EGU General Assembly 2022

Evaluating the skill of seasonal forecasts of sea ice in the Southern Ocean

Insights from the SIPN South project 2017-2022

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J. Lieser, P. Reid, J. Fyfe, C. M. Bitz, W. Hobbs

and all SIPN South contributors!

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EGU2013-10518 | Orals | OS1.3

A model reconstruction of the Antarctic sea ice thickness and volume changes over the past decades using data assimilation

François Massonnet, Pierre Mathiot, Thierry Fichefet, Hugues Goosse, Christof König Beatty, Martin Vancoppenolle, and Thomas Lavergne

Mon, 08 Apr, 15:30–15:45, Room Y5

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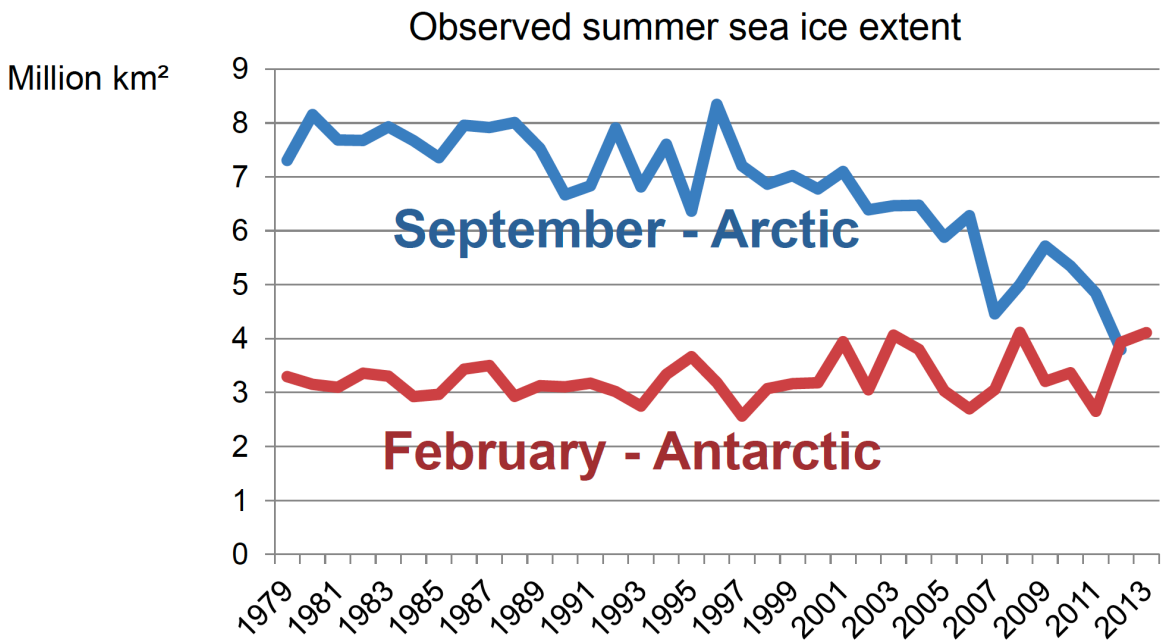
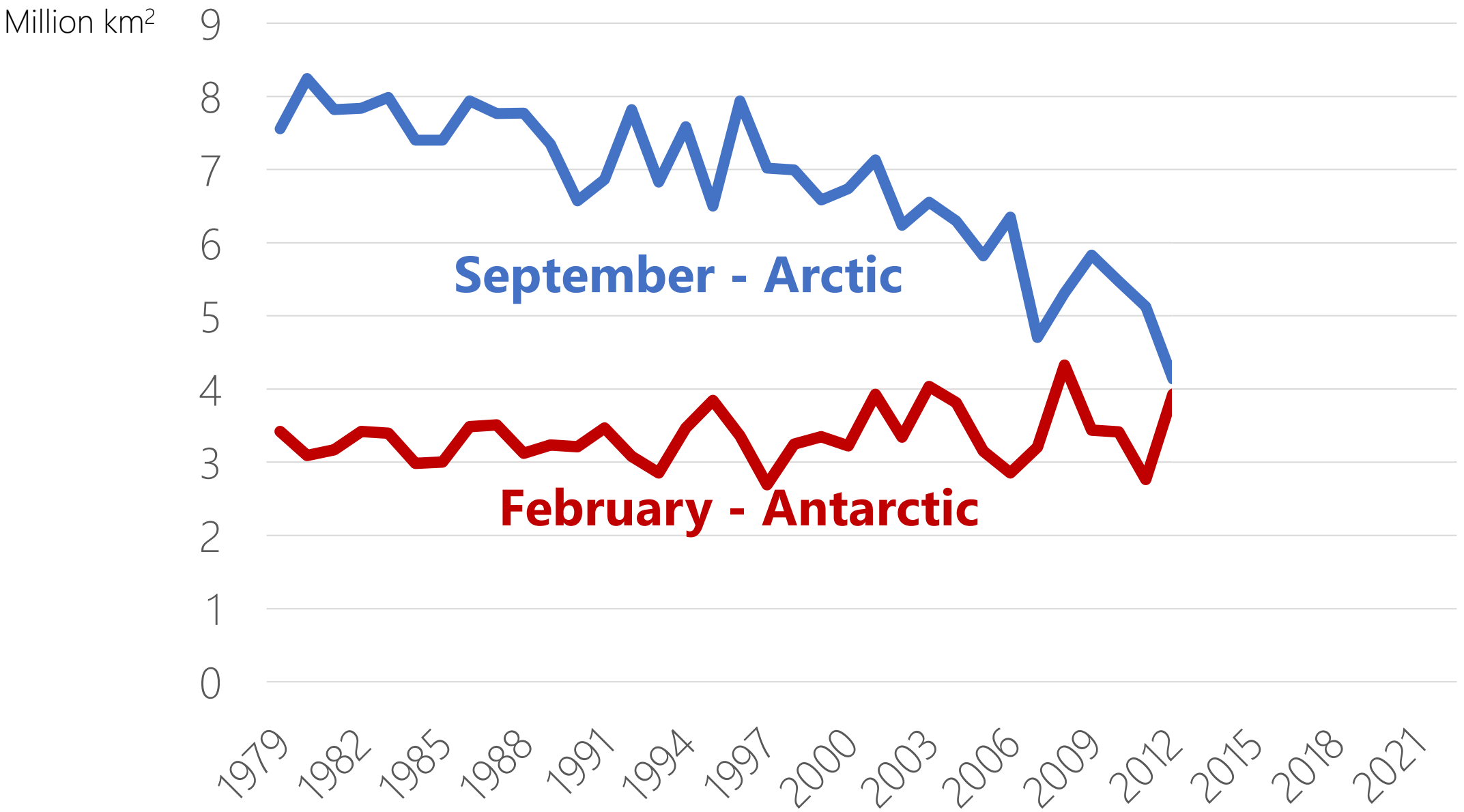
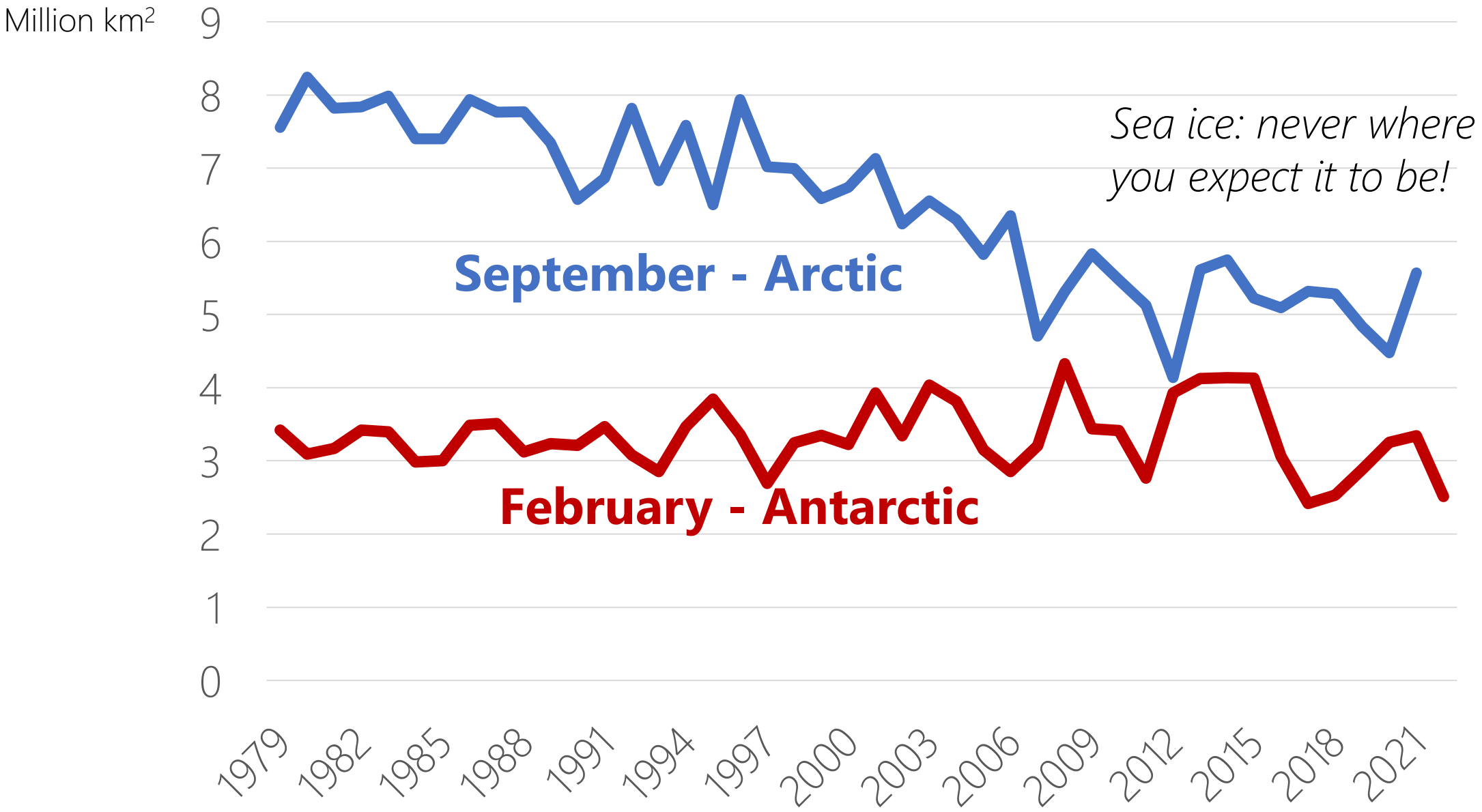
The 2012 sea ice kiss



