LA-UR-21-23220
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Title: InteRFACE an Introduction

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Intended for: Presentation to the USGCRP Coastal Group

Issued: 2021-04-05

Interdisciplinary Research for Arctic Coastal Environments

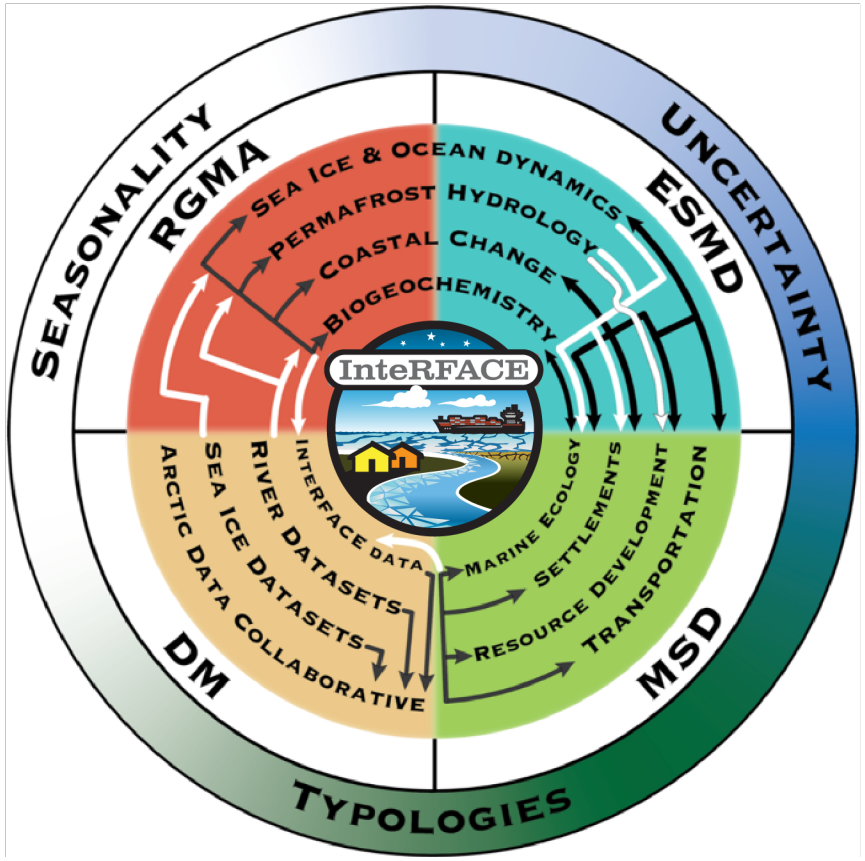
InteRFACE – A systems approach to Arctic coastal challenges

- Recognition that coasts bridge the intersection between land and ocean, and are critically important to humans

- Requires science that addresses coastal processes and ecosystems, upstream watersheds, ocean dynamics, and human activity

- Arctic is unique from all other coastal regions due to sea ice, permafrost, and sensitivity to global climate drivers and feedbacks.

Project Structure and Science



- Funded by Earth System Modeling and Data (Hnilo)
  - Model Analysis (Joseph)
  - Model Development (Davis)
  - Multisector (Vallario)
- Five institutions, UAF (21%) and NCAR joining 2021
- Four common earth science foci
  - Sea ice & ocean dynamics
  - Permafrost hydrology
  - Coastal change
  - Marine Biogeochemistry
- Integrated with four multisector foci
  - Transportation
  - Resource development
  - Settlements
  - Marine ecology

