



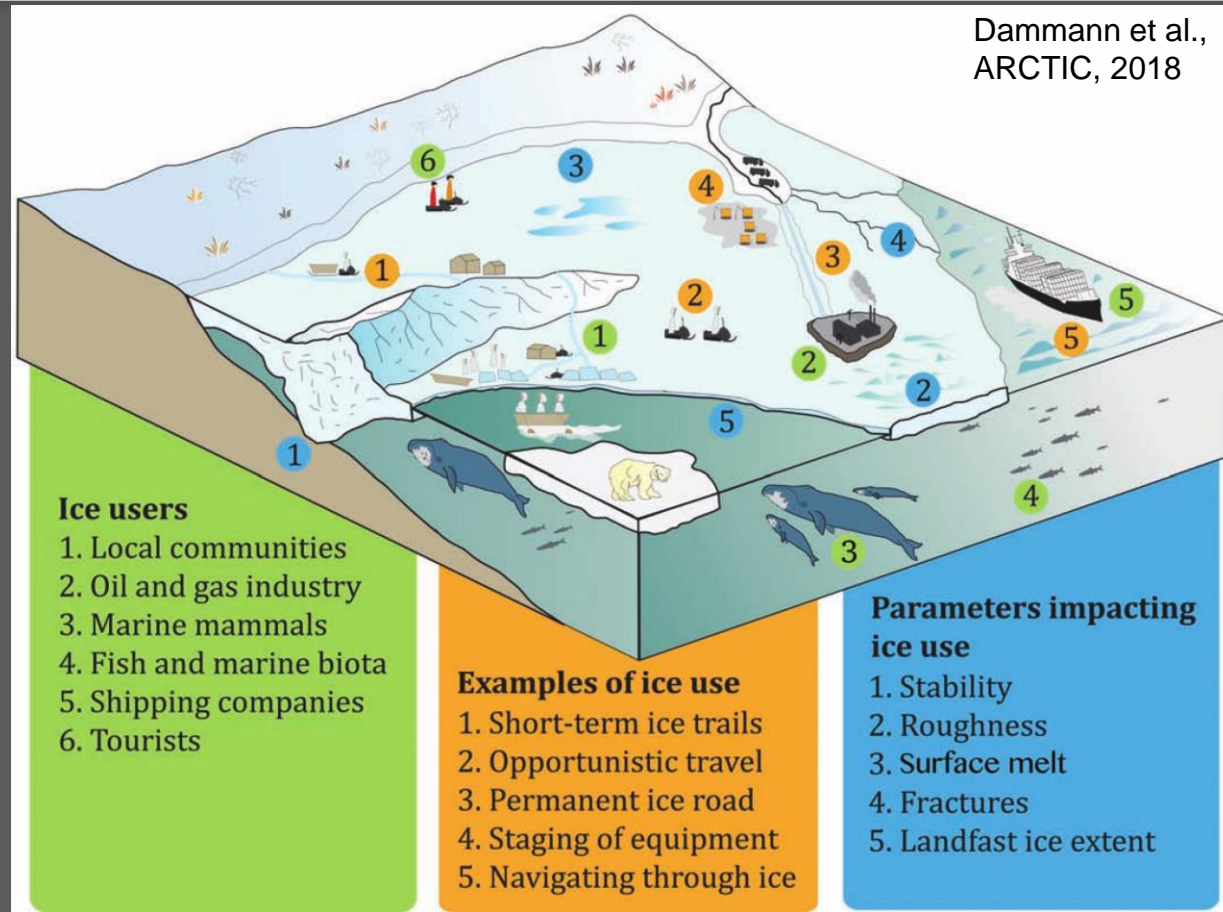
Arctic Alaska coastal processes: What a difference a datum makes

Hajo Eicken

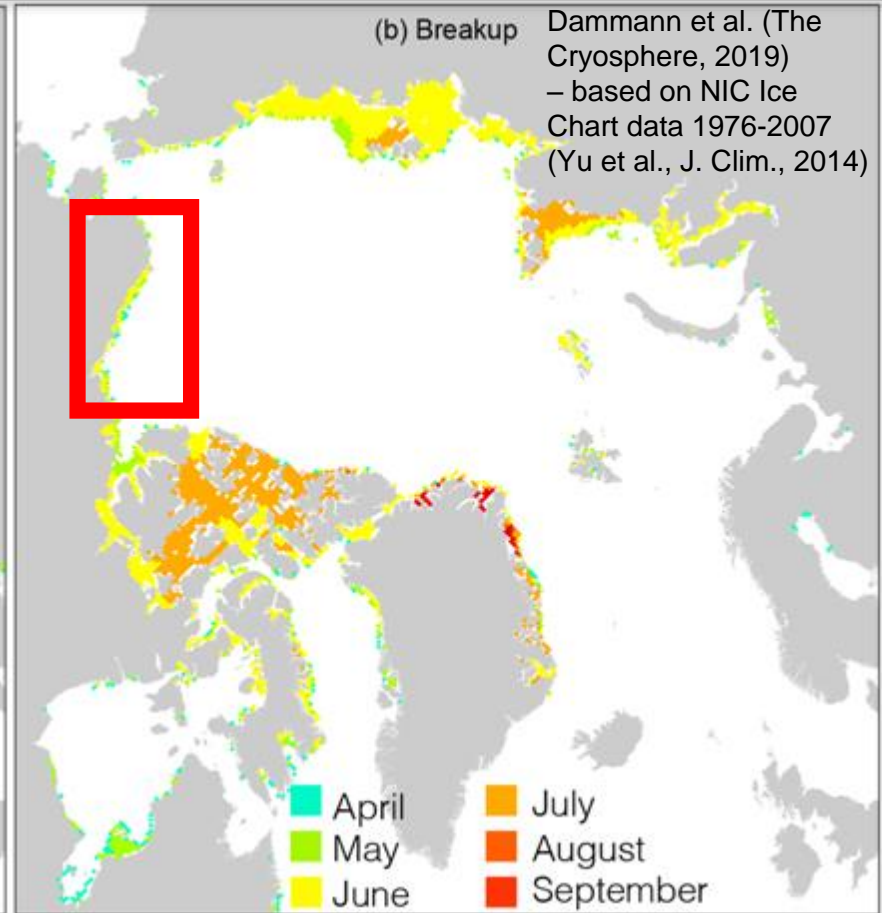
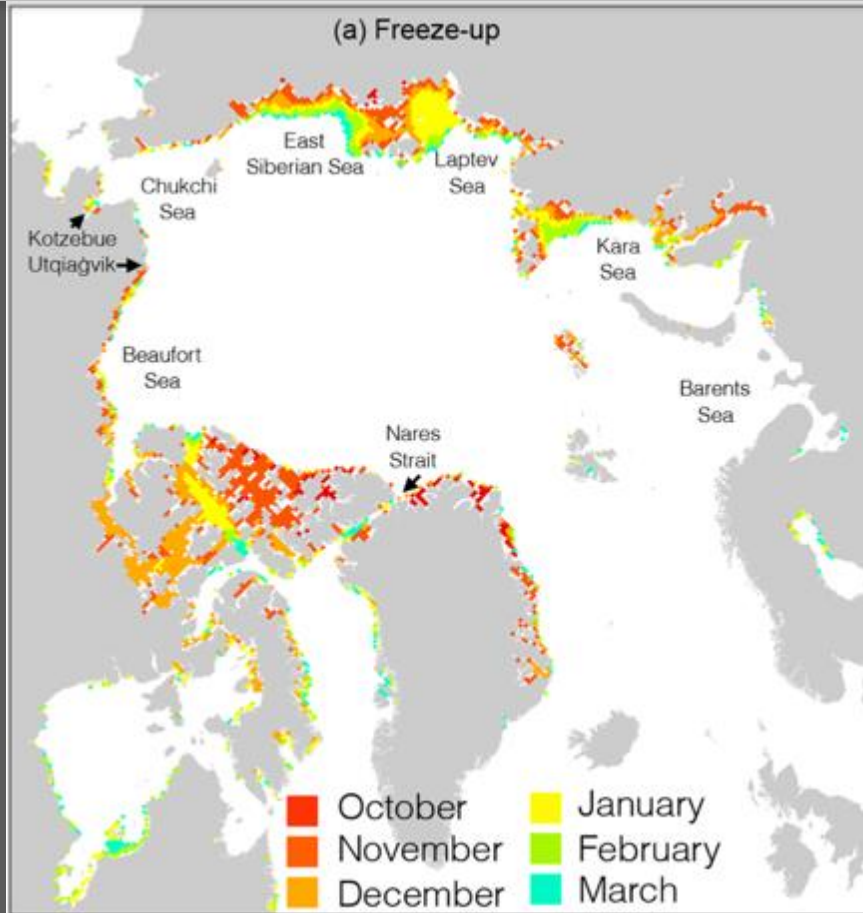
International Arctic Research Center • University of Alaska Fairbanks

