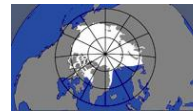


# Summary of the FAMOS workshop

# Forum for Arctic Ocean Modeling and Observational Synthesis (FAMOS), 2-4 November, Woods Hole, MA

- Meeting to foster collaborations among modelers, theoreticians and observationalists
- Working groups:
  - Arctic Climate Response Functions
  - Bio-Geo-Eco
  - Eddies/Mixing/Internal Waves
  - Greenland & Gyres
  - [Sea ice](#)
  - General (ocean) circulation
  - Regional-scale oceanography and ice-ocean interactions



FAMOS

- The “sea ice” group split into 3 teams
  - **Ice predictions**
    - Ice modeling
    - Ice observations and climatology
- The ice predictions group came up with a few ideas..

# Community input on stakeholder needs for sea ice predictions (leader J. Stroeve)

- **Goal: What should we predict and what can we predict?**
- Reach out to stakeholders through online survey for initial input:
  - E.g., Shipping, Oil Drilling, Tourism, Fishing, hunters, Erosion predictions, Arctic council, local transport needs, etc
  - which variables, for which period, how defined, what accuracy/probability
  - Timeline: Send survey in Spring 2017
- Workshop to bring the forecasting community together with stakeholders to better define what metrics they want forecasted
  - obtain new NSF funding or SIPN/SIPN2 funding.
  - Host workshop at Fall 2017 AGU meeting
- EOS paper discussing the needs of stakeholders and what scientists can realistically provide (probabilistic forecasts).

# Sea Ice prediction metric intercomparison

(leader A. Jahn)

- **Goal: Intercompare different metrics for evaluating sea ice predictions**
- Search literature for sea ice prediction metrics that have been developed
- Apply to set of existing sea ice simulations:
  - We have sea ice thickness and concentration from 8 models (with > 7 ensembles each) from a model-intercomparison experiment where sea ice thickness was perturbed for 2015
  - Also have many MITgcm simulations for 2005 we can analyze

# Sea Ice prediction metric intercomparison

(leader A. Jahn)

- **Goal: Intercompare different metrics for evaluating sea ice predictions**
- **Timeline:**
  - Literature search this fall, collecting different existing metrics (**and code**)
  - Discuss again at Polar prediction workshop in March 2017 in Bremerhaven and/or webinar in April 2017
  - Start analysis spring 2017-early 2018
  - Preliminary results by FAMOS 2017
  - Website with list of metrics and their attributes and their code
  - Synthesis paper on outcome of results and recommendations in 2018



