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PLANS FOR ARCTIC OSE AND SWOT OSSE IN CANADIAN ANALYSIS SYSTEMS

Gregory Smith

Meteorological Research Division, ECCC

Canada

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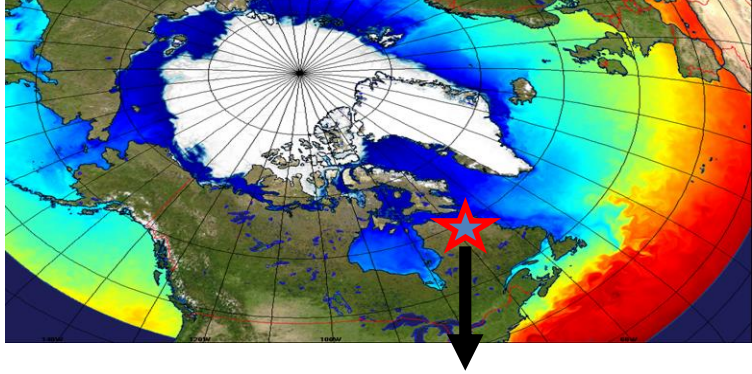
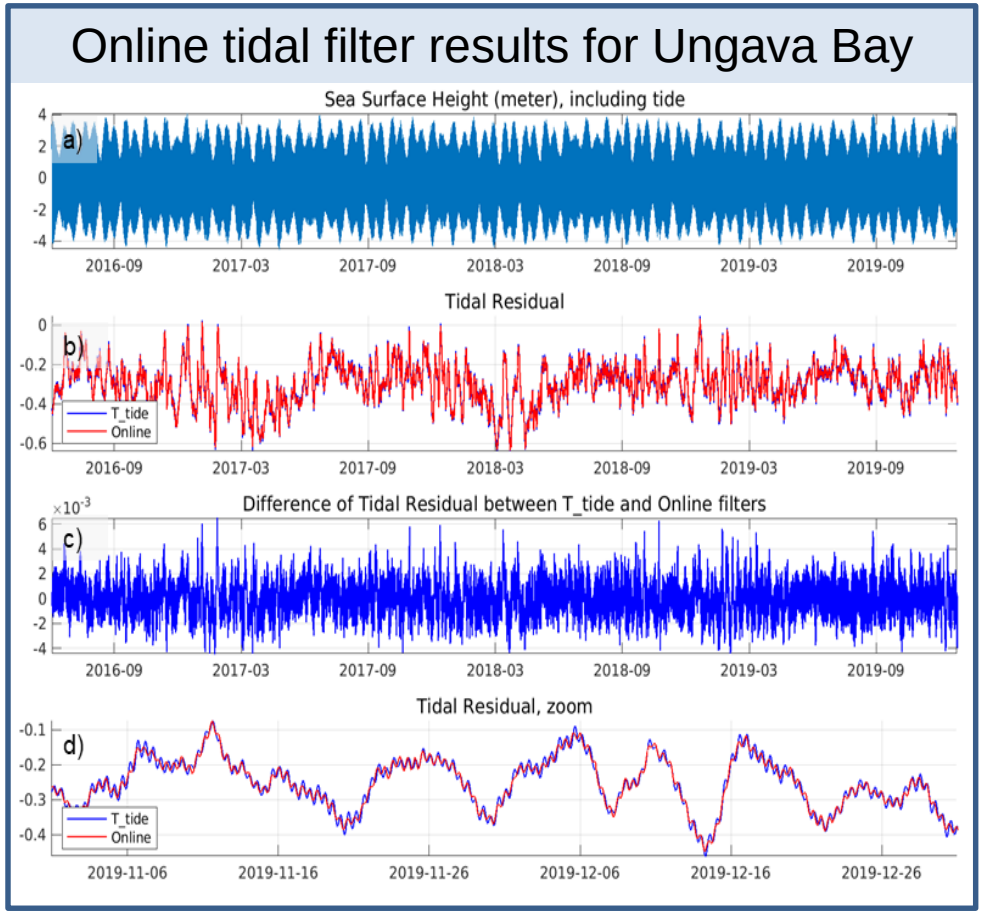
CONCEPTS OCEAN DATA ASSIMILATION



Canada has two operational ocean assimilation systems:

- GIOPS (1/4°)
  - Coupled A-I-O 10d, 16d and 32d fcsts
- RIOPS (1/12°)
  - 48hr Ice-ocean forecasts
- Data Assimilation
  - Multivariate SEEK filter (SAM2)
  - Background error from multi-year hindcast
  - Assimilates SLA, SST, in situ T/S profiles
  - Blended with 3DVar ice analysis (CIS charts, SSMI, SSMI/S, AVHRR, AMSR2)
  - 3DVar T/S bias correction
  - RIOPS includes tides and atm pressure
    - online sliding window tidal filter allows non-stationary tides (e.g. due to sea ice)