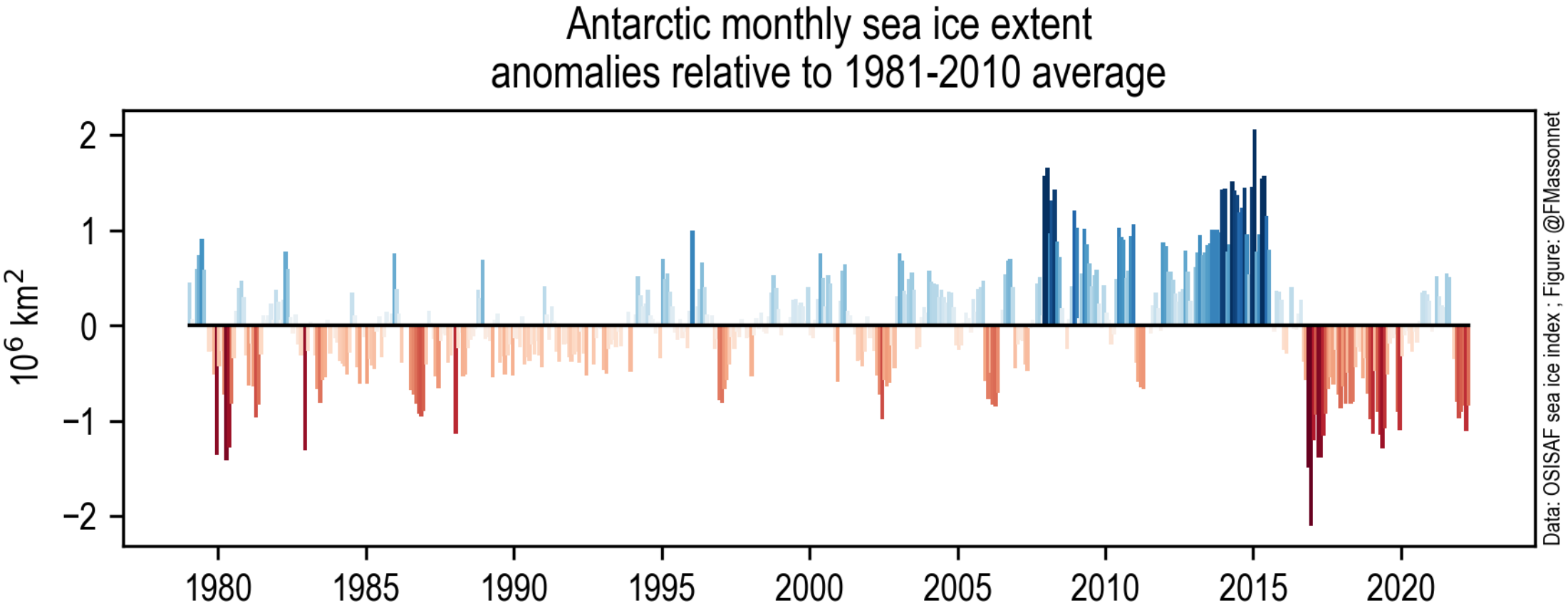
Summer sea ice extent

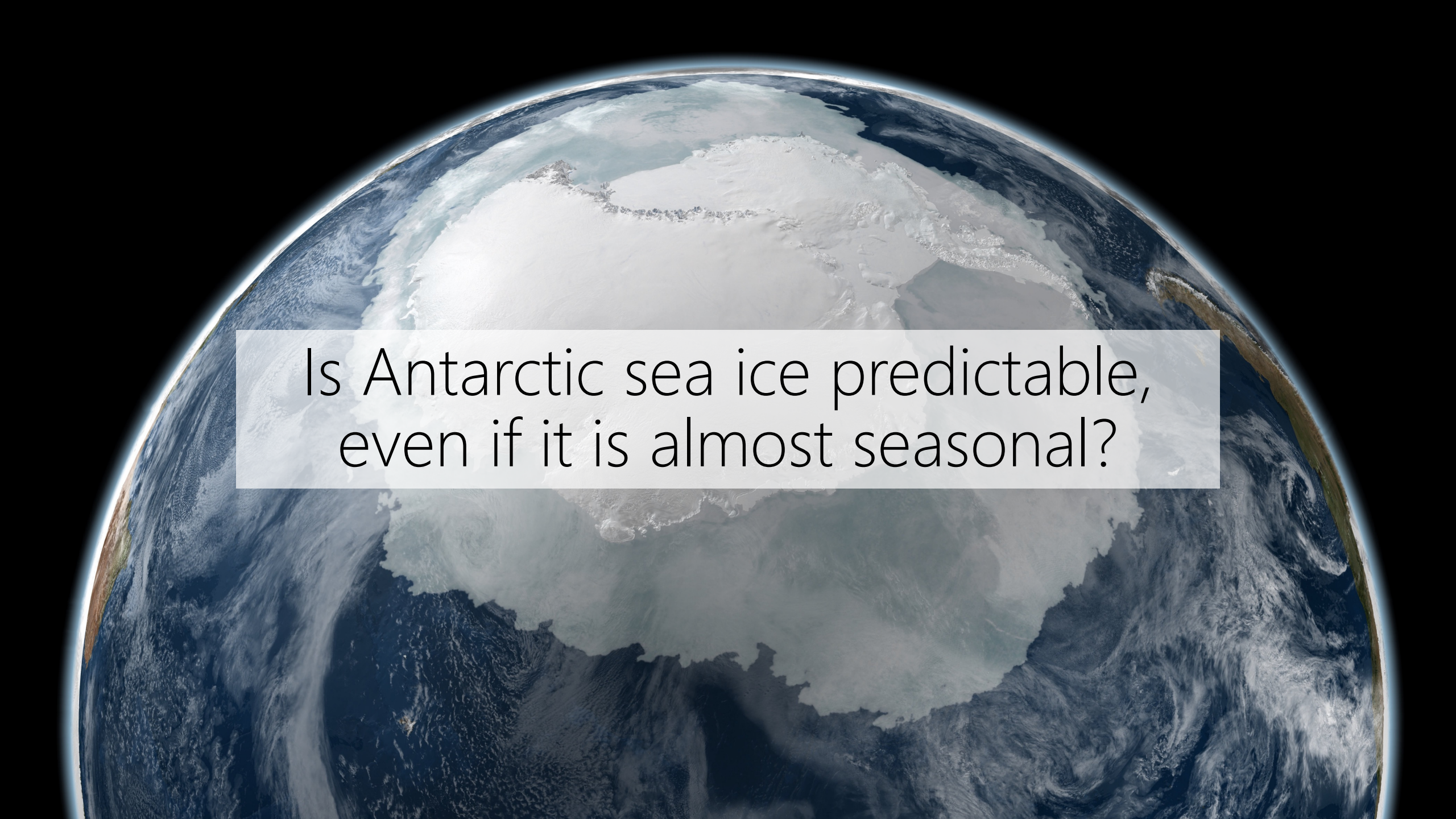


Summer sea ice extent



A window of opportunity for seasonal forecasting?





Is Antarctic sea ice predictable, even if it is almost seasonal?

