August 2020 Sea Ice Outlook Key Statements

AWI Consortium

NSIDC (Meier)

Statistical and Rothrock, 2003), with coupled sea ice and ocean model components. The Pan-Arctic Ice-Ocean Modeling and Assimilation System (PIOMAS, Zhang et al., 2016). Atmospheric forcing is from the NCEP Climate POP; Sea ice component: CICE4; Land component: CLM4) Horizontal resolutions: Approximately 1°

Extent

Deviation

square

Antarctic

Alaska

The uncertainty was estimated by the ensemble member spread. These statistics are ensemble.

Our August 1 prediction for the September-averaged Arctic sea-ice extent is 2.26 million square km, with an uncertainty range of 1.36-3.06 million square km. Our prediction is the bias-corrected ensemble mean, and the uncertainty range reflects the lowest and highest sea ice extents in the 12-member ensemble.

Our forecast is based on the GFDL Forecast-oriented Low Ocean Resolution (FLOR) model (Vecchi et al. 2014), which is a coupled atmosphere-land-ocean-sea ice model. The model is initialized from an Ensemble Kalman initialization procedure. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentration or thickness data. The FLOR atmospheric initial conditions are produced from an AMIP run forced by observed SST and sea ice. Historical concentra...
### Climate Prediction Center

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#### IceNet1: Training and Testing Details

- **Model Structure**: Fully convolutional neural network for predicting 12-month sea ice forecasts.
- **Input Data**: Arctic sea ice extent anomalies, sea level pressure, and surface wind.
- **Output**: Future 12 months of spatial pan-Arctic sea ice concentration.
- **Evaluation Metrics**: RMI, RMST, and BIC.

#### Ocean-Sea Ice Model Initializations

- **NAWAVE**: Initial conditions came from the pre-operational system using perturbed observations.
- **RASM**: Initial conditions were derived from a hindcast, forced with CORE2 reanalysis for 1948-2009 and 2019 except 2015, which caused the model to crash. The final estimate is the output for RASM-WRF lateral boundary condition.
- **NEMO3.6-LIM3**: Each member is initialized from a reference run on January 1, 2020.

#### Ice Forecasting System Reanalysis (CFSR)

- **Ocean and Atmosphere**: The CFSR provides ocean and atmosphere fields for the model initial condition.
- **Infiltration Capacity (VIC) land hydrology and routing scheme (RVIC)**: Model initial condition for ensemble forecast was derived from a hindcast, forced with CORE2 reanalysis for 1948-2009.

#### Artic September Sea Ice Extent (SIE)

- **Calculation**: Calculated from predicted SIC. The skill of the regional SIE is be less than 15% (no ice), between 15% and 80% (marginal ice), or above 80% (full ice).

#### SIE Error Estimation

- **Method**: Ensemble spread and bias correction.
- **Data Sources**: ERSST, surface air temperature, GH300, vector winds at sea level, and oxygen concentrations.

#### Bayesian Posterior Distribution

- **Calculation**: Based on the 31-member ensemble predictions.
- **Summary**: Mean SIE error is calculated from predicted SIC. The skill of the regional SIE is estimated based on 2007-2019 retrospective forecasts and corresponding observations.

#### Model Bias Correction

- **Method**: Ensemble Adjustment Kalman Filter (EAKF).
- **Data Sources**: SST, wind stress, temperature, and salinity.

#### Forecast Initialization

- **Method**: Initial conditions are derived from a hindcast, forced with CORE2 reanalysis for 1948-2009.
- **Assimilation**: Assimilation of AMSR2 ice concentration.

#### Model Final Estimate

- **Method**: Output for RASM-WRF lateral boundary condition.
- **Assimilation**: None.

#### Model Verification

- **Method**: Anomaly correlation and RMSE.
- **Data Sources**: NSIDC's Sea Ice Index V3 (DataSet ID:G02135), all other self-generated from the fully coupled ice-ocean model.