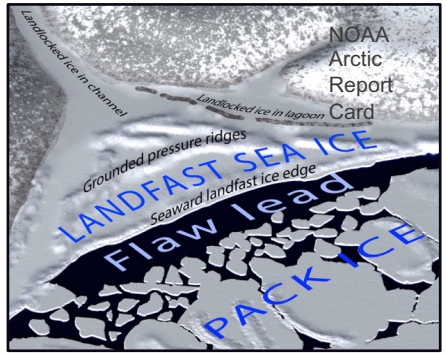
Data

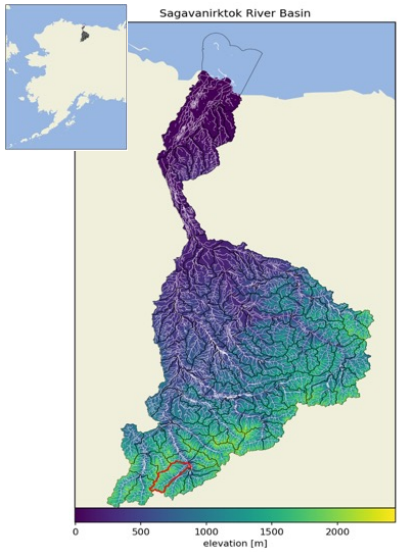
Los Alamos NATIONAL LABORATORY · OAK RIDGE National Laboratory · Pacific Northwest NATIONAL LABORATORY · Sandia National Laboratories · UAF UNIVERSITY OF ALASKA FAIRBANKS

