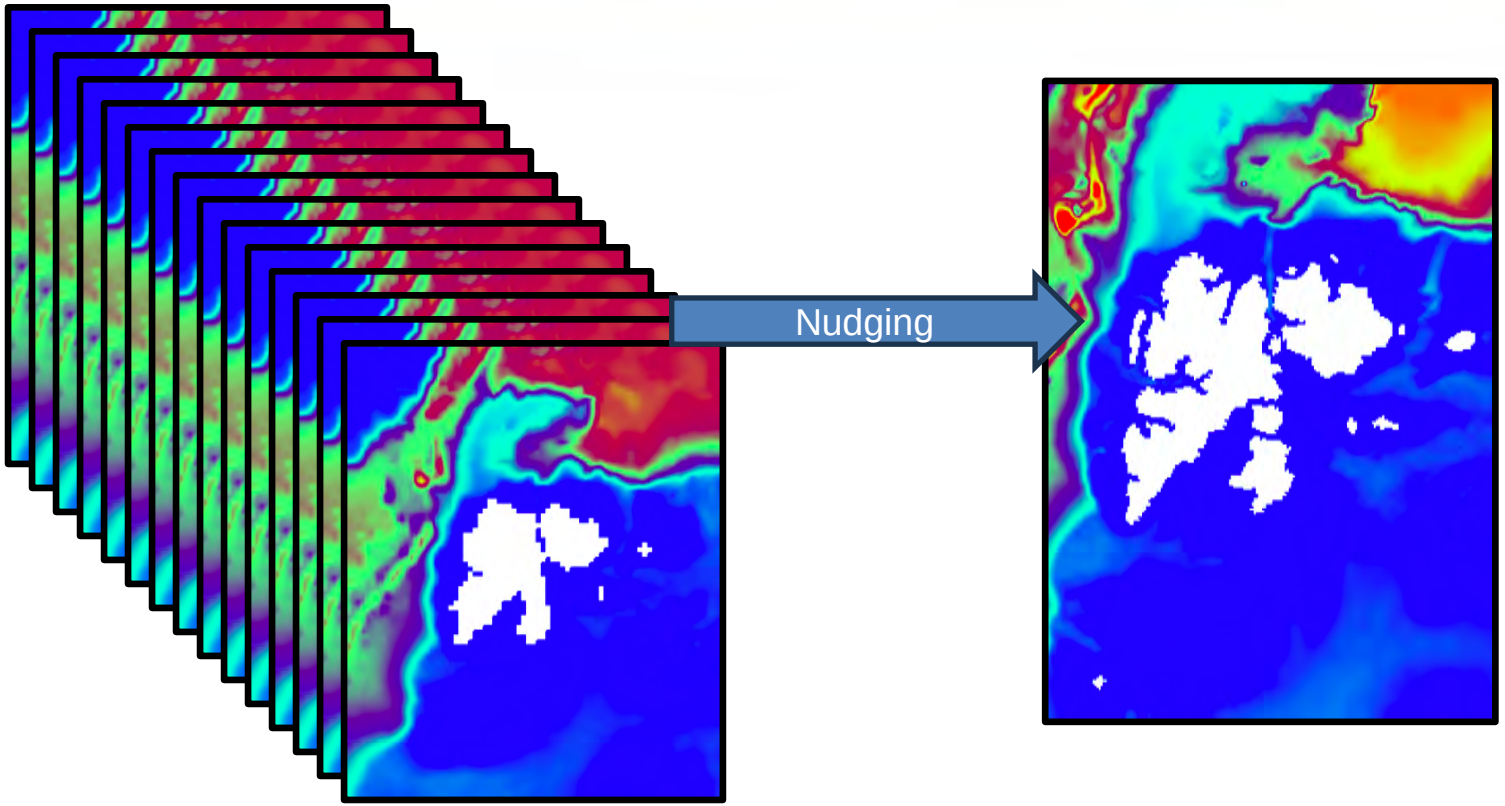
TOPAZ5 – 6 km

- **EnKF, 100 members**
- **Assimilates SLA, SST, SIC, T/S profiles etc.**

TOPAZ6 – 3 km

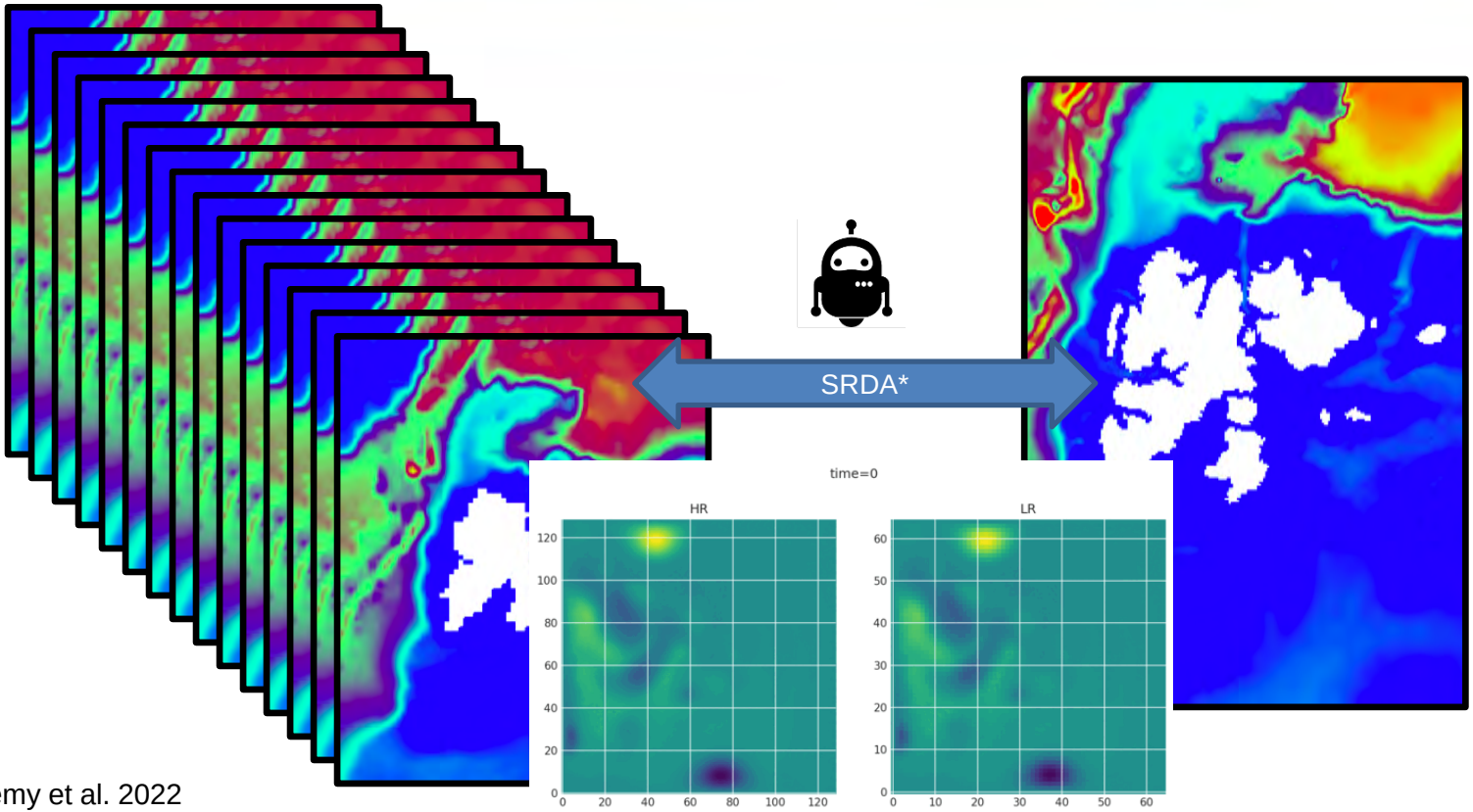
- **Deterministic free run**
- **Tides, storm surges, wave terms**
- **Ensemble unaffordable**

Plans 2024: a dual forecast



One EnKF and one deterministic forecast

Outlook: 2028?