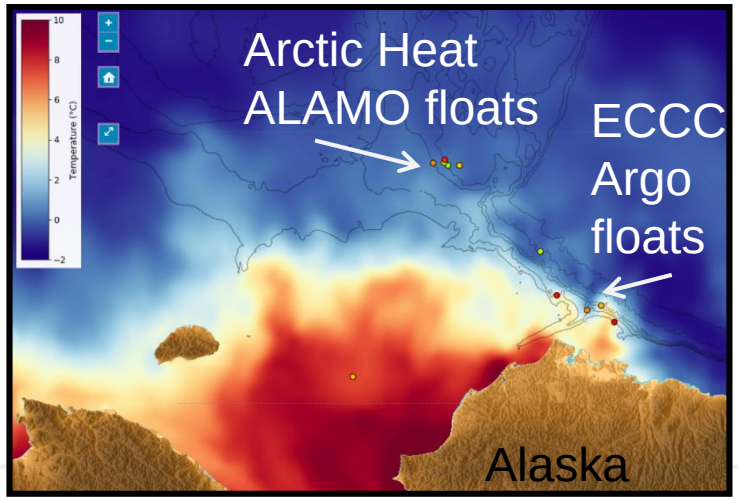
Smith et al. (2015, 2018, 2021)

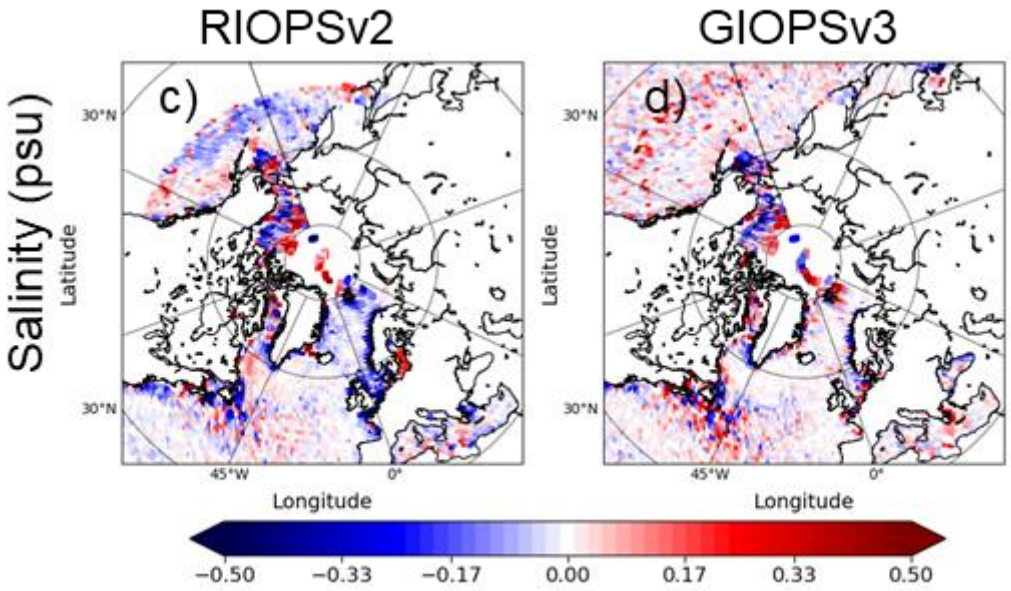


[G,R]IOPS = [Global, Regional] Ice Ocean Prediction System

ARCTIC OBSERVING SYSTEM EXPERIMENTS

- Despite addition of tides and k-ε vertical mixing scheme, significant errors remain in water mass properties in the Beaufort Sea
- These errors likely related to various sources
  - Model error, uncertainty in river runoff, atmospheric forcing, sea ice cover
- Take advantage of increase of in situ observations deployed for Year of Polar Prediction (2017-19), e.g.:
  - Argo – ECCC
  - ALAMO floats – ArcticHeat project (NOAA)





Innovation statistics of salinity over upper 500m for the period 2016 to 2019.

