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.)).
    FIO-ESM (Qiao et al.)

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.
   Fangli Qiao (First Institute of Oceanography, State Oceanic Administration, China)
   Qi Shu (First Institute of Oceanography, State Oceanic Administration, China)
   Zhenya Song (First Institute of Oceanography, State Oceanic Administration, China)
   Xunqiang Yin (First Institute of Oceanography, State Oceanic Administration, China)
   Ying Bao (First Institute of Oceanography, State Oceanic Administration, China)

2. * Contributions submitted by a person or group not affiliated with a research organization, please self-identify here:
    No, this contribution is from "First Institute of Oceanography, State Oceanic Administration, China".

3. * Do you want your contribution to be included in subsequent reports in the 2016 season?
    No, I/we plan to submit separate contributions for subsequent reports.

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.
    Our prediction is based on FIO-ESM with data assimilation. The prediction of September pan-Arctic extent in 2016 is 4.36 (+/-0.59) million square kilometers. 4.36 and 0.59 million square kilometers is the average and one standard deviation of 10 ensemble members, respectively.

5. *Type of Outlook method:
    dynamic model

6. *Dataset of initial Sea Ice Concentration (SIC) used (include name and date; e.g., "NASA Team, May 2016"):
    None.

7. Dataset of initial Sea Ice Thickness (SIT) used (include name and date):
    None.

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

    a) Model name: **FIO-ESM (First Institute of Oceanography-Earth System Model)**

    b) Information about components, for example:

Component	Name	Initialization (e.g., describe Data Assimilation)
Atmosphere	**CAM3**	**1992-2016 integration**
Ocean	**POP2**	**DA – EAKF DA system**
Ice	**CICE4**	**1992-2016 integration**
Wave	**MASNUM-wave model**	**1992-2016 integration**

    c) Number of ensemble members and how they are generated:
    10 ensemble members. The method to generate these ensemble members can be found in Chen et al. (2015).

    Chen Hui, Yin Xunqiang, Bao Ying, et al. 2015. Ocean satellite data assimilation experiments in FIO-ESM using ensemble adjustment Kalman filter. Science China Earth Sciences, doi: 10.1007/s11430-015-5187-2

    d) For models lacking an atmosphere or ocean component, please describe the forcing:

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%.)

4.36 (+/-0.59) million square kilometers.

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 18 September.

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.

This is a model contribution. The initialization is also from the same model (FIO-ESM) but with data assimilation. The data assimilation method is Ensemble Adjustment Kalman Filter (EAKF). The data of SST (sea surface temperature) and SLA (sea level anomaly) from 1 January 1992 to 1 July 2016 are assimilated into FIO-ESM model to get the initial condition for the prediction of the Arctic Sea Ice.

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).
Our prediction is 4.36 (+/-0.59) million square kilometers based on 10 ensemble members. 4.36 and 0.59 million square kilometers is the average and one standard deviation of these 10 ensemble members, respectively.

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

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

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).