Focused modeling for InteRFACE science

Multi-resolution Arctic focus

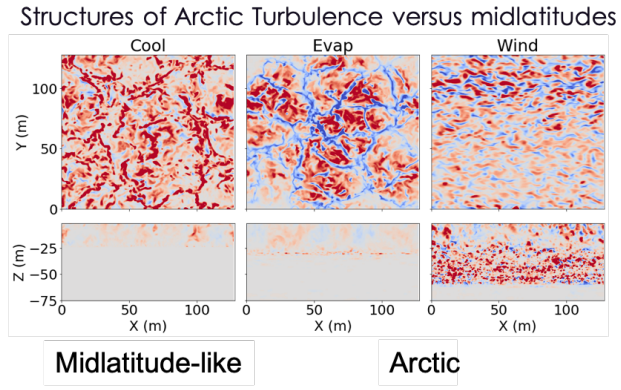
Landfast ice dynamics





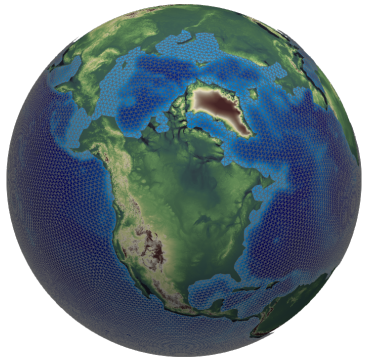
Multi-scale nested watershed modeling

Arctic mixing ocean parameterizations

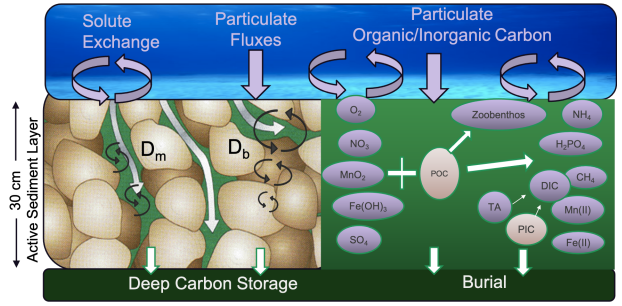


Shipping model for transport, trade, resource development

Incorporation of WaveWatch-E3SM for polar applications



Benthic biogeochemistry

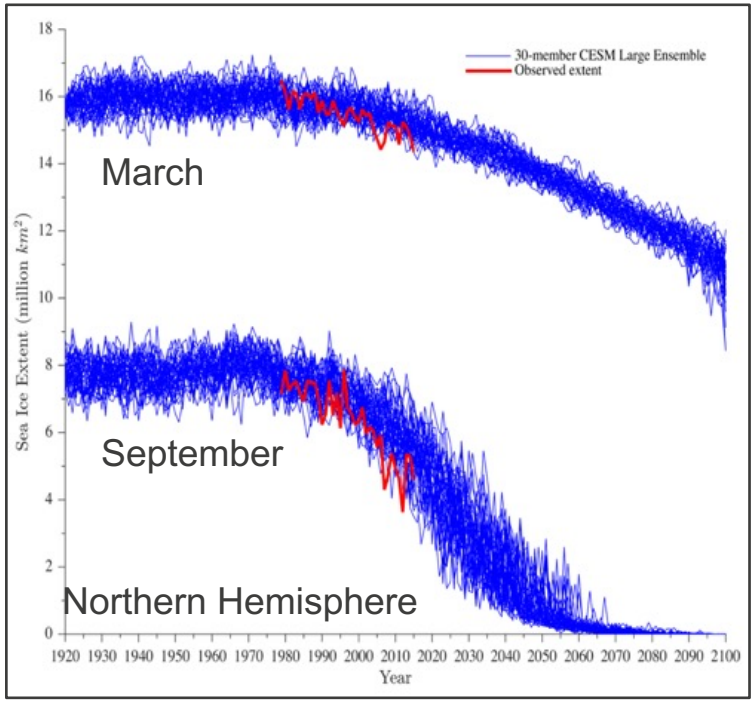


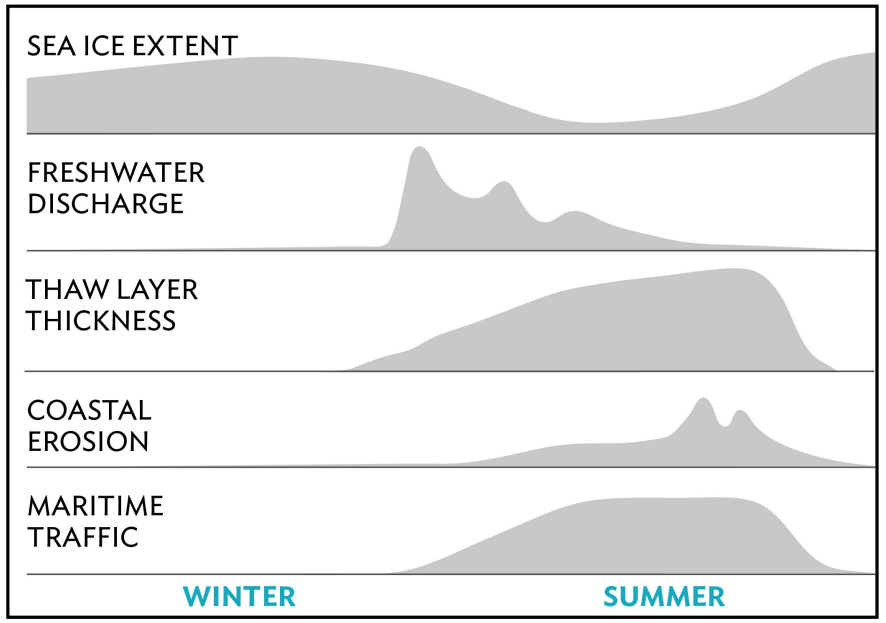
Integrating themes to guide cross-cutting science