The Arctic coast in winter: Landfast ice & ice uses

- Coastal landfast ice provides
 - *Transportation corridor for offshore installations & between communities*
 - *Important wildlife habitat*
 - *Platform for coastal community marine resource harvesting*
 - *Shoreline protection*
 - *Geologic agent*



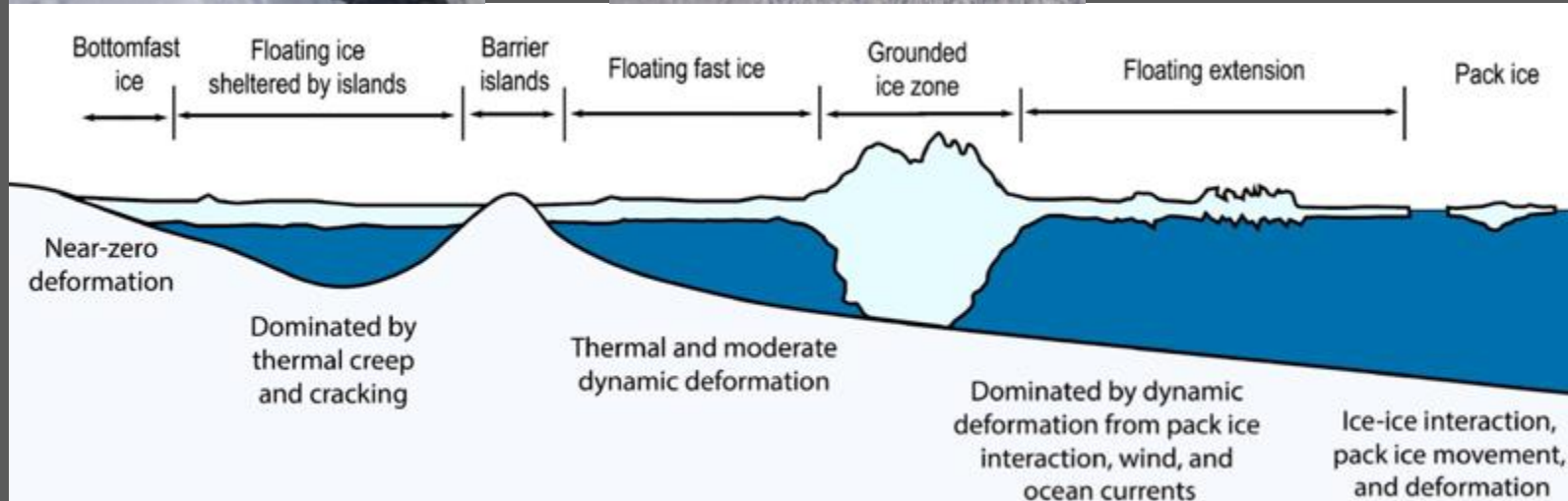
Seasonality & distribution of landfast ice