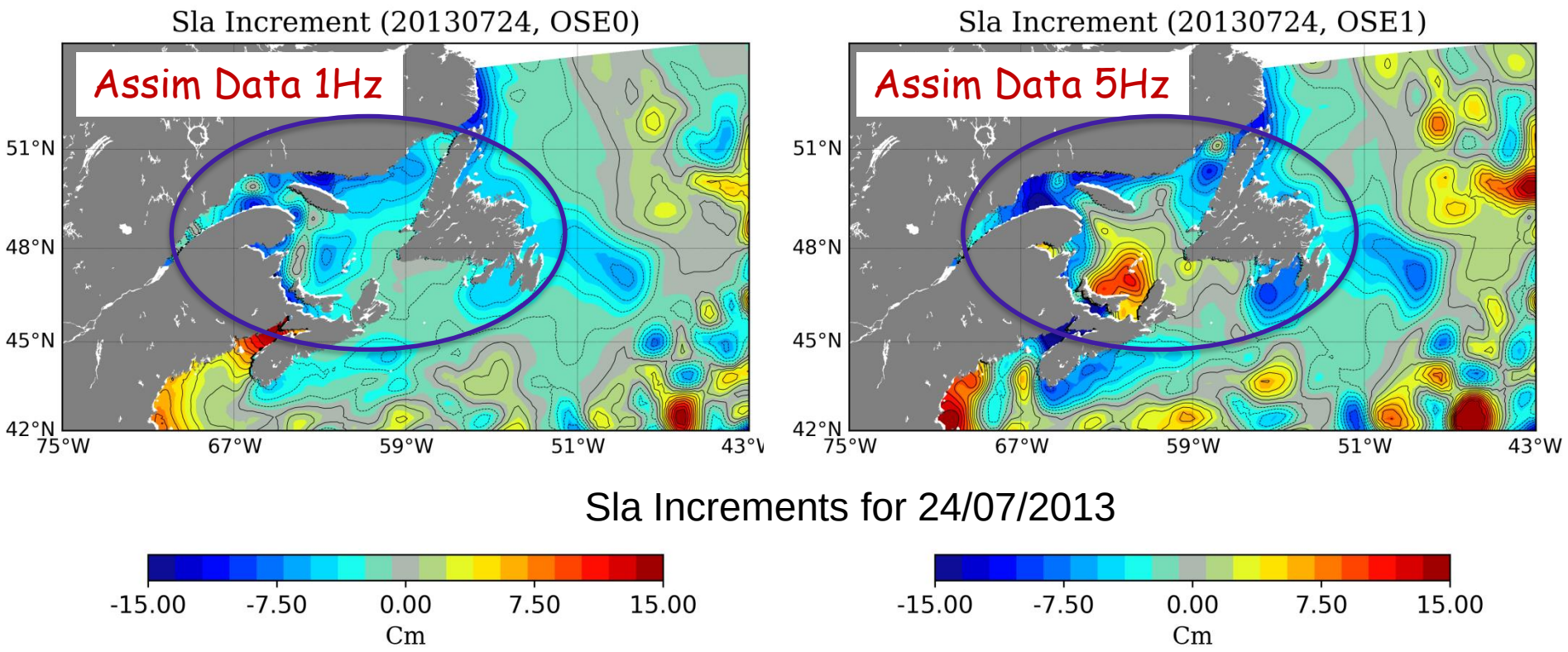
How can we make the best use of Arctic profile observations given their sparseness and seasonality?

Smith et al. (Frontiers, 2019)
Smith et al. (GMD, 2021)

OSE IN 1/12° COASTAL OCEAN DATA ASSIMILATION CONFIGURATION

IMPACT OF ASSIMILATING HIGH-RESOLUTION SEA LEVEL ANOMALY DATA

Collaboration with M. Benkiran (MOI)



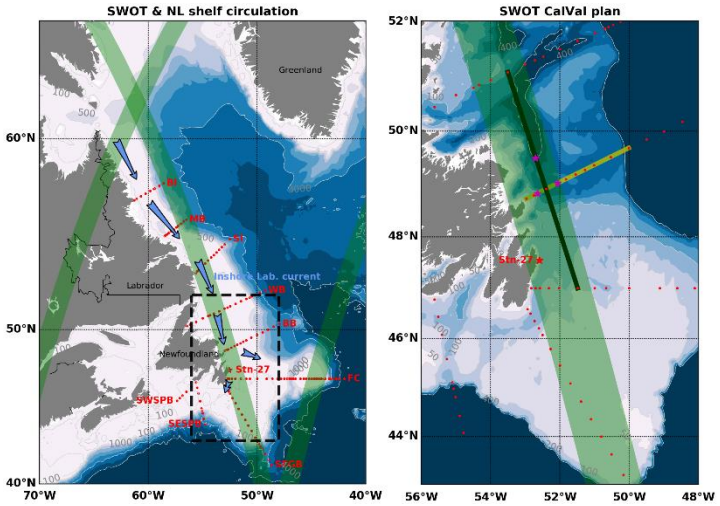
Sla : **High-Resolution Altimetry** (5Hz) :

- ✓ No jump at the limit of change of the data resolution
- ✓ Different correction in the Gulf of St. Laurence : more data along tracks
- ✓ More mesoscale structures in the increment

ASSIMILATION OF SWOT OVER THE NORTHWEST ATLANTIC OCEAN

Collaboration with Will Perrie (DFO)

- Evaluation using 1/36° Coastal Assimilation System
  - Gulf Stream region
  - Gulf of Maine, Gulf of St. Lawrence and Labrador Shelf
- Perform OSSE of SWOT data
  - Build on previous efforts (Carrier et al., 2016; Bonaduce et al., 2018; D'Addezio et al., 2019)
  - Use NATL60 (J. LeSommer) as Nature Run (Fraternal twin)
  - Synthetic obs using JPL SWOT Simulator
  - Assess benefits of multiscale approach and constrained scales
- OSE: SWOT Cal/Val swath on Labrador coast
  - Eval impact on eddies and surface currents using RCM



Han&Cyr Cal/Val Plan