Four years of coordinated seasonal sea ice predictions in the Southern Ocean

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2020-2021 Antarctic sea ice conditions

Antarctic Sea Ice Extent

Median 1981-2010 with 10-90%iles, 25-75%iles, and max/min (1979-2020)

Graph was plotted 22/06/2021 10:07 UTC
Source: EUMETSAT OSI SAF (http://osi-saf.eumetsat.int)

https://osisaf-hl.met.no/archive/osisaf/sea-ice-index/v2p1/sh/en/osisaf_sh_sie_daily-2years.png
2020-2021 Antarctic sea ice conditions

ftp://sidads.colorado.edu/DATASETS/NOAA/G02135/
What is going on with Antarctic sea ice?

- No significant trend, increasing variability, regional expressions
- No clear signature (yet?) of global radiative forcing on Antarctic sea ice
- Increase in variability
- Apparent increase in persistence/auto-correlation in area anomalies

https://climate.copernicus.eu/sites/default/files/inline-images/ts_1month_anomaly_polar_ei_CI_201902.png
The Sea Ice Prediction Network South (SIPN South) has three main goals:

1) Identify existing efforts in Southern Ocean seasonal sea ice forecasting (currently scattered) and build an international network;

2) Coordinate realistic prediction test cases and evaluate the skill of current forecast systems;

3) Lay the foundations for systematic evaluation of forecasts in the coming years.
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A mechanism for summer sea ice predictability in the Southern Ocean

Correlation of October grid-point zonal wind speed with following March western Ross Sea sea ice area (1979-2015)

Climatology of ERA-Interim winds (1979-2015)

Enhanced October zonal winds $\rightarrow$ Increased ice divergence $\rightarrow$ Lower ice concentration $\rightarrow$ Lower albedo $\rightarrow$ Enhanced shortwave absorption $\rightarrow$ Increased oceanic heat storage $\rightarrow$ Delayed sea ice formation

A mechanism of reemergence for winter sea ice predictability

Correlation of September SST and potential temperature at different lags and depths

(a) EC-Earth2.2 (340-360 °E)
# The 2020-2021 Southern Ocean summer sea ice forecasts

<table>
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<tr>
<th>Contributor name</th>
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*received as monthly data, interpolated daily

** received as Sea Ice Probability
SIPN South predictions and verifying observations

Dec-Jan-Feb 2020-2021 total Antarctic sea ice area

- NASA-GSFC
- FIO-ESM
- barreira
- Nico5un
- ucl
- CanSIPSv2
- MetOffice
- CNRM
- Lamont
- ecmwf
- cmcc
- sintexf2
- SYSU
- OBS NSIDC-0081
- OBS OSI-401-b
SIPN South predictions and verifying observations
As for last years, statistical forecasts better capture the spatial distribution of sea ice concentration.
Forecasts of winter Antarctic sea ice: outliers are dynamical models
Probability of sea ice presence

Dynamical model (42 forecasts)

MetOffice | prob > 15% | 15 February 2021

Spread but with a bias

Statistical model (3 forecasts)

NicoSun | prob > 15% | 15 February 2021

(Too?) sharp but not so far from observations
Data and scripts to process Sea Ice Prediction Network South (SIPN South) analyses.
Conclusions

• As Antarctica becomes a hot spot for research (and tourism) the need for sea ice information is greater than ever

• Modeling and observational studies show evidence for seasonal Antarctic sea ice predictability

• Dynamical model contributions have large biases even at initial state, and are outperformed by statistical contributions

• A winter YOPP SOP (April-July 2022) will be highly beneficial for SIPN South
Thank you

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https://fmassonn.github.io/sipn-south.github.io/

www.climate.be/u/fmasson