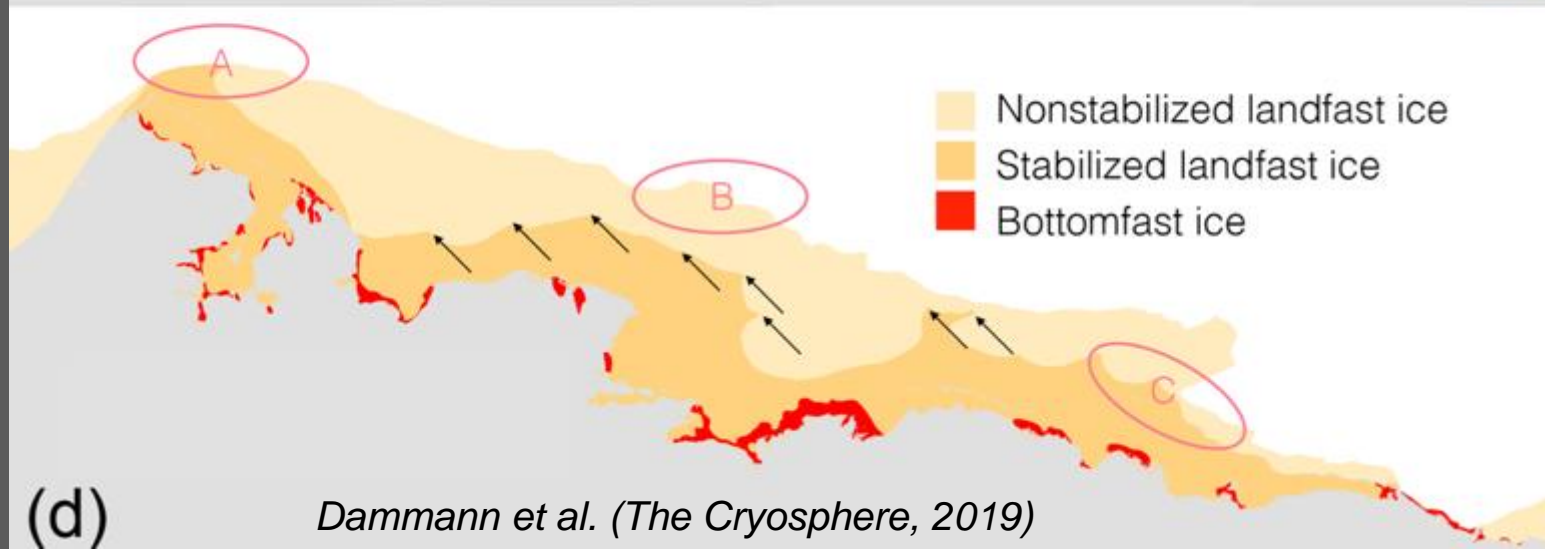
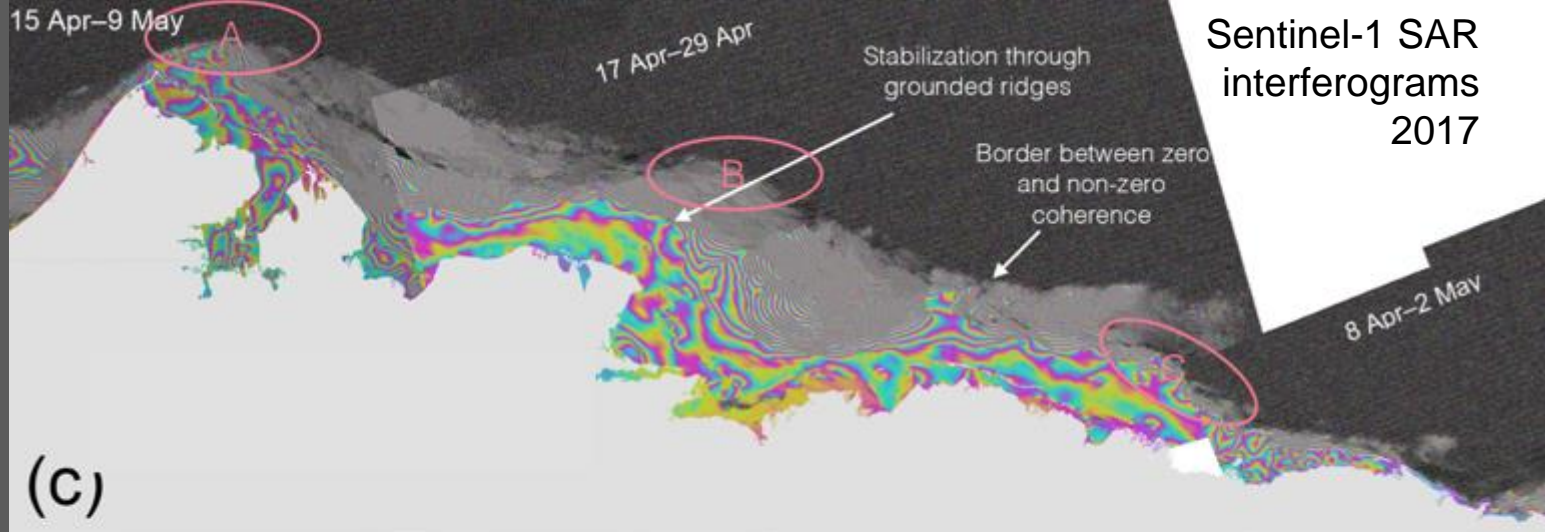