GEOPHYSICAL RESEARCH LETTERS, VOL. 40, 2121–2124, doi:10.1002/grl.50410, 2013

Initial-value predictability of Antarctic sea ice in the Community Climate System Model 3

Marika M. Holland,[1] Edward Blanchard-Wrigglesworth,[2] Jennifer Kay,[1] and Steven Vavrus[3]

Climate Dynamics
https://doi.org/10.1007/s00382-018-4292-2

Reemergence of Antarctic sea ice predictability and its link to deep ocean mixing in global climate models

Sylvain Marchi[1] · Thierry Fichefet[1] · Hugues Goosse[1] · Violette Zunz[2] · Steffen Tietsche[3] · Jonathan J. Day[3] · Ed Hawkins[4]

Received: 20 September 2017 / Accepted: 31 May 2018

Geophysical Research Letters

Research Letter | Open Access

Predictability of Antarctic Sea Ice Edge on Subseasonal Time Scales

Lorenzo Zampieri, Helge F. Goessling, Thomas Jung

First published: 27 August 2019 | https://doi.org/10.1029/2019GL084096 | Citations: 12

Geophysical Research Letters

RESEARCH LETTER
10.1029/2021GL097047

Ocean-Sea Ice Processes and Their Role in Multi-Month Predictability of Antarctic Sea Ice

Stephy Libera[1,2], Will Hobbs[2,3], Andreas Klocker[4], Amelie Meyer[1,2], and Richard Matear[5]

[1]Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, TAS, Australia, [2]Australian Research Council Centre of Excellence for Climate Extremes, Sydney, NSW, Australia, [3]Australian Antarctic Program Partnership, Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, TAS, Australia, [4]Department of Geosciences, University of Oslo, Oslo, Norway, [5]CSIRO Oceans and Atmosphere, Hobart, TAS, Australia

Key Points:

- Sea ice predictability in the Weddell Sea is strongly determined by temperature and salinity profiles of the underlying upper ocean
- Every winter, the timing of the loss of sea ice predictability is defined when deep water is entrained into the mixed layer
- Sea ice predictability depends not only on the depth of the Winter Water layer but also on how strongly stratified its base is

Supporting Information:

Supporting Information may be found in the online version of this article.

Correspondence to:
S. Libera,

Abstract Antarctic sea ice is a critical component of the climate system and a vital habitat for Southern Ocean ecosystems. Understanding the underlying physical processes and improving Antarctic sea ice prediction is of broad interest. Using the model data, we investigate sea ice and upper ocean predictability at interannual timescales in the Weddell Sea region. We find that oceanic predictability is largely confined to the Winter Water layer and responds to seasonal modifications of the water column, mainly driven by sea ice processes. Predictability depends not only on the depth of the Winter Water layer, but also on how strongly stratified its base is. Predictability is lost when warm Circumpolar Deep Water with no sea ice-related memory entrains into the mixed layer. We show the strong dependence of sea ice predictability on the local upper ocean vertical structure, which suggests that both are likely to change in a warming climate.

Seasonal Prediction and Predictability of Regional Antarctic Sea Ice

MITCHELL BUSHUK,[a,b] MICHAEL WINTON,[a] F. ALEXANDER HAUMANN,[c] THOMAS DELWORTH,[a] FEIYU LU,[a,c] YONGFEI ZHANG,[a,c] LIWEI JIA,[a,b] LIPING ZHANG,[a,b] WILLIAM COOKE,[a] MATTHEW HARRISON,[a] BILL HURLIN,[a] NATHANIEL C. JOHNSON,[a] SARAH B. KAPNICK,[a] COLLEEN MCHUGH,[a,d] HIROYUKI MURAKAMI,[a,b] ANTHONY ROSATI,[a,b] KAI-CHIH TSENG,[a,c] ANDREW T. WITTENBERG,[a] XIAOSONG YANG,[a] AND FANRONG ZENG[a]

[a] *National Oceanic and Atmospheric Administration/Geophysical Fluid Dynamics Laboratory, Princeton, New Jersey*
[b] *University Corporation for Atmospheric Research, Boulder, Colorado*
[c] *Atmospheric and Oceanic Sciences Program, Princeton University, Princeton, New Jersey*
[d] *SAIC, Science Applications International Corporation, Reston, Virginia*

(Manuscript received 15 December 2020, in final form 30 March 2021)

nature COMMUNICATIONS

ARTICLE

DOI: 10.1038/s41467-017-00820-0 OPEN

Springtime winds drive Ross Sea ice variability and change in the following autumn

Marika M. Holland[1], Laura Landrum[1], Marilyn Raphael[2] & Sharon Stammerjohn[3]

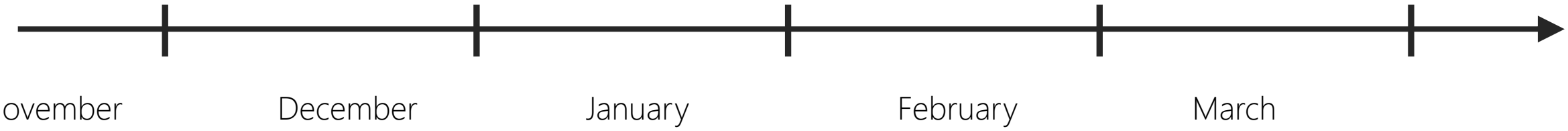
Is Antarctic sea ice predictable even if it is almost seasonal?