Barthélémy et al. 2022
https://doi.org/10.1007/s10236-022-01523-x

Super-resolution Data Assimilation

Plans: CICE5.1 replaced by neXtSIM in 2030

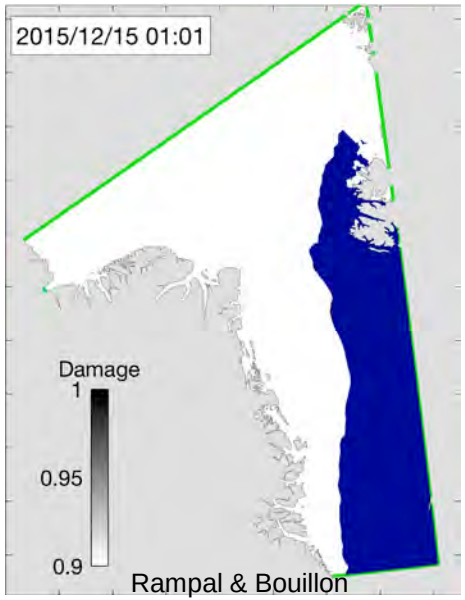
White Ocean

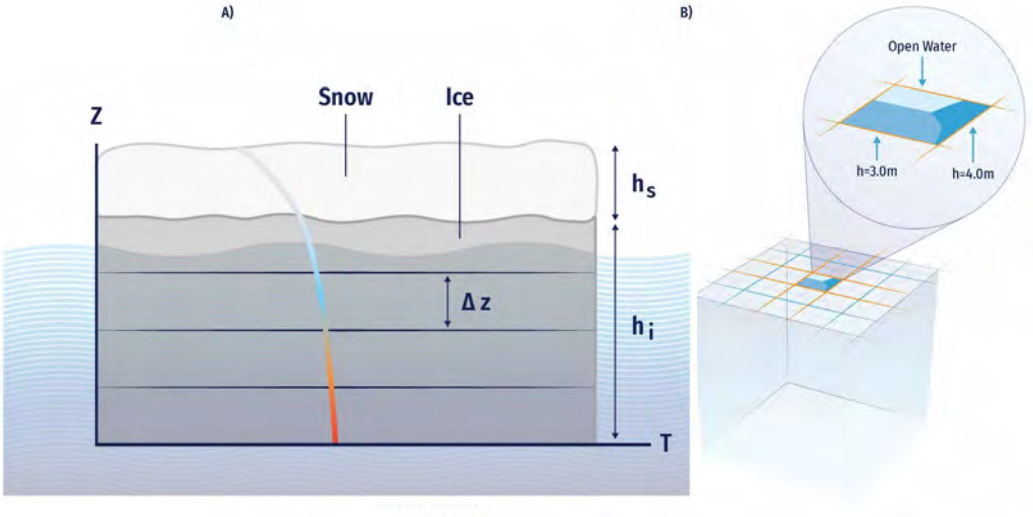
Dynamics (rheology)

- Simple (LIM, CICE, SI^3)
- Brittle (neXtSIM)

Thermodynamics

- Simple (LIM2, CICE3, neXtSIM)
- Ice thickness distribution (LIM3, CICE4-6, SI^3)