Coastal landfast ice zonation → Bathymetry & ice deformation

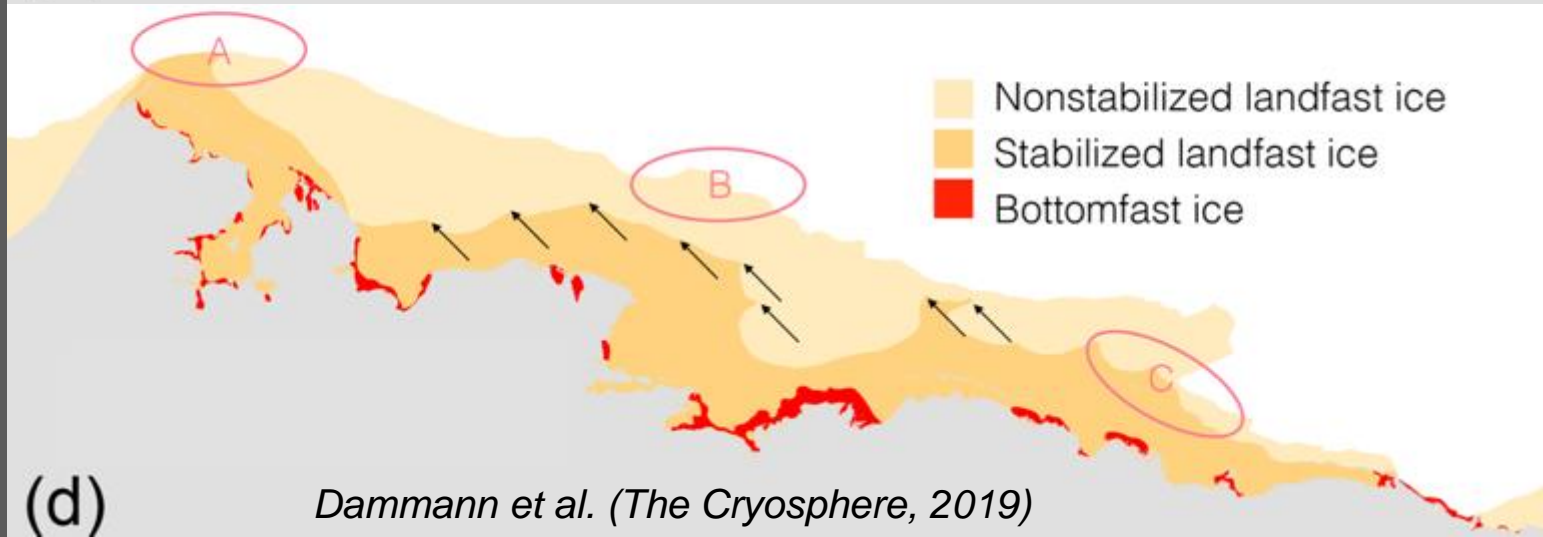
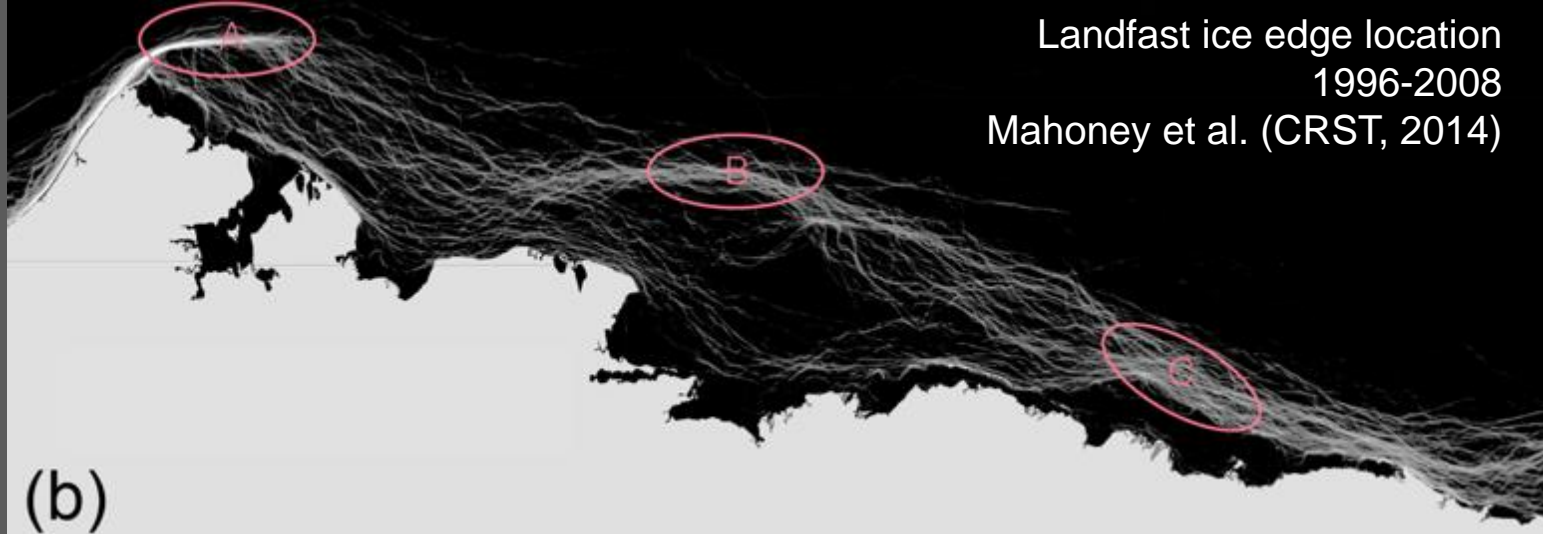


- Grounded ice critical in stabilizing landfast ice
→ Timing & ice use

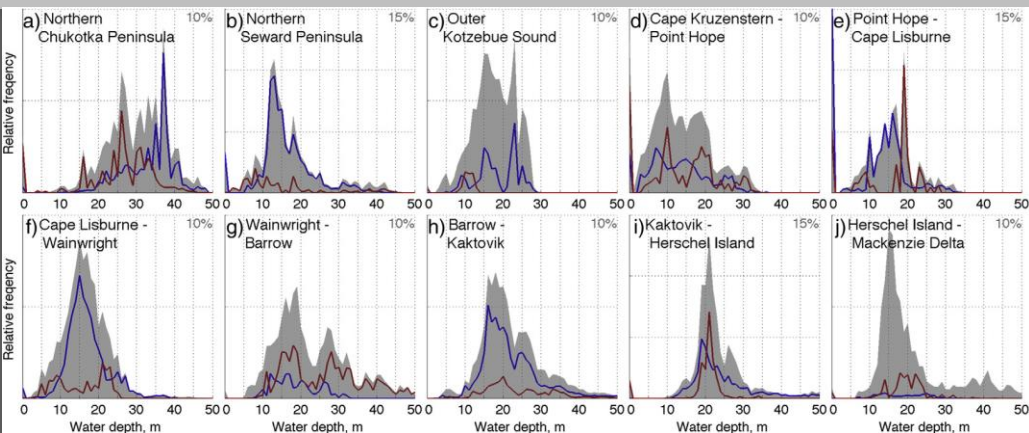




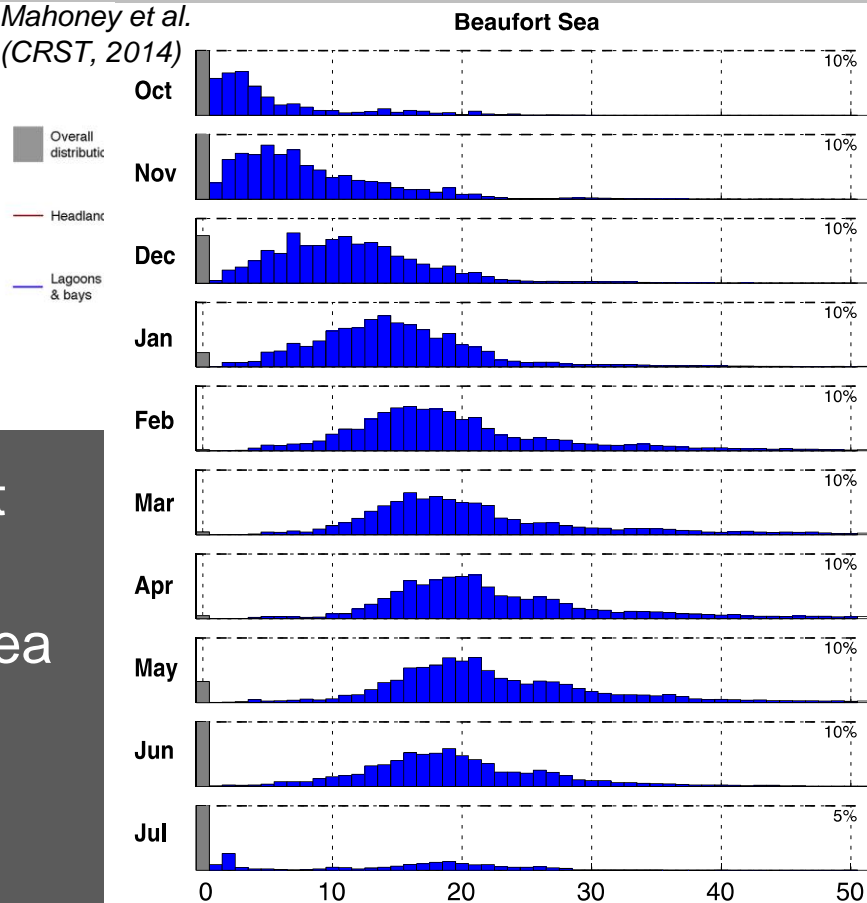
Dammann et al. (*The Cryosphere*, 2019)