YES

- Important role of **zonally advected** upper ocean **heat content anomalies**
- Modulation of sea ice predictability by the underlying oceanic stratification

SIPN South: The rules of the game

- Initialize before < 1 Dec
- Submit at least total sea ice area
- Provide daily temporal output



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November December January February March

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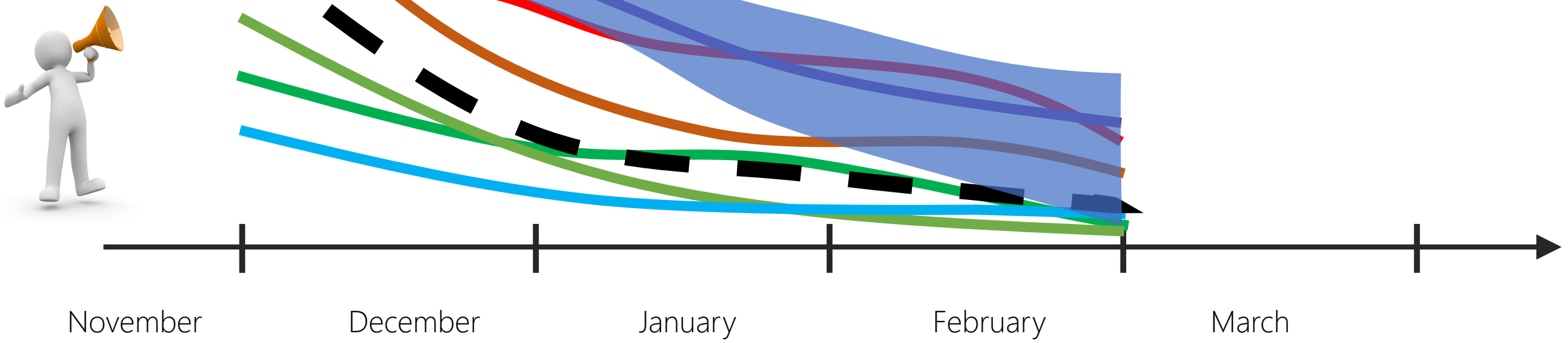