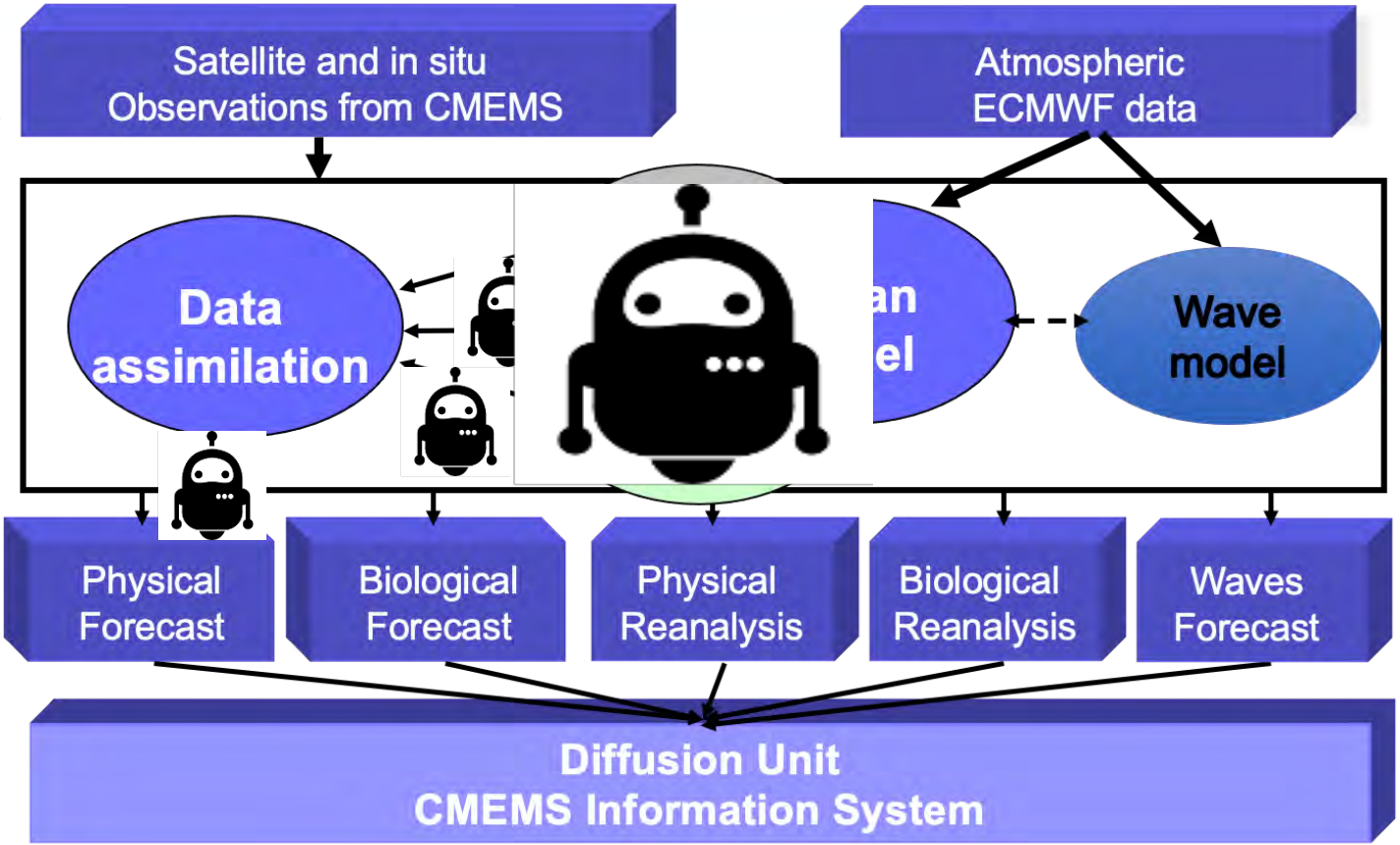


Machine learning in forecast systems

Image classification

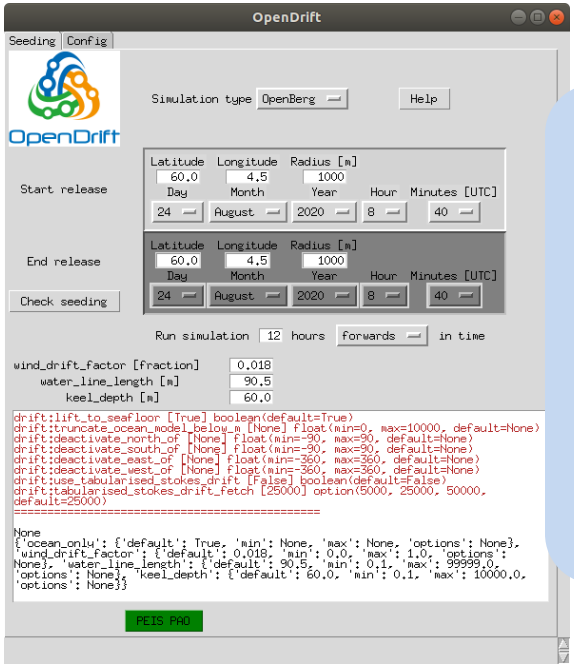
Super-resolution Parametrizations (2028)

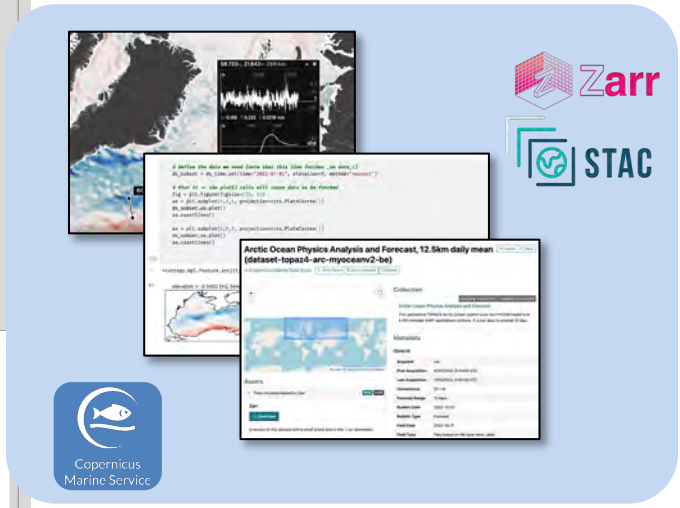
Forecast calibration (2025)