Location of landfast ice edge constrained by bathymetry



Mahoney et al.
(CRST, 2014)



- Landfast ice extends out to isobath that allows deformed ice to ground
- Critical water depth 20 m in Beaufort Sea
10 m in Bering Sea
- Critical water depth function of ice thickness and shelf morphology

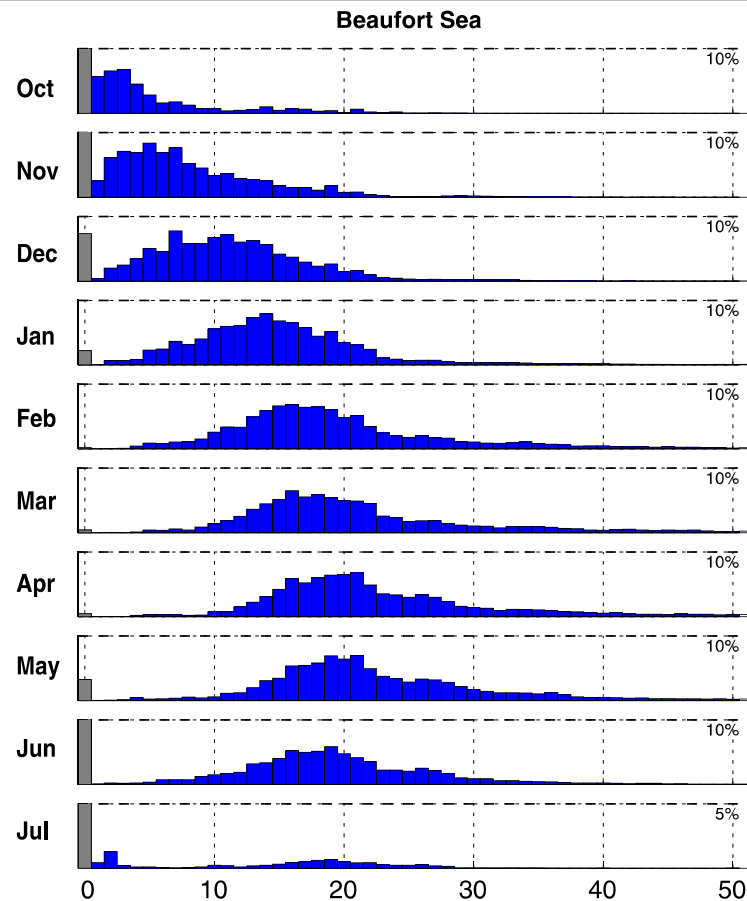
Location of landfast ice edge constrained by bathymetry

NOAA North Slope Saildrone Survey to Update Nautical Charts

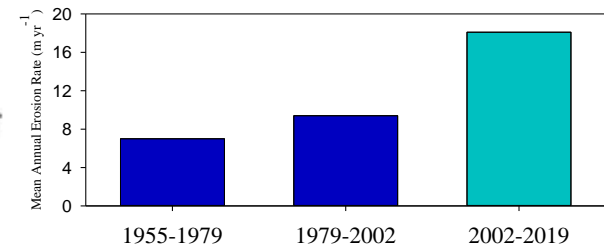
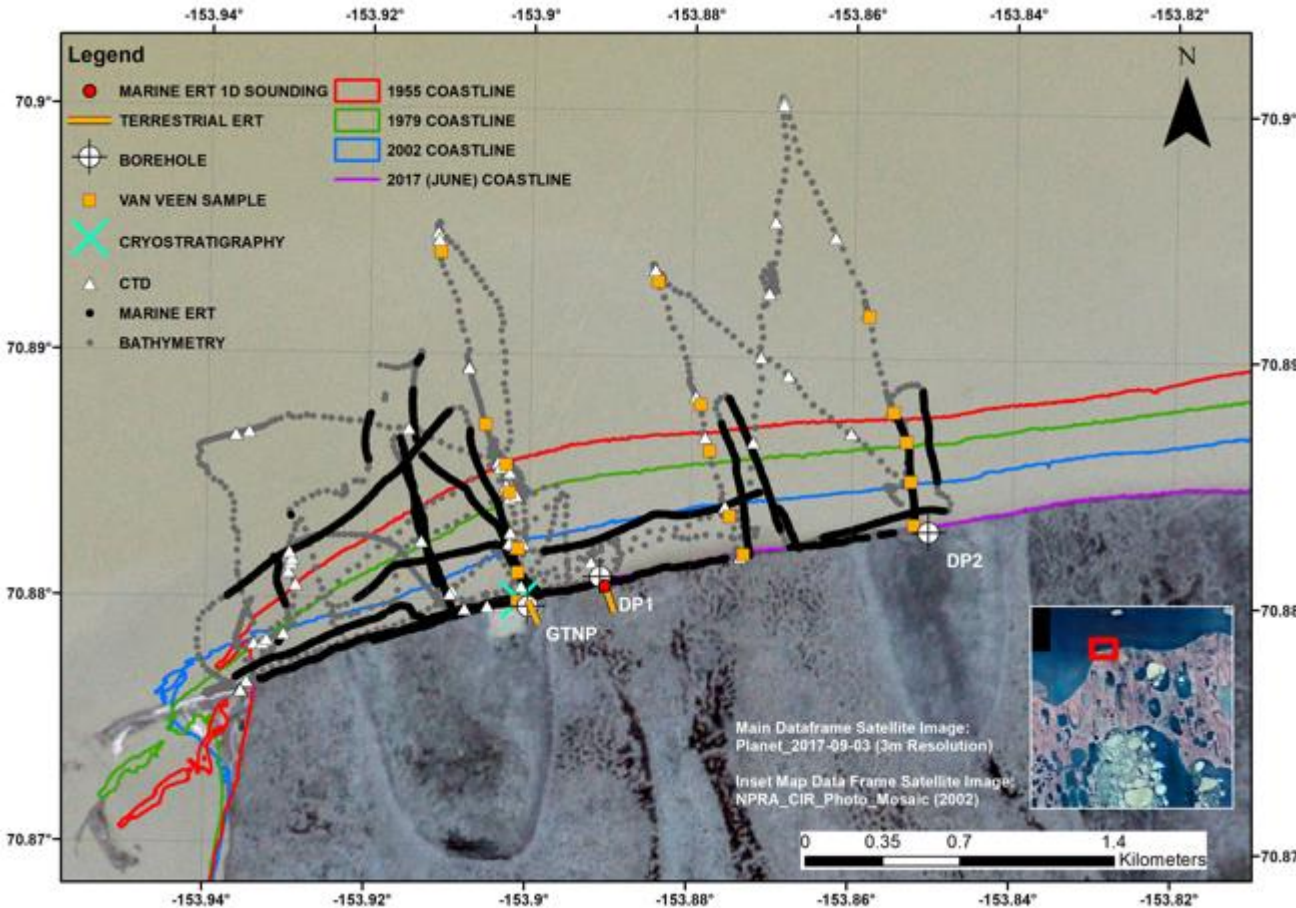
NOAA Office of Coast Survey Project Number: S-R364-KR-20

