



Developing seasonal forecasting capability to support on-ice operations at Liberty site, Alaska

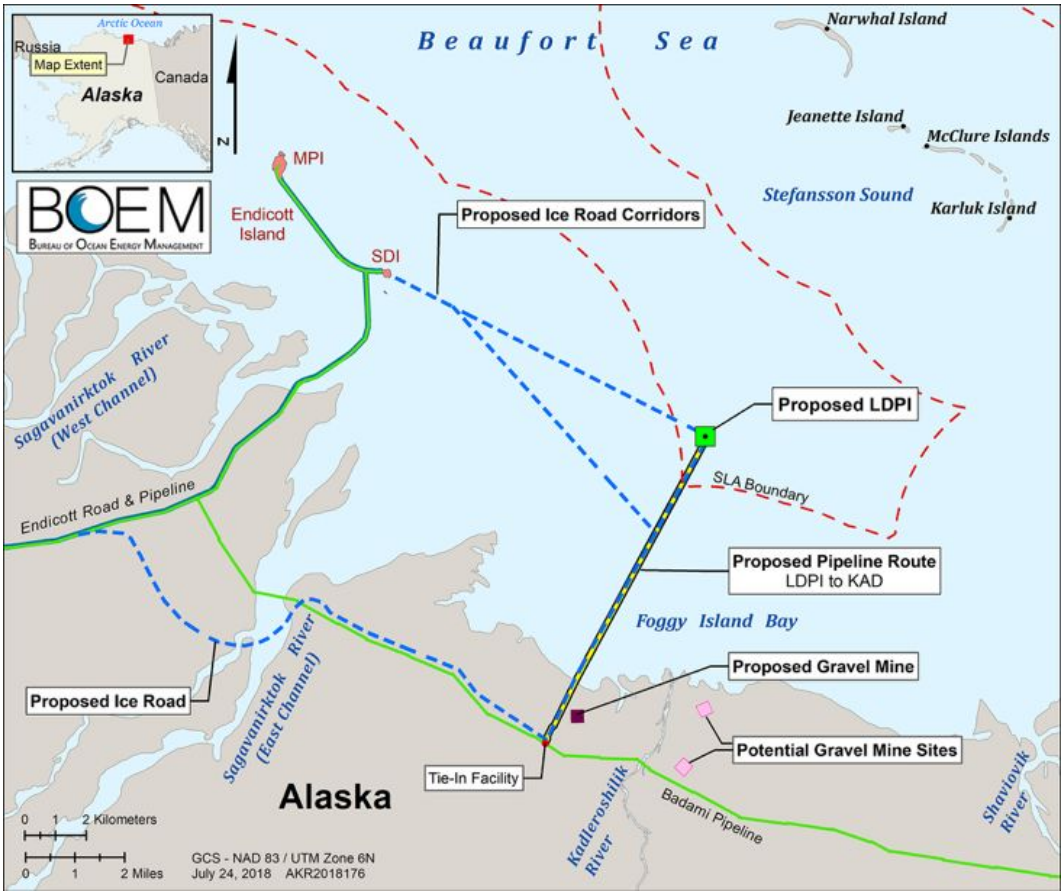
Climate Diagnostics and Prediction Workshop
October 21, 2020

