

## SEA ICE PREDICTION NETWORK (SIPN)

### Template for Pan-Arctic Sea Ice Outlook Core Contributions

August Report

1. Contributor Name(s)/Group Xiaojun Yuan, Dake Chen and Cuihua Li/Lamont-Doherty Earth Observatory of Columbia University

2. Type of Outlook projection

Numerical (time-stepping) Model\_\_\_ Statistical\_x\_ Heuristic\_\_\_

If you use a numerical model, please specify:

Model Name \_\_\_\_\_

Components of the model (please check):

Atmosphere\_\_\_ Ocean\_\_\_ Ice\_\_\_ Land\_\_\_

For a model that lacks an atmosphere and/or ocean component, please specify forcing sources\_\_\_\_\_

Are you initializing your method with data from May (or earlier), June, or July?:\_\_July\_\_\_\_\_

3. September monthly average projection (in million square kilometers) 5.02

4. Short explanation of Outlook method (1-3 sentences)

If this is a model contribution, please include method of initialization and variable used. In addition, we encourage you to submit a more detailed Outlook, including discussions of uncertainties/probabilities and any relevant figures, imagery, and references.

A Linear Markov model is used to predict monthly Arctic sea ice concentration at all grid points in the pan Arctic region. The model is a stochastic linear inverse model that is built in the multi-EOF space and is capable to capture the co-variability in the ocean-sea ice-atmosphere system. The model employs 6 variables (ice concentration, sea surface temperature, surface air temperature, 300mb height and wind vectors at 300mb) and 11 mEOF modes. Bias corrections have been applied to the prediction.

Yuan, X., D. Chen, and C. Li, A Markov model for seasonal forecast of Arctic sea ice. In prep.

Chen, D. and X. Yuan, A Markov model for seasonal forecast of Antarctic sea ice. *Journal of Climate*, 17(16), 3156-3168, 2004.

5. Projection uncertainty/probability estimate (but only required if available with the method you are using)

The uncertainty is measured by RMS error (predicted extent – observed extent). Based on cross-validation experiments, RMS error for 2-month lead prediction of September ice extent is 0.72 million square kilometers.

6. Short explanation/assessment of basis for the uncertainty estimate in #5 (1-2 sentences; only required if available with the method you are using)

The uncertainty is estimated based on cross-validation experiments for two-month lead prediction of September ice extent using 33 years (1980-2012) of time series. The model bias has been corrected in the ice prediction.

7. "Executive summary" about your Outlook contribution

1-3 sentences, to be used in Outlook summary: say in a few sentences what your Outlook contribution is and why. To the extent possible, use non-technical language. The Markov model is capable to capture co-variability in the ocean-sea ice –atmosphere system, which is likely the predictable part of variances in sea ice. The model predicts that the Arctic sea ice extent in September 2014 will be 5.02 million square km. Cross-validation skill, measured by the correlation between two-month lead predictions and observations of September ice extent, is 0.82, while the RMS error of predictions is 0.72 million square km.