

SEA ICE PREDICTION NETWORK (SIPN)
Template for Pan-Arctic Sea Ice Outlook Core Contributions
August 2015 Report

***REQUIRED**

1. *Contributor Name(s)/Group – how you would like your contribution to be labeled in the report (e.g., Wiggins et al.): BSC-ES (EC-Earth2.3)

1b. (Optional but helpful for us): Primary contact if other than lead author; name and organization for all contributors; total # of people who may have contributed to your Outlook, even if not included on the author list: 4

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2. * Individuals submitting "public" contributions should self-identify here:

Yes Yes, this is a "public" contribution.

Probably yes, but I am not 100% sure what is meant by "public" contribution. This specific contribution is the result of research performed with a comprehensive (general circulation) coupled climate model at a research institution in Barcelona mostly supported by national (Spanish) and EU projects.

3. *"Executive summary" about your Outlook contribution (max 300 words)

Say in a few sentences what your Outlook contribution is and why. To the extent possible, use non-technical language.

We produced September 2015 forecast of Arctic sea ice conditions using dynamical climate model (EC-Earth2.3) initialized on May 1st, 2015. This coupled general circulation model includes dynamic-thermodynamics model of sea ice (LIM2) with horizontal resolution of about 1 degree. We employ dynamical models for seasonal forecast because they have capability to resolve and predict details from pan-Arctic to local scales in non-stationary and physically consistent manner.

4. *Type of Outlook projection

dynamic model statistical heuristic mixed or other: (specify)

If you use a model, please specify:

Model Name EC-Earth2.3

Components of the model: Atmosphere_IFS, Ocean_NEMO2, Ice_LIM2, Land_H-TESSEL,

For models lacking an atmosphere or ocean, please describe the forcing: ____

5. *September monthly average projection (extent in million square kilometers. To be consistent with the validating sea ice extent index from NSIDC, if possible please first compute the average concentration for the month and then compute the extent as the sum of area of all cells > 15%.)

→ Dynamical forecast (with 19 ensemble members) adjusted with the trend bias correction method using 1979-2011 hindcast archive of the same forecast system initialized on May 1st and NSIDC NASA sea ice extent over the same period:

Mean of SIE = 5.55 M km²,

Median of SIE = 5.56 M km²

(Just for additional record - raw dynamical forecast without any bias correction:

Mean of SIE = 5.47 M km²,

Median of SIE = 5.31 M km²)

6. *Short explanation of Outlook method (max 300 words)

In addition, we encourage you to submit a more detailed Outlook, including discussions of uncertainties/probabilities, including any relevant figures, imagery, and references.

If this is a model contribution, please include method of initialization and variable used.

First we used ocean-sea-ice NEMO2-LIM2 setup forced by the ERA-Interim surface fields with ocean nudged to ORAS4 5-member reanalysis (by restoring temperature and salinity to reanalyzed data) to produce 5 members of sea ice initial conditions (IC) on May 1st, 2015, as described in Guemas et al., 2014, *Climate Dynamics*, 43, 2813-2829. These five sea-ice IC along with the five associated ORAS4 oceanic IC were used to initialize seasonal forecast with the state-of-the-art coupled climate model EC-Earth2.3 on 05/01/2015. We were not in position to obtain 05/01/2015 atmospheric IC before the submission deadline for this call, so we used five atmospheric IC on selected May 1st in the first decade of 21st century: 2001, 2004, 2007 and 2010, so that each ocean and sea ice IC is coupled with atmospheric IC from 4 different years. Finally, we produced 19-member forecast of Arctic sea ice concentration and extent in September of 2015 on time to be submitted for this SIPN call in August 2015. EC-Earth2.3 seasonal forecast system has significantly different long-term trend in the Arctic sea ice from the observed one, hence we applied trend bias correction method as described in Fučkar et al., 2014, GRL.

We are also sending 19-member raw forecast of sea ice concentration (ileadfra in LIM2) for September 2015 (ileadfra_BSC-ES_EC-Earth2.3_20150501_fc01-19_201509.nc) on ORCA1 grid (grid1_NEMO.EC-Earth2.3_ORCA1L42.nc) as optional item for pan-Arctic contribution.

7. Projection uncertainty/probability estimate for September extent (only required if available with the method you are using)

→ Dynamical forecast (with 19 ensemble members) adjusted with the trend bias correction method using 1979-2011 hindcast archive of the same forecast system initialized on May 1st and NSIDC NASA sea ice extent over the same period:

Standard Deviation of SIE = 0.45 M km²,

Quartiles of SIE = {5.16, 5.56, 5.85} M km² => IQR = 0.69 M km²

(Just for additional record - raw dynamical forecast without any bias correction:

Standard Deviation of SIE = 0.43 M km²,

Quartiles of SIE = {5.11, 5.31, 5.79} M km² => IQR = 0.68 M km²)

8. Short explanation/assessment of basis for the uncertainty estimate in #6 (1-2 sentences)

Standard deviation and interquartile range (IQR) of this ensemble forecast primarily stem from differences in 5 members of reconstructed sea ice IC (HistERAnudg: Guemas et al., 2014), and 5 members of ECMWF ORAS4 oceanic IC, combined with 5 members of atmospheric IC in 2001 and 2004 (two years with September SIE above trend time), and 2007 and 2010 (two year with September SIE below trend line).