Peter Bieniek, Hajo Eicken, Meibing Jin, Andy Mahoney, Josh Jones, Uma Bhatt

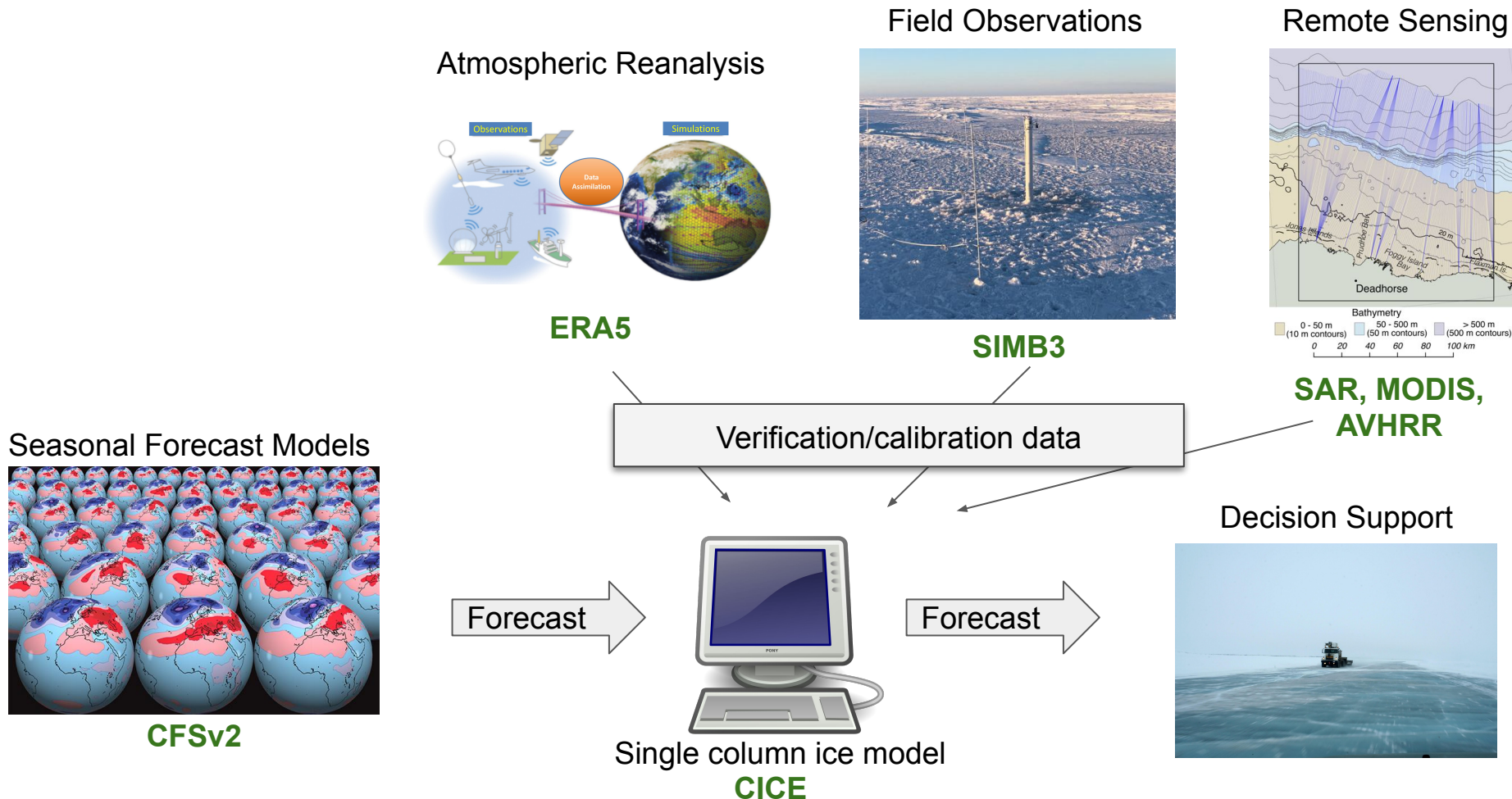
Funded by: Hilcorp Alaska LLC

Long-range ice forecasts could aid operations at Liberty

- Hilcorp Alaska LLC plans to build a gravel island and infrastructure at Liberty
- Ice roads needed to support construction and operations
- Long-range (subseasonal to seasonal) sea ice forecasts could aid planning and decisions on when to start/stop ice road operations