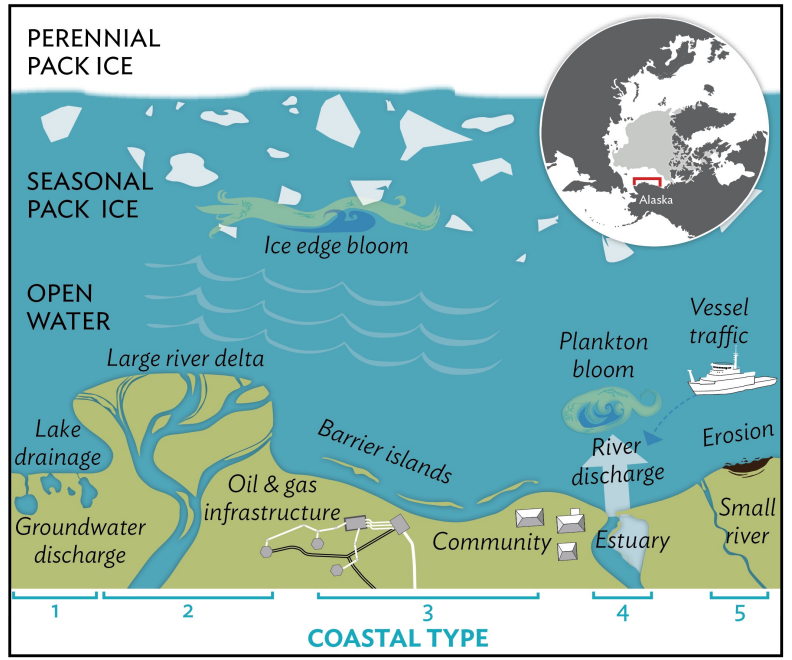
Uncertainty
Quantify the role of sea ice state and predictability on complex human system dynamics

Seasonality
Identify the impact of seasonality on coupled system responses across the land-ocean and natural-human interfaces.

Typologies
Characterizing regions of the Arctic based on a set of unique properties and dynamics.







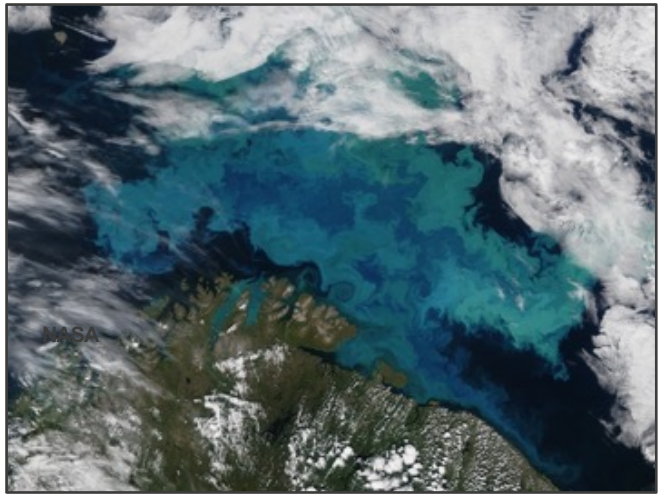
Goal: Identify and fill gaps in knowledge and predictive capabilities

Today's decisions requires knowledge to constrain possible trajectories of the coupled land-ocean-human interface over the coming decades

What are the key drivers that determine whether to harden or move a community?

How will sea ice loss impact the cost of resource extraction?

How will marine primary productivity impact food resources?



Phase I: Focused on Alaskan north slope

- Foundational for future work
- Significant opportunities for collaboration with DOE and non-DOE research programs
- Data-rich relative to other arctic regions
- Of vital national importance
- Offers strong opportunities to develop new observational efforts in the Arctic

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Active Collaborations

NASA ICESat-2 Assimilation: Bitz (U. Washington) and Petty (U. Maryland)

Arctic Maritime Spill Response Modeling Working Group on the Meter-Scale: Kinner (U. New Hampshire)

MOSAiC Observation Integrations into Models: Holland (NCAR), Smith (U. Washington), Hutchings (OSU)

Ocean Mixing: Pearson (OSU), Timmermans (Yale)

BOEM Landfast Ice Climatology: Mahoney (U. Alaska)

Partnership with Toolik Lake LTER, Cardenas (UT Austin)

MOSAIC Collaboration, Rob Rember (IARC)

NOAA – Alaska Mapping Executive Committee (AMEC), Kinsman

USGS – Coastal Climate Impacts Alaska, Pacific Coastal and Marine Science Center

Other DOE funded projects: **NGEE-Arctic, ICoM, E3SM, and HiLAT-RASM**