Coordinating sea ice prediction for the Southern Ocean

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J. Lieser, P. Reid, J. Fyfe, C. M. Bitz, W. Hobbs
Antarctica, are you trying to tell us something?

Antarctic sea ice area anomalies (millions of sq km) relative to 1981-2010

No significant trend, increasing variability, increasing persistence...

https://climate.copernicus.eu/sea-ice-cover-february-2020
New Cruise Ships to Set Sail for Antarctica

Interested in the southernmost continent? Here's a roundup of some of the new ships and itineraries planned for the bucket-list destination.

According to the International Association of Antarctica Tour Operators, approximately 56,000 tourists visited Antarctica in the 2018-2019 season, a 53 percent increase from the 2014-2015 season.

“Climate change is a chief reason for the increased interest in visiting Antarctica,” said Mary Curry, a small ship cruise specialist and travel planner at Adventure Life. “We truly don’t know if the region will ever be as magnificent as it is now.”

To turn or not to turn

https://blogs.helmholtz.de/polarpredictionmatters/2017/11/to-turn-or-not-to-turn/
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.
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 → Increased ice divergence → Lower ice concentration → Lower albedo → Enhanced shortwave absorption → Increased oceanic heat storage → 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
## Coordinating 2019-2020 Southern Ocean summer sea ice forecasts

<table>
<thead>
<tr>
<th>Contributor name</th>
<th>Short name (in figures)</th>
<th>Forecasting method</th>
<th># of forecasts</th>
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A first glance at predictions: total sea ice area

Dec-Jan-Feb 2019-2020 total Antarctic sea ice area

NEMO-based models have high bias and retain too much ice for too long
Is the *timing* of the minimum well predicted?
Regional expressions of sea ice area anomalies and forecast errors

Ross & Weddell Seas are the most challenging regions for sea ice prediction
Integrated Ice Edge Error:
quantification of spatial errors in forecasted sea ice concentration

Integrated Ice Edge Error = Area of overestimation + Area of underestimation

https://doi.org/10.1002/2015GL067232.
Statistical model contributions have on average a lower integrated ice edge error.

Integrated Ice Edge Error = Area of overestimation + Area of underestimation.
Data and scripts to process Sea Ice Prediction Network South (SIPN South) analyses.

Latest commit de31b96 3 days ago

- **data** Fix Barreira's issue (lat used instead of lon, thank W. Hobbs)
- **doc** Add Doc file
- **figs** Add Phil's Hovmoeller plot
- **scripts** Fix title Fig IIIE

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https://github.com/fmassonn/sipn-south-public
https://fmassonn.github.io/sipn-south.github.io/
Conclusions

• As Antarctica becomes a hot spot for research (and tourism) the need for predictive sea ice information on sub-seasonal to seasonal time scales 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 (different from Arctic).

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

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www.climate.be/u/fmasson
Probability of sea ice presence

Dynamical model (42 forecasts)
MetOffice | prob > 15% | 01 February 2019

Well spread but with a bias

Statistical model (3 forecasts)
Nico-Sun | prob > 15% | 01 February 2019

Too sharp but not so far from reality
Ice charts: best available information on current sea ice conditions

http://polarview.met.no/antarctic/peninsula_20190429.png
Ice charts: best available information on current sea ice conditions
Ice charts: best available information on current sea ice conditions

How about sea ice thickness here?

http://polarview.met.no/antarctic/peninsula_20190429.png
Ice charts: best available information on current sea ice conditions

Strong need for

- Information on date of sea ice edge retreat and advance
- Information on sea ice conditions inside the ice pack

possibly several weeks/months ahead