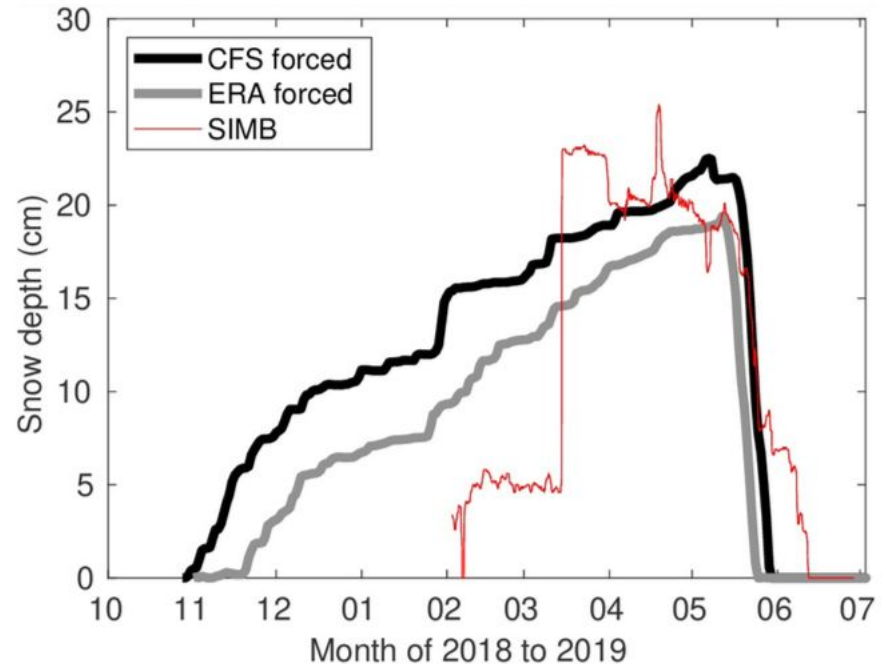
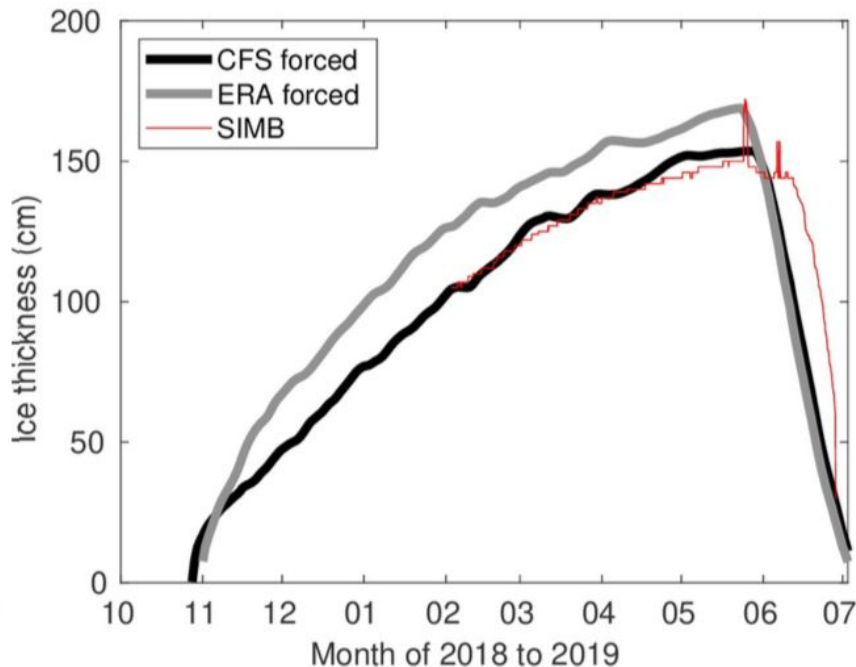


Forecasting requires integration of field observations, remote sensing and models



- Long-term in-situ observations not available at Liberty
- Location not adequately resolved in existing forecast models
- Multiple data sets and an ice model employed to establish/test forecasts