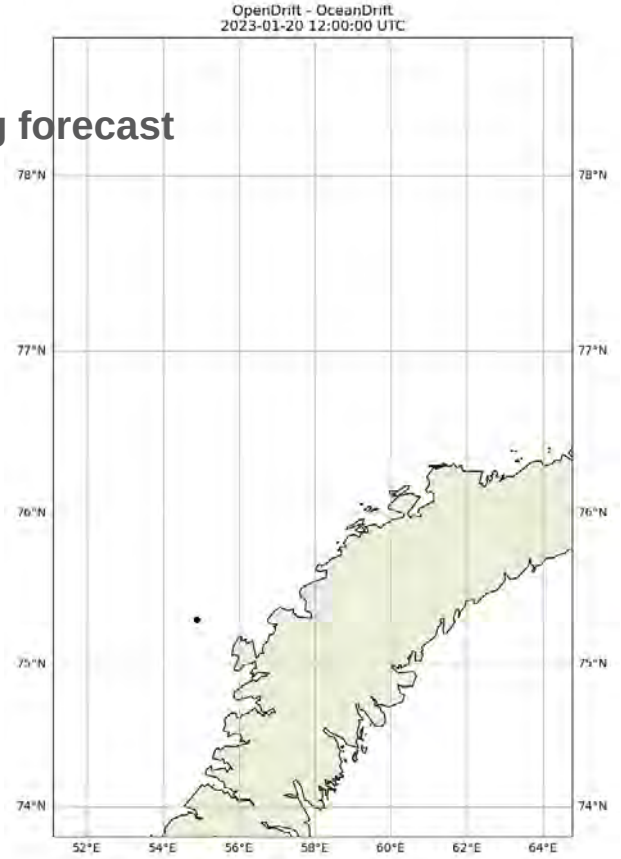


Users: Iceberg forecasts on-demand

In Summer 2024: Use the IceWatch app to order an iceberg forecast



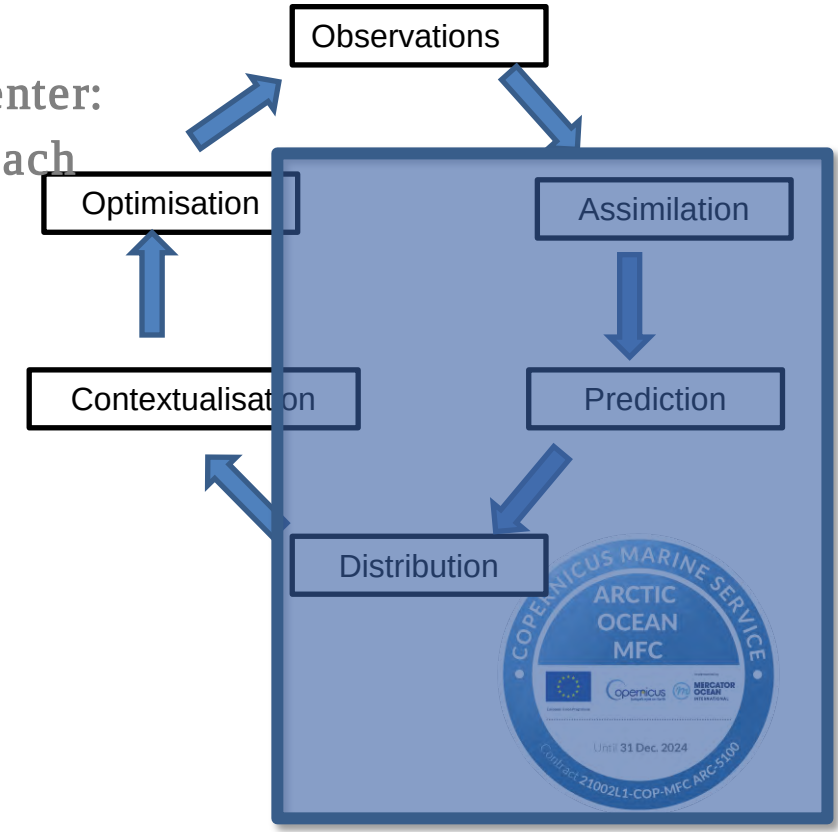




CONCLUSIONS

Digital Twin Oceans virtuous wheel

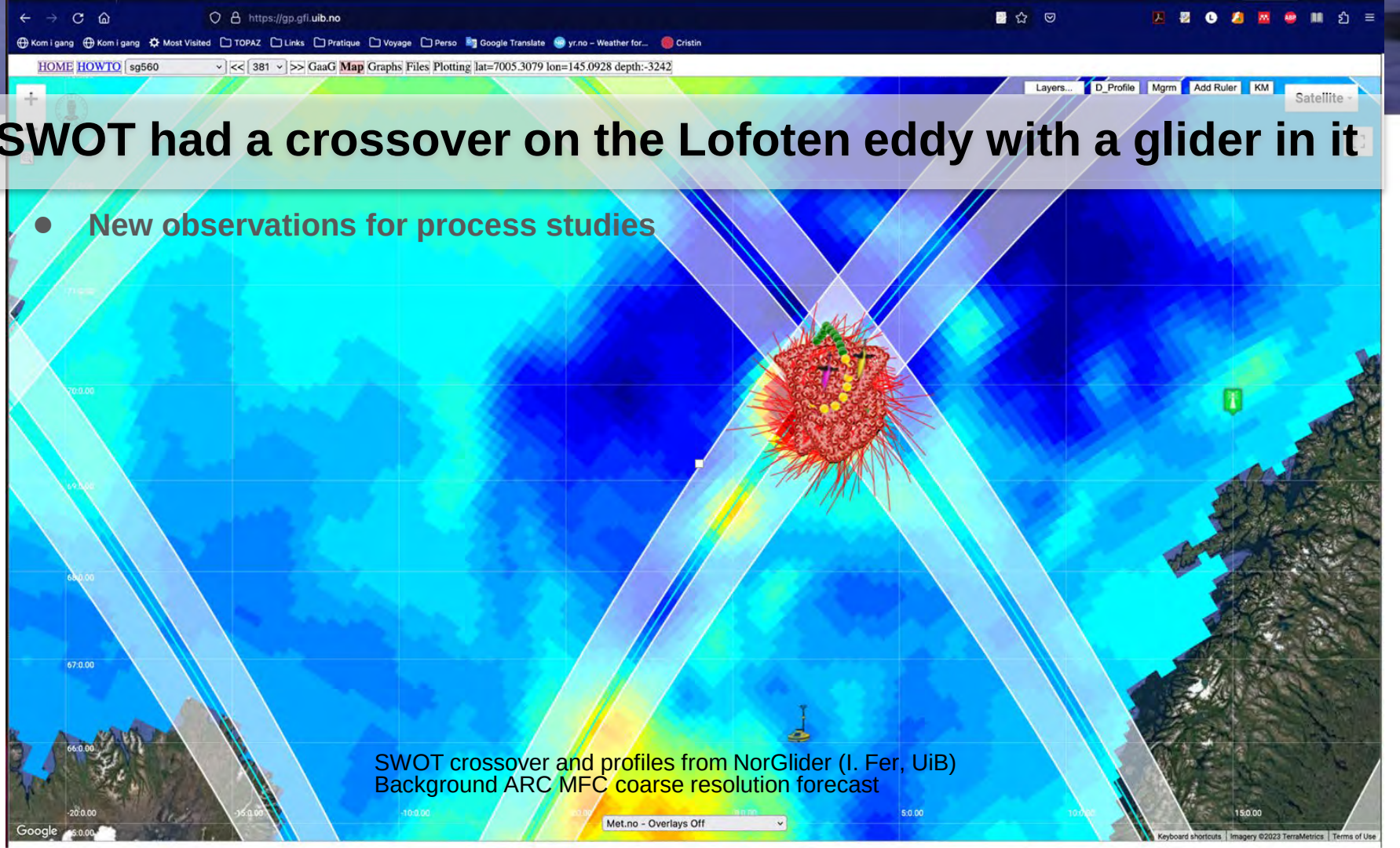
- Participation to the Decade Collaborative Center:
  - Sea Ice modelling chapters w. P. Heimbach
  - Regional Arctic Team (H. Regan)
    - Contributions from ECCC, DMI, UK Met
- Relationship with NWP
  - MET Norway works on Arctic reanalysis CARRA2




Thank you!

SWOT had a crossover on the Lofoten eddy with a glider in it

- New observations for process studies



SWOT crossover and profiles from NorGlider (I. Fer, UiB)
Background ARC MFC coarse resolution forecast