SEA ICE OUTLOOK
2016 Report

Template with Core Requirements for Pan-Arctic Contributions and Guidelines for Submitting Optional Alaskan Regional Outlook, Figures, and Gridded Data

Submission Guidelines:

The submission deadline is 6:00 pm (AKDT) Monday, 13 June 2016 (firm) and all submissions should be sent to sio2016@arcus.org. Contributions received after the deadline will be posted to the website but not incorporated into the Outlook report or discussion.

Questions may be directed to Betsy Turner-Bogren, ARCUS (betsy@arcus.org)

Core Requirements for Pan-Arctic Contributions:

* REQUIRED

1. *Name of Contributor or name of Contributing Organization and associated contributors as you would like your contribution to be labeled in the report (e.g., Smith, or ARCUS (Wiggins et al.)).

   Dmitri Kondrashov

1b. (Optional but helpful for us): Primary contact if other than lead author; name and organization for all contributors; total number of people who may have contributed to your Outlook, even if not included on the author list.

University of California, Los Angeles (UCLA)

2. * Contributions submitted by a person or group not affiliated with a research organization, please self-identify here:
   __**N/A**_____ Yes, this contribution is from "Citizen Scientists."

3. * Do you want your contribution to be included in subsequent reports in the 2016 season?
   _____Yes, use this contribution for all of the 2016 SIO reports (this contribution will be superseded if you submit a later one).
   ___**X_____No, I/we plan to submit separate contributions for subsequent reports**.
   _____ No, I only want to participate this time.

4. *"Executive summary" of your Outlook contribution: in a few sentences (using 300 words or less) describe how and why your contribution was formulated. To the extent possible, use non-technical language.

This contribution relies on data-driven approach to predict sea ice conditions over the Pan-Arctic region. The prediction model is obtained by data-adaptive decomposition and inverse modeling of Multisensor Analyzed Sea Ice Extent – Northern Hemisphere (MASIE-NH) dataset.

5. *Type of Outlook method:
___dynamic model __**X_statistical** ___heuristic ____mixed or other (specify)

6. *Dataset of initial Sea Ice Concentration (SIC) used (include name and date; e.g., "NASA Team, May 2016"):

   Because Sea Ice Index from NSIDC has not been updated since March 2016, Multisensor Analyzed Sea Ice Extent – Northern Hemisphere (MASIE-NH) daily dataset (2006 - May 2016) was used.

7. Dataset of initial Sea Ice Thickness (SIT) used (include name and date):

   N/A

8. If you use a dynamical model, please specify:

   N/A

9. *Prediction of September pan-Arctic extent as monthly average in million square kilometers. (To be consistent with the validating sea ice extent index from NSIDC, if possible, please first compute the average sea ice concentration for the month and then compute the extent as the sum of cell areas > 15%.)

   4.94

10. Prediction of the week that the minimum daily extent will occur (expressed in date format for the first day of week, taking Sunday as the start of the week (e.g., week of 4 September).

    Week of September 25

11. *Short explanation of Outlook method (using 300 words or less). In addition, we encourage you to submit a more detailed Outlook, including discussions of uncertainties/probabilities, including any relevant figures, imagery, and references.

    The forecasting methodology relies on the Multilayer Stochastic Modeling (MSM) framework of Kondrashov et al. (2015) combined with Data-adaptive Harmonic Decomposition (DAH) approach of Chekroun and Kondrashov [2016, in preparation]. This methodology is applied to the Multisensor Analyzed Sea Ice Extent – Northern Hemisphere (MASIE-NH) 4km dataset. The daily MASIE-NH data was averaged to provide weekly-sampled dataset from which DAH-MSM predictive model has been obtained. The key features of DAH-MSM model are memory effects conveyed by the non-Markovian model formulation and data-

adaptive basis. The stochastic DAH-MSM model is integrated from latest initial conditions of SIE by ensemble of white noise realizations to provide probabilistic forecasts over the Arctic.

This contribution benefits from successful performance by non-Markovian statistical model of Kondrashov et al. (2005) for real-time prediction of the El-Niño Southern Oscillation (ENSO) in a forecast plume of various statistical and dynamical models compiled monthly by International Research Institute of Climate and Society (IRI).

[1] Kondrashov, D., M. Chekroun, and M. Ghil, 2015: *Data-driven non-Markovian closure models*. Physica D., 297, 33–55.
[2] Kondrashov, D., S. Kravtsov, A. W. Robertson and M. Ghil, 2005: A hierarchy of data-based ENSO models. *J. Climate*, 18, 4425–4444.

12. If available from your method for pan-Arctic extent prediction, please provide:

    a) Uncertainty/probability estimate such as median, ranges, and/or standard deviations (specify what you are providing).

       Standard deviation: **0.4**

    b) Brief explanation/assessment of basis for the uncertainty estimate (1-2 sentences).

       The uncertainty estimate of SIE prediction is based on the spread in ensemble forecast by DAH-MSM model.

    c) Brief description of any post processing you have done (1-2 sentences).

       None

    d) Raw (and/or post processed) forecasts for this year and retrospective forecasts in an excel spreadsheet with one year on each row and ensemble member number on columns (specifying whether raw or post processed).

       Coming in subsequent reports for the 2016.