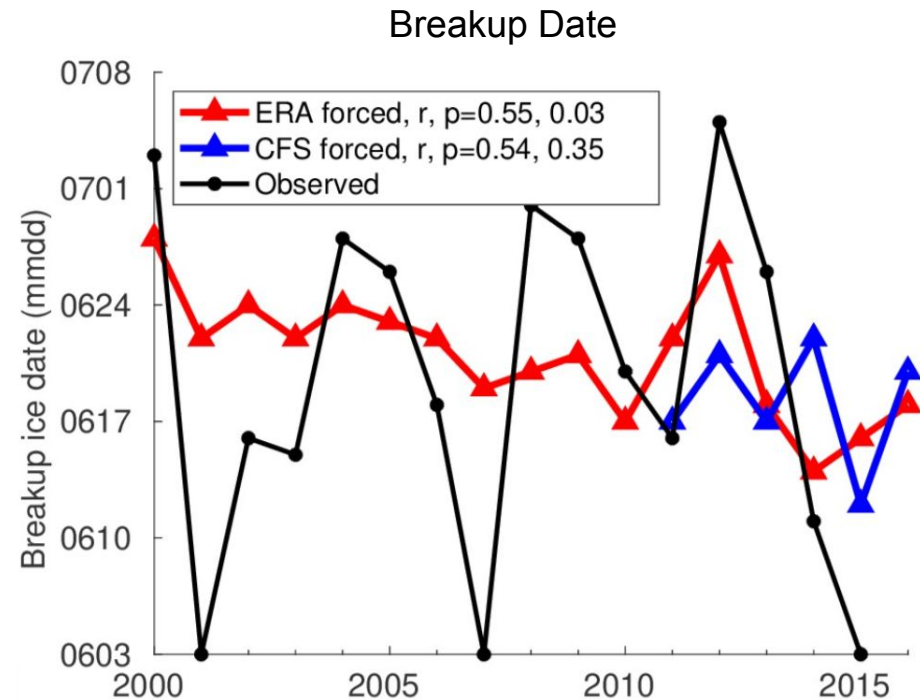
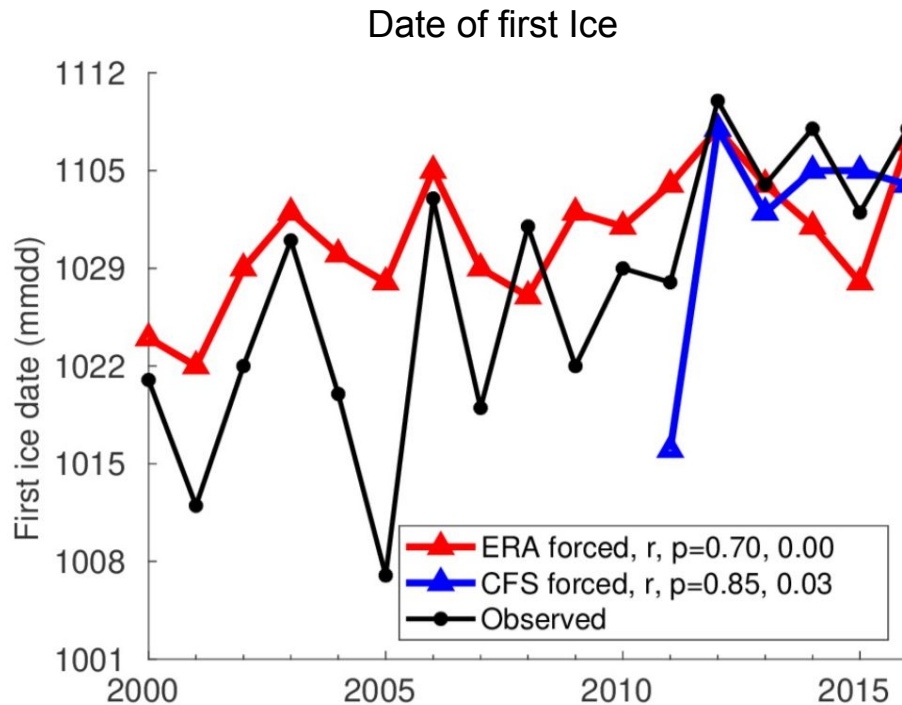
Single column ice model performed well in 2019