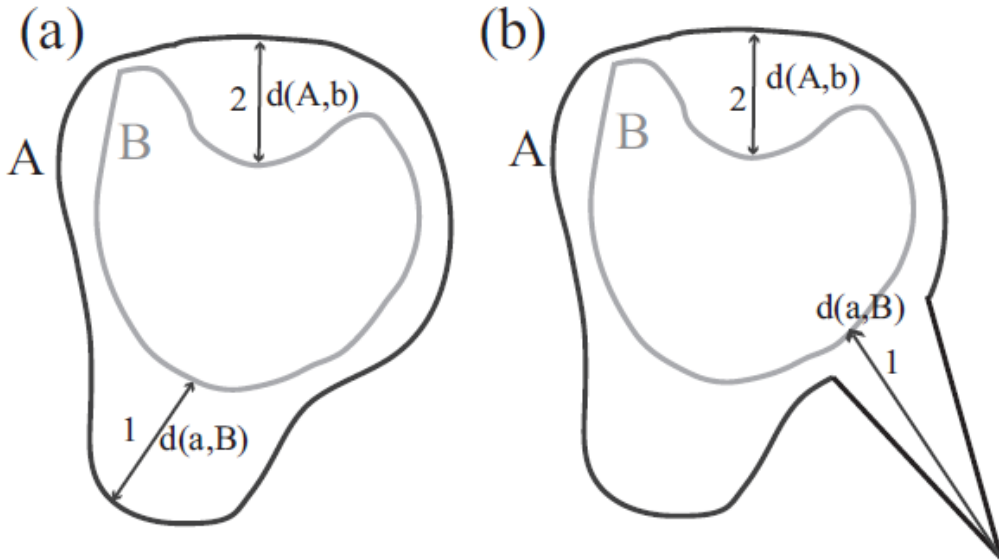
RESEARCH ARTICLE

Skill metrics for evaluation and comparison of sea ice models

10.1002/2015JC010989

Dmitry S. Dukhovskoy<sup>1</sup>, Jonathan Ubnoske<sup>1</sup>, Edward Blanchard-Wrigglesworth<sup>2</sup>, Hannah R. Hiester<sup>1</sup>, and Andrey Proshutinsky<sup>3</sup>

<sup>1</sup>Center for Ocean-Atmospheric Prediction Studies, Florida State University, Tallahassee, Florida, USA, <sup>2</sup>Department of Atmospheric Sciences, University of Washington, Seattle, Washington, USA, <sup>3</sup>Department of Physical Oceanography, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts, USA



**Figure 3.** Hausdorff distance between point-sets  $A$  and  $B$  represented by two contours. (a) Line 1 represents  $\sup_{a \in A} d(a, B)$ , and line 2 represents  $\sup_{b \in B} d(A, b)$ . Hausdorff Distance ( $D_{HD}$ ) corresponds to line 1, the longer of the two lines. (b) If another point is added to  $A$  such that this point is placed sufficiently far outside of the original contour  $A$ , HD is now determined by the distance between this outlier and the closest point on contour  $B$ .

# Evaluation of hindcasts for predictability and ensemble spread

(leader R. Cullather)

**Goal: Better characterize capabilities of current seasonal forecasting systems**

Motivation:

- Seasonal forecasts still in early days
- Still don't know specific questions about
  - Regional skill
  - Relation to initial conditions
  - Nature of ensemble spread (more predictable at certain times)?



# Evaluation of hindcasts for predictability and ensemble spread

(leader R. Cullather)

- Identify states that make sea ice more predictable from existing model forecasts (I.e. negative versus positive AO states may have different levels of predictability).
- Determine what model results have already been saved from these forecasts (i.e. SSTs, SLP, atmospheric temperature, ice thickness).
- Encourage groups to send additional fields as well as hindcasts.
- Discuss potential for initial condition experiments

# Sea-Ice Drift Forecast Experiment (YOPP/FAMOS/SIPN/MOSAIC)

## Why?

Overarching goals:

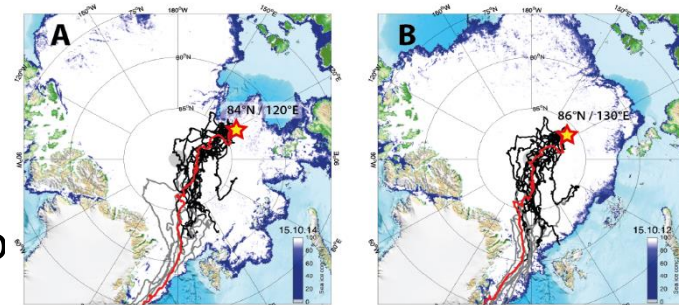
Learn

- (i) how to forecast sea-ice trajectories (days to a year ahead) and
  - (ii) About shortcomings of models, observations, atmospheric forcings, etc.;
- understand predictability of ice drift

From MOSAiC perspective:

Goal A)