Overview

From August to October, NOAA's Office of Coast Survey will operate four Saildrones in the Alaskan Arctic to update the nautical chart and improve general understanding of ocean depths in the region. These four Saildrones will travel in pairs to survey and develop the 20 meter (65 foot) and 50 meter (164 foot) contours. The survey will start offshore of Point Hope and extend eastward to the Canadian Border before returning to Point Hope.



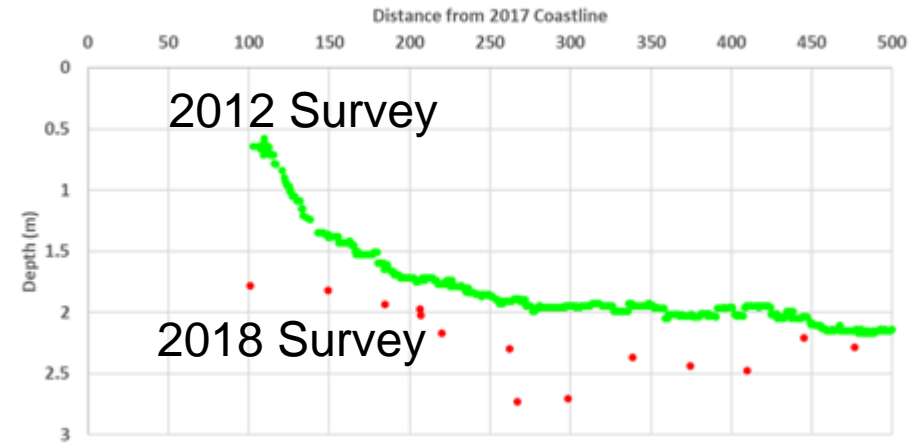
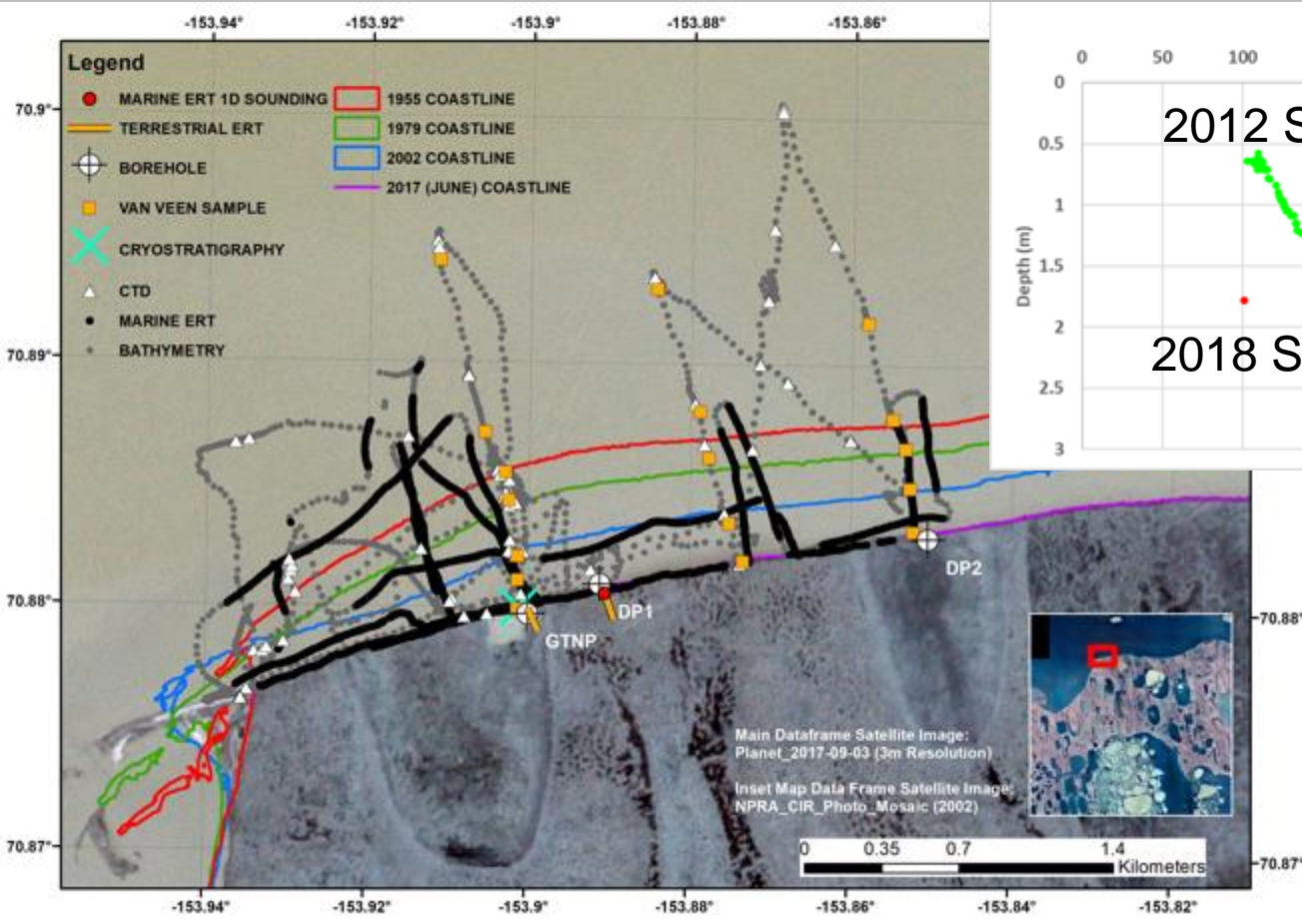
Rapid coastal change & permafrost thaw



Ben Jones (UAF) & collaborators:

- Rapid coastal retreat due to permafrost thaw in ice-rich coastlines
- Subsea permafrost thaw contributing factor?