SIMB=Seasonal Ice Mass Buoy

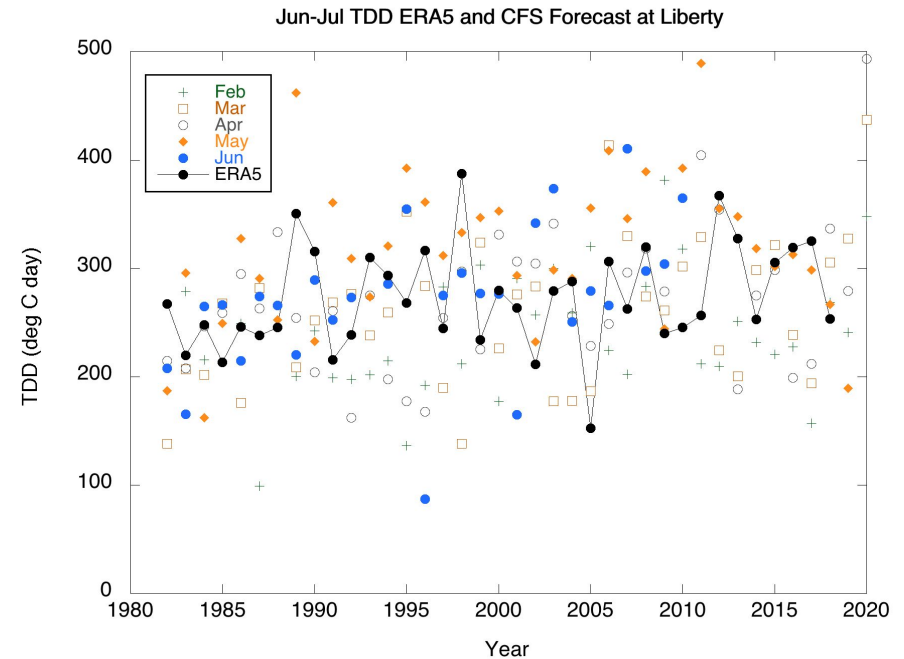
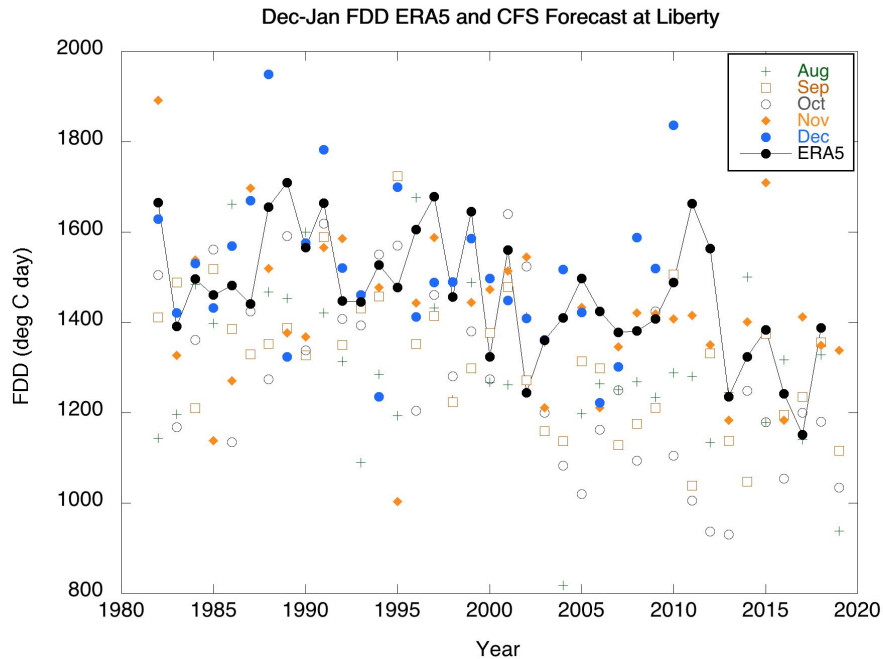
- Initial tests using the ERA5 reanalysis for winters 2018 (not shown due to short record) and 2019 compare well (see “ERA” gray line) with the SIMB ice thickness measurements (red line)
- Seasonal forecasts from CFSv2 (i.e. “CFS” black line) will need to accurately capture snow depth to predict ice thickness
- Initial seasonal forecast test started in November track observations fairly well

Model captures observed first ice date, breakup is more challenging



- Broader testing shows promise when comparing first ice and breakup date parameters for model based on the ERA5 reanalysis (i.e. modeled but based on observed meteorological conditions), seasonal forecasts and satellite observations
- Satellite observations at different scale than model data so comparison is challenging

CFS has better skill with Dec-Jan Freezing Degree Days than Jun-Jul Thawing Degree Days



- Correlation ERA5 vs. CFS higher for Dec-Jan FDD than Jun-Jul TDD

Thawing Degree Days (TDD)
Freezing Degree Days (FDD)

Summary and next steps

- Single column model captures the observed ice thickness for winter 2019 when run with reanalysis.
- Seasonal forecasts show promise but more analysis is needed to assess their skill - CFS struggles to capture observed FDD and TDD during critical months
- Comparing remote sensing data and single column results is challenging since the data represent different aspects of the sea ice

Next Steps:

- Expanded evaluation of seasonal forecast model skill
- Revisit remote sensing product to refine the data for Liberty
- Examine skill in forecasting ice thickness