

Sea Ice Outlook  
2017 August Report  
Individual Outlook

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**Name of contributor or name of contributing organization:**

Dmitri Kondrashov

**Is this contribution from a person or group not affiliated with a research organization?**

**Name and organization for all contributors. Indicate primary contact and 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)

**Do you want your June contribution to automatically be included in subsequent reports?  
(If yes, you may still update your contribution via the Google form.)**

**What is the type of your Outlook projection?**

Statistical

**Starting in 2017 we are accepting both pan-Arctic and pan-Antarctic sea ice extent (either one or both) of the September monthly mean. As in 2016, we are also collecting Alaskan regional sea ice extent. 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%.**

**a) Pan-Arctic September extent prediction in million square kilometers.**

4.54

**b) same as in (a) but for pan-Antarctic. If your method differs substantially from that for the Arctic, please enter it as a separate submission.**

**c) same as in (b) but for the Alaskan region. Please also tell us maximum possible extent if every ocean cell in your region were ice covered.**

0.38

**"Executive summary" of your Outlook contribution (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-harmonic analysis techniques to predict sea ice conditions over the Pan-Arctic region. The prediction model is obtained by data-adaptive harmonic decomposition and stochastic inverse modeling of Multisensor Analyzed Sea Ice Extent – Northern Hemisphere (MASIE-NH) dataset, as well as regional sea ice extent (SIE) from Sea Ice Index (SII) dataset.

**Brief explanation of Outlook method (using 300 words or less).**

The forecasting methodology relies on Data-adaptive Harmonic Decomposition (DAH) and Multilayer Stuart-Landau Models (MSLM) techniques [Chekroun and Kondrashov, 2017]. This methodology is applied to the Multisensor Analyzed Sea Ice Extent – Northern Hemisphere (MASIE-NH) and regional SIE from SII dataset, combined into several key Arctic regions. The daily MASIE-NH and SIE data were aggregated to provide weekly-sampled dataset. DAH-MSLM predictive model has been derived from SIE anomalies with annual cycle removed. The key features of DAH-MSM model are memory effects conveyed by the non-Markovian model formulation and data-adaptive basis that helps to disentangle complex regional dynamics of by harmonic spatio-temporal patterns. The stochastic DAH-MSLM model is driven from latest initial conditions of SIE by ensemble of white noise realizations to provide probabilistic regional Arctic forecasts, as well as pan-Arctic ones.

[1] Kondrashov, D., M. Chekroun, and M. Ghil, 2015: Data-driven non-Markovian closure models. *Physica D.*, 297, 33–55.

[2] Chekroun, M., and D. Kondrashov, 2017: Data-adaptive Harmonic Spectra and Multilayer Stuart-Landau Models, HAL preprint, <https://hal.archives-ouvertes.fr/hal-01537797>

**Tell us the dataset used for your initial Sea Ice Concentration (SIC). Include name and date (e.g., "NASA Team, May 2017"). We also encourage you to submit initial fields to the dropbox, see <https://www.arcus.org/sipn/sea-ice-outlook/2017/june/call> in the section on "Submitting Figures and Gridded Data of Full Spatial Fields (Optional) of Forecasts and Initial Conditions" for detailed instructions. Required if sea Ice concentration is used.**

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

**If you use a dynamic model, please specify the name of the model as a whole and each component including version numbers and how the component is initialized:**

**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).**

**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).**