SIPN South: The rules of the game

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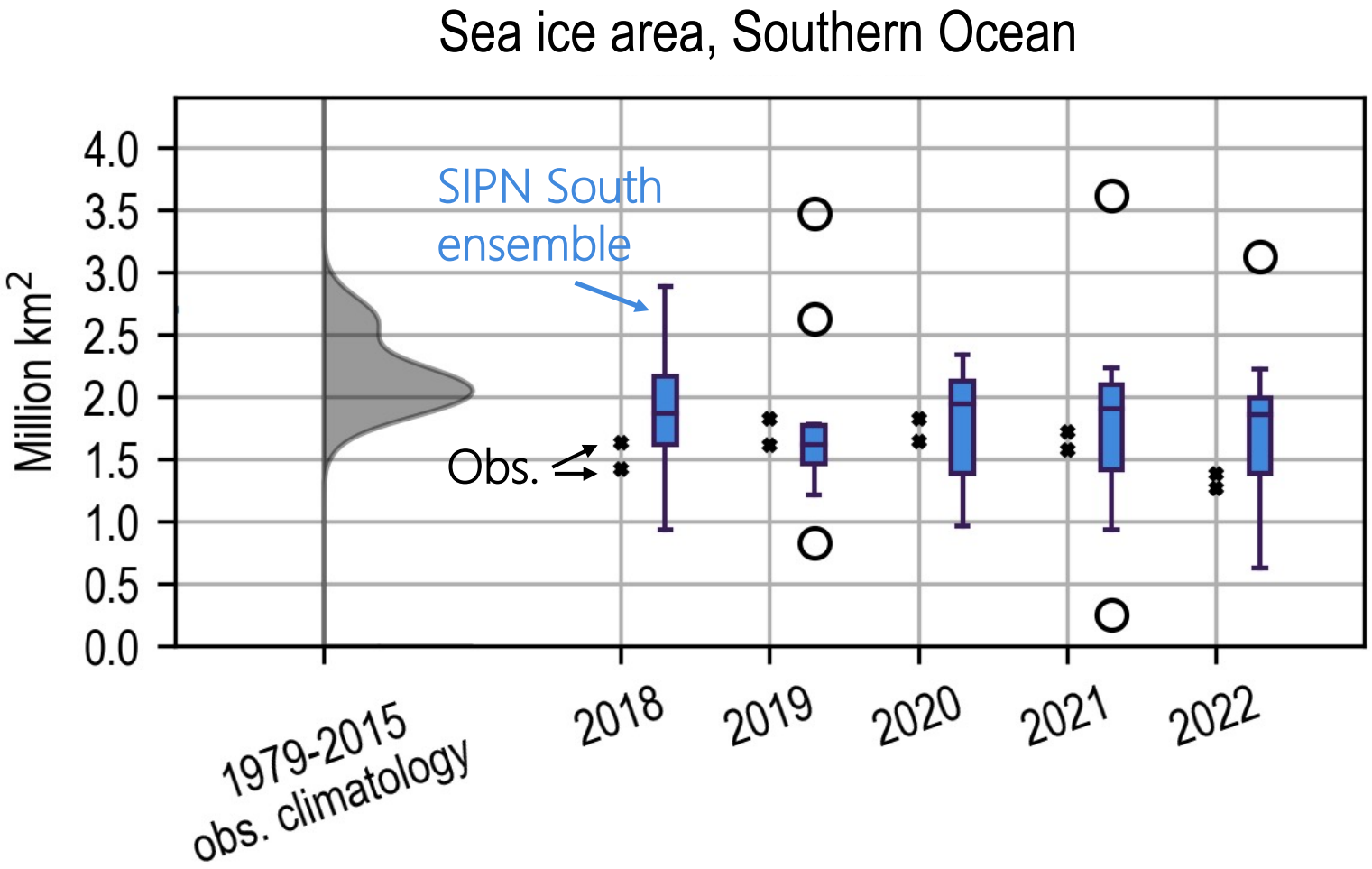
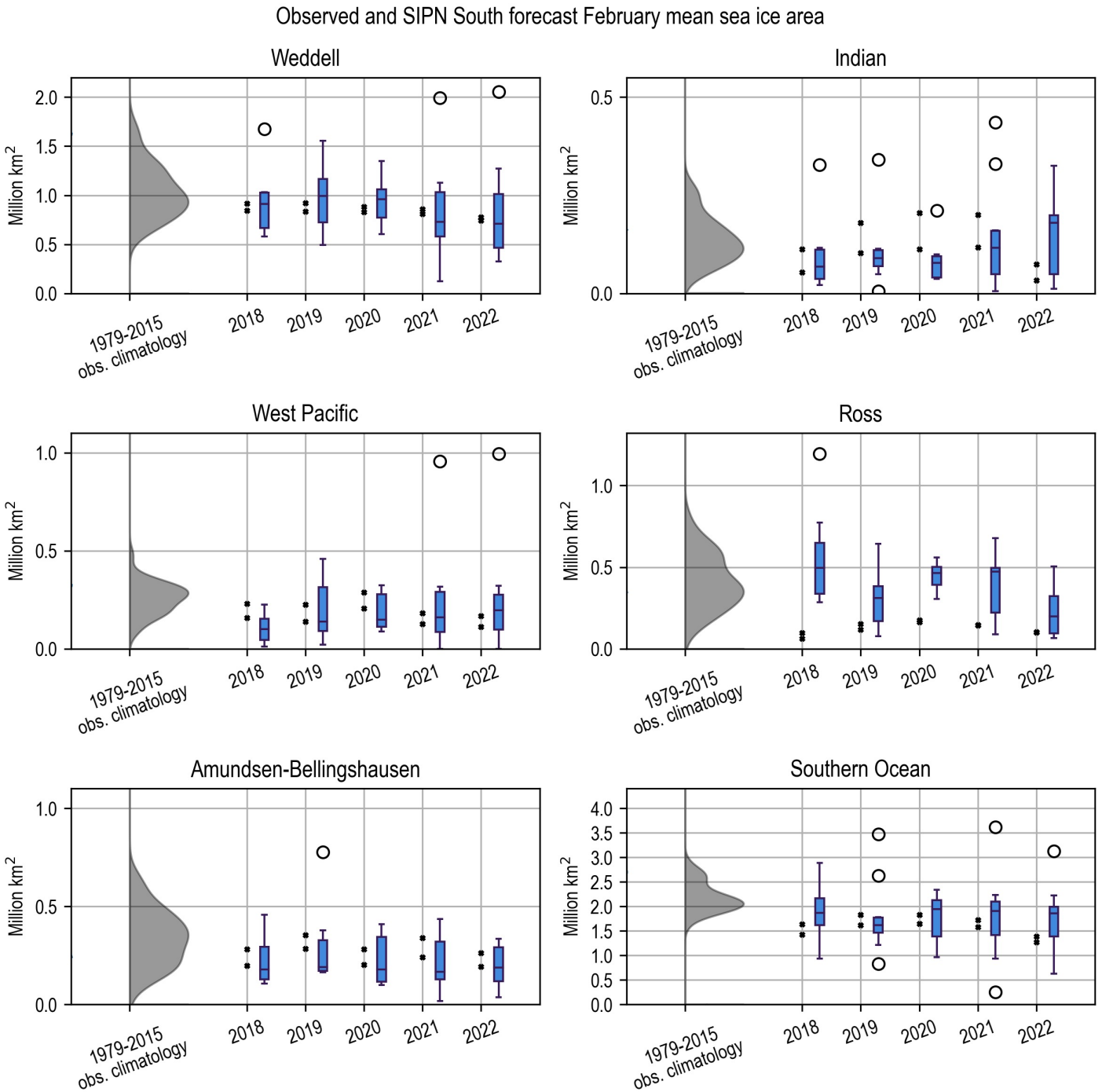
November December January February March