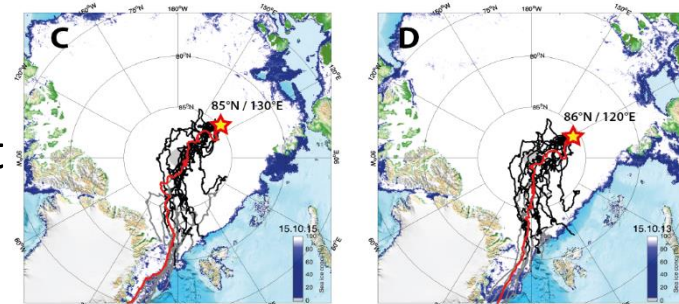
Provide guidance to MOSAiC where to deploy  
Polarstern in autumn 2019



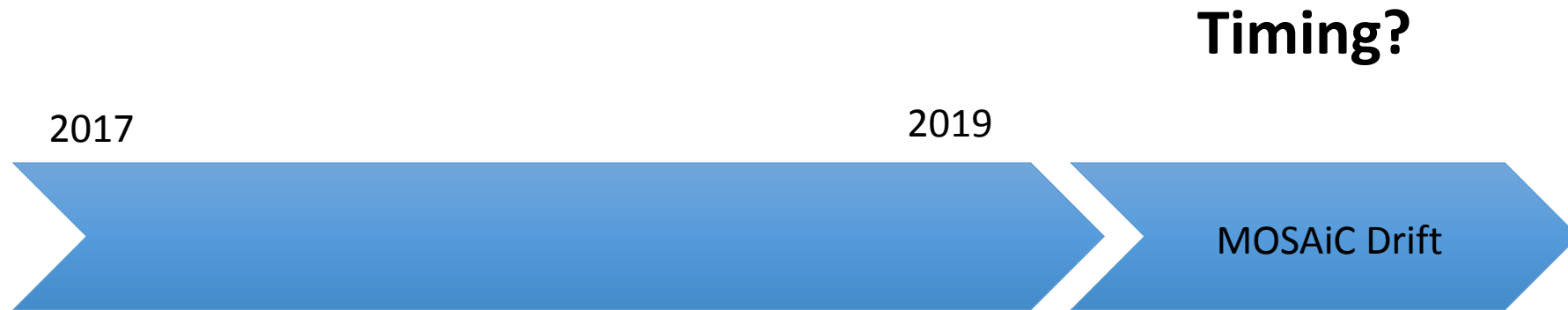
Goal B)

Provide drift forecasts to MOSAiC for Polarstern  
during the drift

"Climatological" drift trajectories based on satellite-derived drift fields  
starting 2001—2013; Figure courtesy T. Krumpen & M. Nicolaus



# Sea-Ice Drift Forecast Experiment



## Phase I)

During YOPP Core Phase (mid-2017 to mid-2019): Collect forecasts that are to be validated with buoy data (5 IABP Buoys?)

Timeline-independent: look into predictability limits ("perfect-model")

## Phase II)

Just before Polarstern deployment (autumn 2019) and during drift, provide guidance to MOSAIC

# Sea-Ice Drift Forecast Experiment

## Implementation?

- **"Easy" first step: Ask for trajectories starting (1st) June, July, August through September**
  - > **straight-forward for SIPN-SIO contributors to do**
  - > this would be "off-season" regarding MOSAiC deployment -> continuation beyond (every other month?)
  - > start in 2017?
- Ask the same for (from MOSAiC perspective) more telling cases
  - > "seamless" w.r.t. timescale; maybe ask longer-range (if possible) only sometimes?
- **Forecast methods: completely open!**
  - > satellite-derived "climatological" forecasts
  - > model-based forecasts (including climatological)
  - > with and without bias corrections (info to be provided)
  - > "free-drift" and empirical methods
  - > combined methods (e.g. blending between short-range (atm. forecast!) and longer-range)
- **Format**
  - > single trajectories
  - > ensembles of trajectories
  - > spatial PDFs
- **Verification scores?**

Community input on stakeholder needs for sea ice predictions

Sea Ice prediction metric intercomparison

Evaluation of hindcasts for predictability and ensemble spread

Sea-Ice Drift Forecast Experiment (YOPP/FAMOS/SIPN/MOSAiC)

# Timelines