Rapid coastal change & permafrost thaw



Ben Jones (UAF) & collaborators:

- Subsea permafrost thaw contributing factor?

Layers

▼ Bathymetric Surveys

- ☒ Multibeam Surveys [?](#)
- ☒ Multibeam Bathymetry Mosaic [?](#)
- ☒ NOAA NOS Hydrographic Data: [?](#)
 - ☒ All Surveys with Digital Data
 - ☐ Surveys with Bathymetric Attributed Grids (BAGs)
 - ☐ Surveys without Digital Data
- ☐ BAG Footprints [?](#)
- ☐ BAG Color Shaded Relief [?](#)
- ☒ Single-Beam Surveys [?](#)
- ☒ Single-Beam Sounding Density [?](#)

[?](#)

▼ Digital Elevation Models

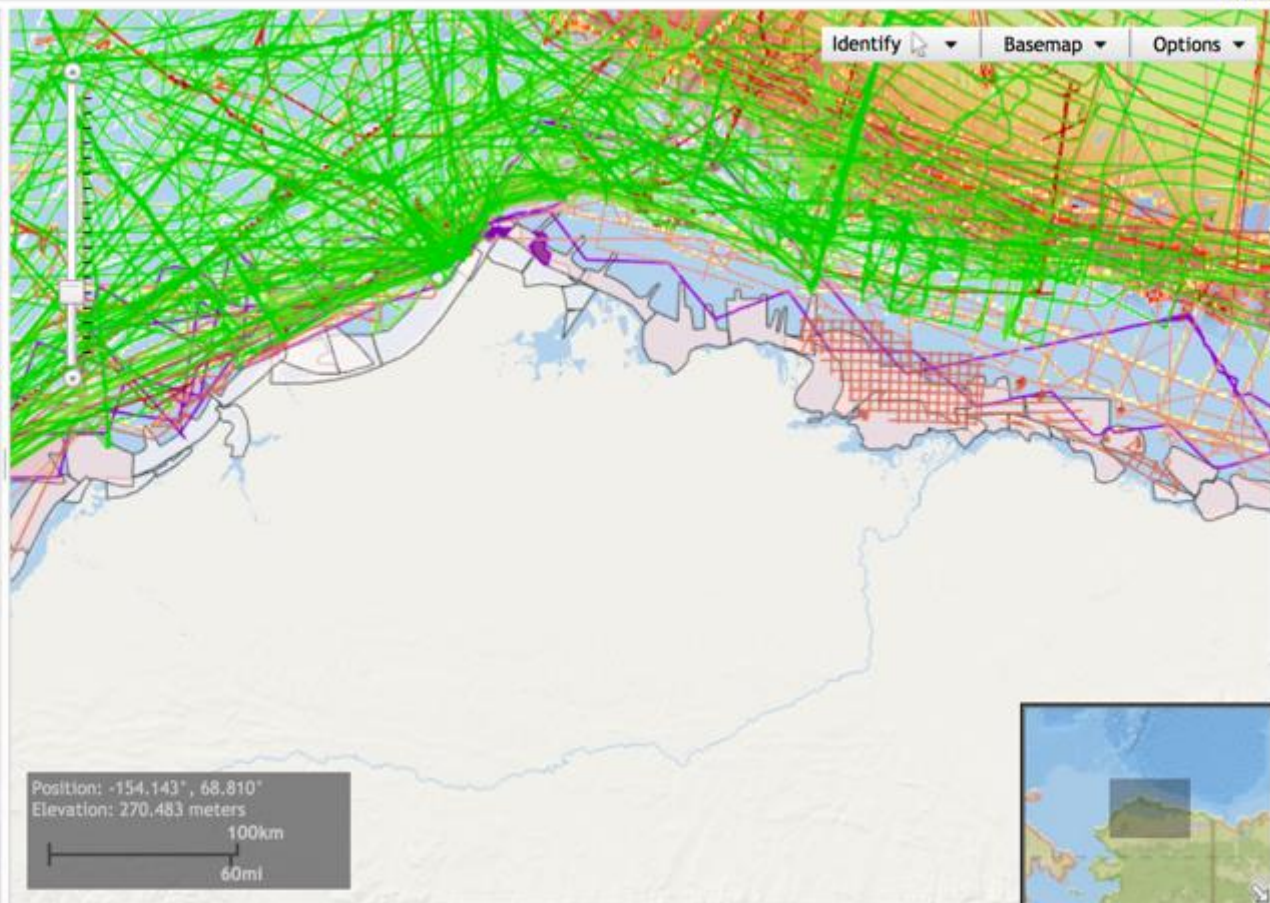
- ☐ DEM Footprints [?](#)
- ☐ DEM Color Shaded Relief [?](#)
- ☒ All DEMs
- ☐ Newer Tiled DEMs

▼ Coastal Lidar

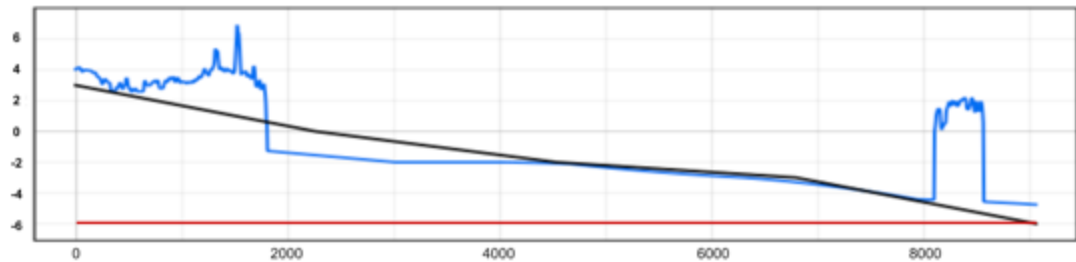
- ☐ Topo-Bathy/Bathy Lidar Datasets [?](#)