#### Model Recommendations

- **Suggestion**: Use the model for regional forecasts.
- **Limitation**: The model is not recommended for global forecasting due to the small number of ensemble members.

#### Model Evaluation

- **Method**: Evaluation of the model's performance using the NSIDC's Sea Ice Index V3.
- **Result**: The model has good skill in predicting the probability that sea ice concentration will be above 15%.

#### Model Future Work

- **Planning**: The focus will be on improving the model's performance in predicting the probability that sea ice concentration will be above 15%.
To achieve a timely pan-Arctic September SIE prediction, we use Multi-relationship between the detrended June TOA-RSR anomaly and the MISR_AM1_CGAL_JUN_yyyy_F06_0024 product and NSIDC G02135.

The corresponding September SIE anomaly is 0.10 (1.24 * 0.0765) million km². This is a statistical prediction based on the correlation between the ice area extent, dynamics and September SIE anomaly. The mean forecast error based on forecasts for the years 2014 in GRL doi:10.1002/2014GL059388; Witness the Arctic article by Hamilton et al. including some unprecedented melt pond formation in the Central Arctic during 15-18 July 2020.

The mean forecast uses the 2007-2019 mean SIC (1/4 weight) and mean SIC change per month. Mean forecast error based on data from satellite microwave sensors, AMSR-E (2002/03-2014/15) and AMSR2 sea ice volume and NSIDC SIC data. The corresponding September SIE anomaly is 0.10 (1.24 * 0.0765) million km². This is a statistical prediction based on the correlation between the ice area extent, dynamics and September SIE anomaly. The mean forecast error based on forecasts for the years 2014 in GRL doi:10.1002/2014GL059388; Witness the Arctic article by Hamilton et al. including some unprecedented melt pond formation in the Central Arctic during 15-18 July 2020.

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The uncertainty is approximately ± 1.5 standard deviations of the ensemble mean. 

A dynamic model forecast made using the Met Office’s seasonal forecasting system (ECMWF) is produced from a small ensemble members of 127 dynamical members each. Forecasts are initialized on the 1st of the month. The ensemble mean is used to create a 20-member seasonal forecast of September ice on ice-mean concentration from the NSIDC-0051 dataset from 1991. Forecast completed together with forecasts initialized between 1991 and 2019 are used to create the seasonal forecasts for the entire period. Several different forcing signal are ensemble forecasts assimilated into the system, allowing the ensemble and single forecasts to be compared. The forecasts are then compared with sea ice concentration estimates from the University of Sheffield (Sect. 4). The uncertainty is the mean plus or minus 2 standard deviations.


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The model output was re-gridded to the standard Northern Hemisphere passive microwave grid.

These estimates are based on a 51-member ensemble. The concentration is part of the APPLICATE project and based on Meteo-France System 7 forecast initialized from three sets of ocean/ice and atmosphere/land initial conditions from May 21 (25 members), May 28 (25 members), and June 1st (1 member). The output is a regional SIE predictor produced by a regional forecasting system for the ocean and sea ice (both concentration and thickness). These estimates are based on an ensemble of 51 members initialized from the Meteo-France System 7 forecast initialized from three sets of ocean/ice and atmosphere/land initial conditions from May 21 (25 members), May 28 (25 members), and June 1st (1 member).

The forecast uses a prototype of the GFS/ES model version 3- modified system that is used for the forecast. The ocean data assimilation system is driven by a near real-time atmospheric analysis that is similar to MERRA-2, and the LEKTF for assimilation of available observations and along-track ocean altimetry. The forecast system was initialized on June 1st using data from June 1st. The ensemble uses 51 members initialized from June 1st. The model has a spread of 1 ensemble member. These estimates are based on the Meteo-France System 7 forecast initialized from three sets of ocean/ice and atmosphere/land initial conditions from May 21 (25 members), May 28 (25 members), and June 1st (1 member).

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