More Information

Help



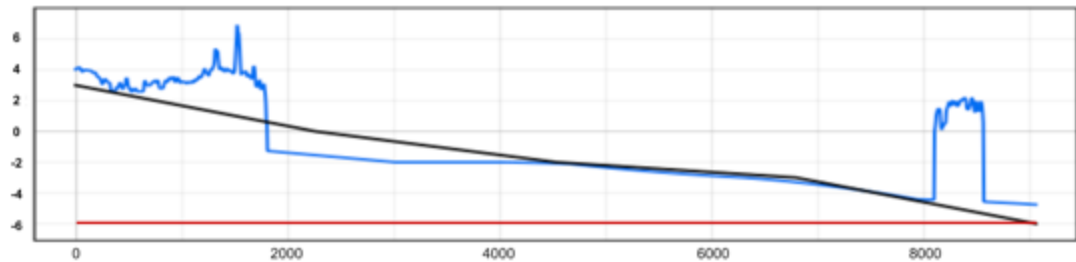
Resolving nearshore bathymetry critical to inundation modeling



Alexeev & Bennett (IARC, UAF):

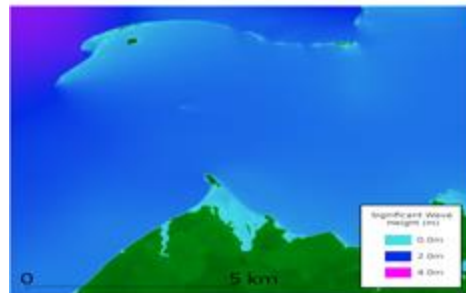
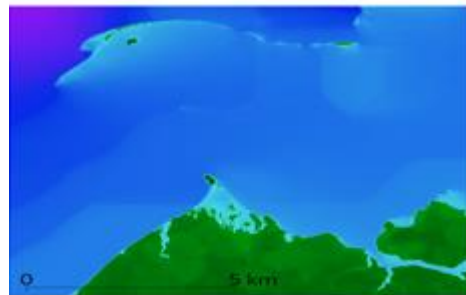
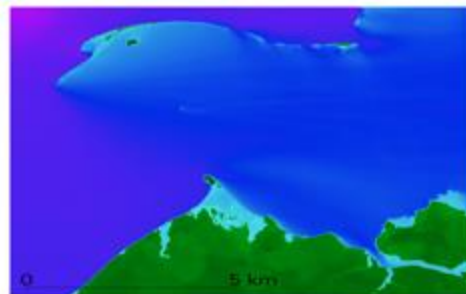
- Resolution of nearshore bathymetric data sets (flat, stepped or smoothed) determines extent of coastal flooding
- Example for Oliktok Pt., Alaska: Smoothed data show greatest extent of inundation during simulated storm run-up event

Resolving nearshore bathymetry critical to inundation modeling

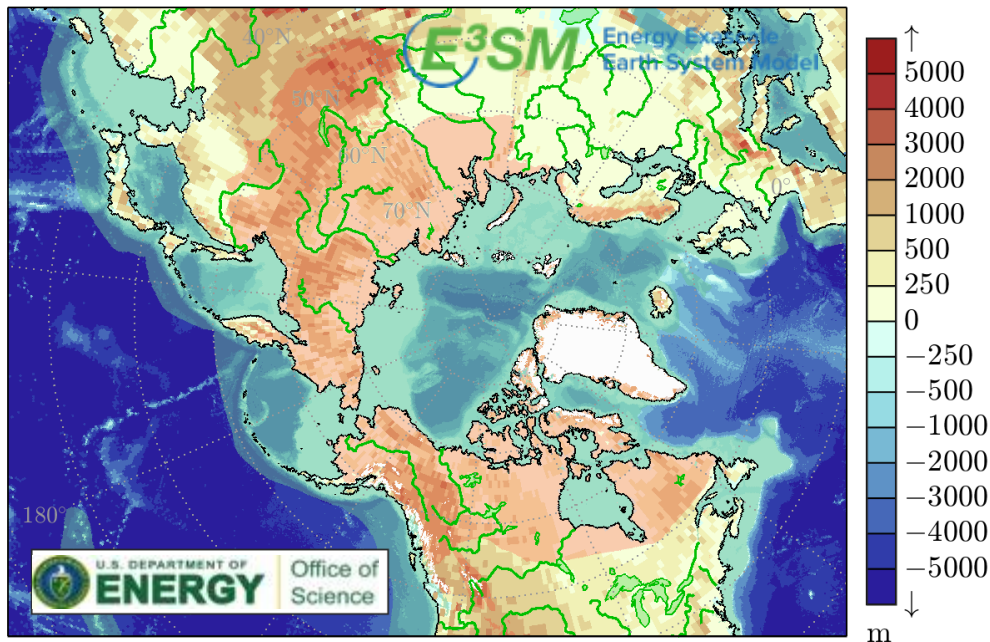
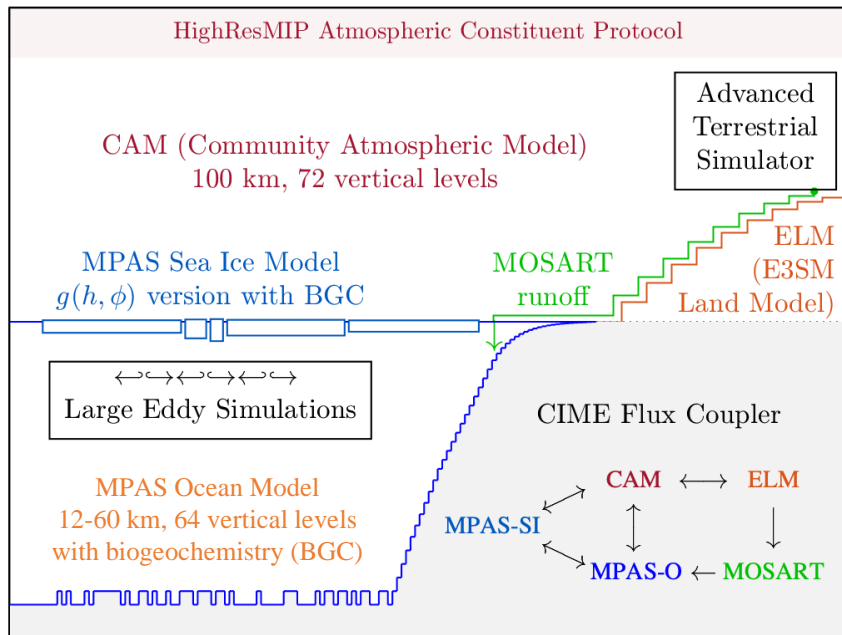


Alexeev & Bennett (IARC, UAF):

- Wave height also strongly dependent on resolution of bathymetric data
- Wave & coastal inundation models can help prioritize acquisition of new bathymetry data



Broader model-based guidance for bathymetric data acquisition



- Modeling frameworks (such as DOE Earth System Model E3SM) can help guide bathymetric data acquisition → Capturing critical oceanographic transport processes, sea ice features, coastal erosion