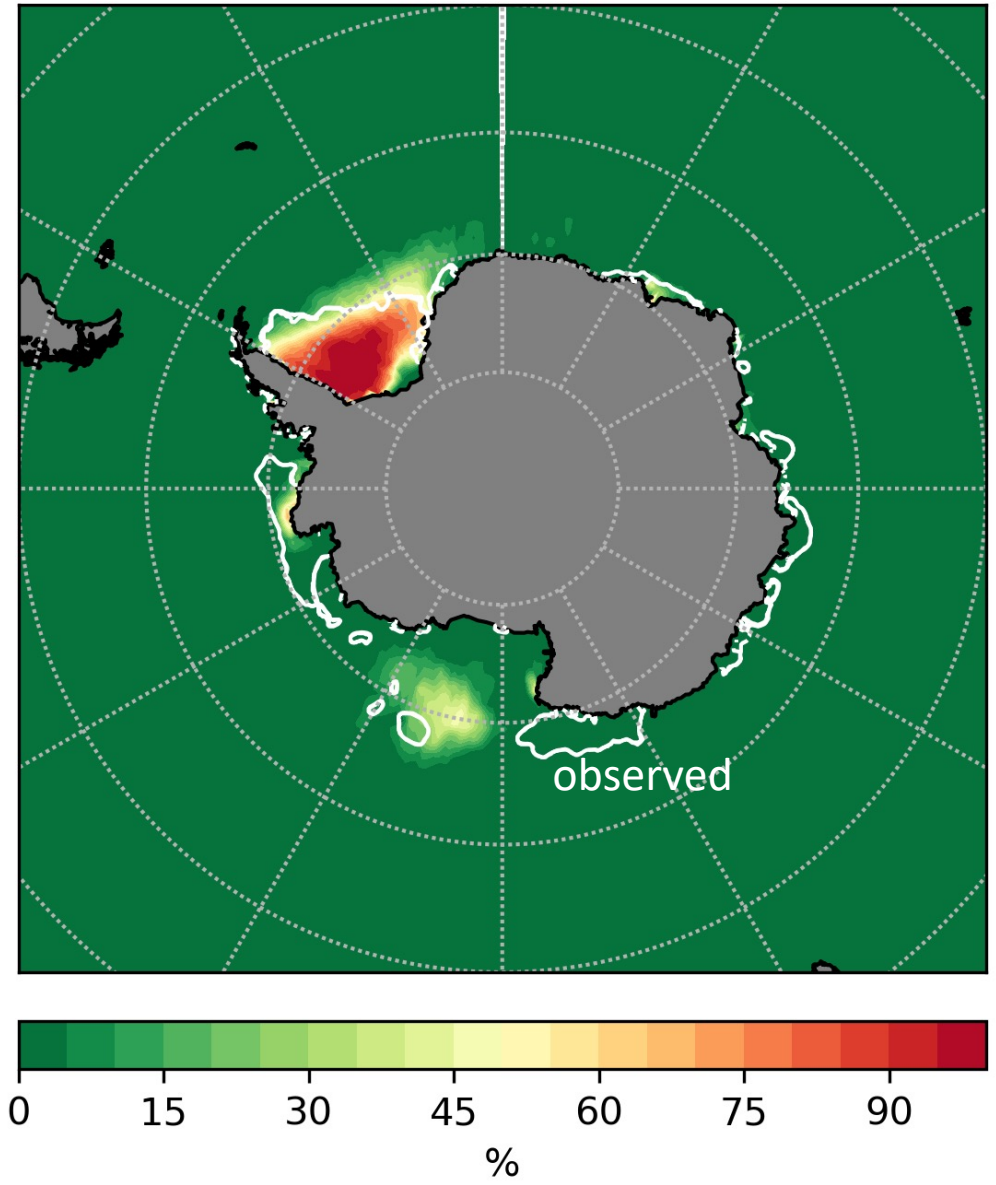
SIPN South ensemble captures the recent negative sea ice area anomalies





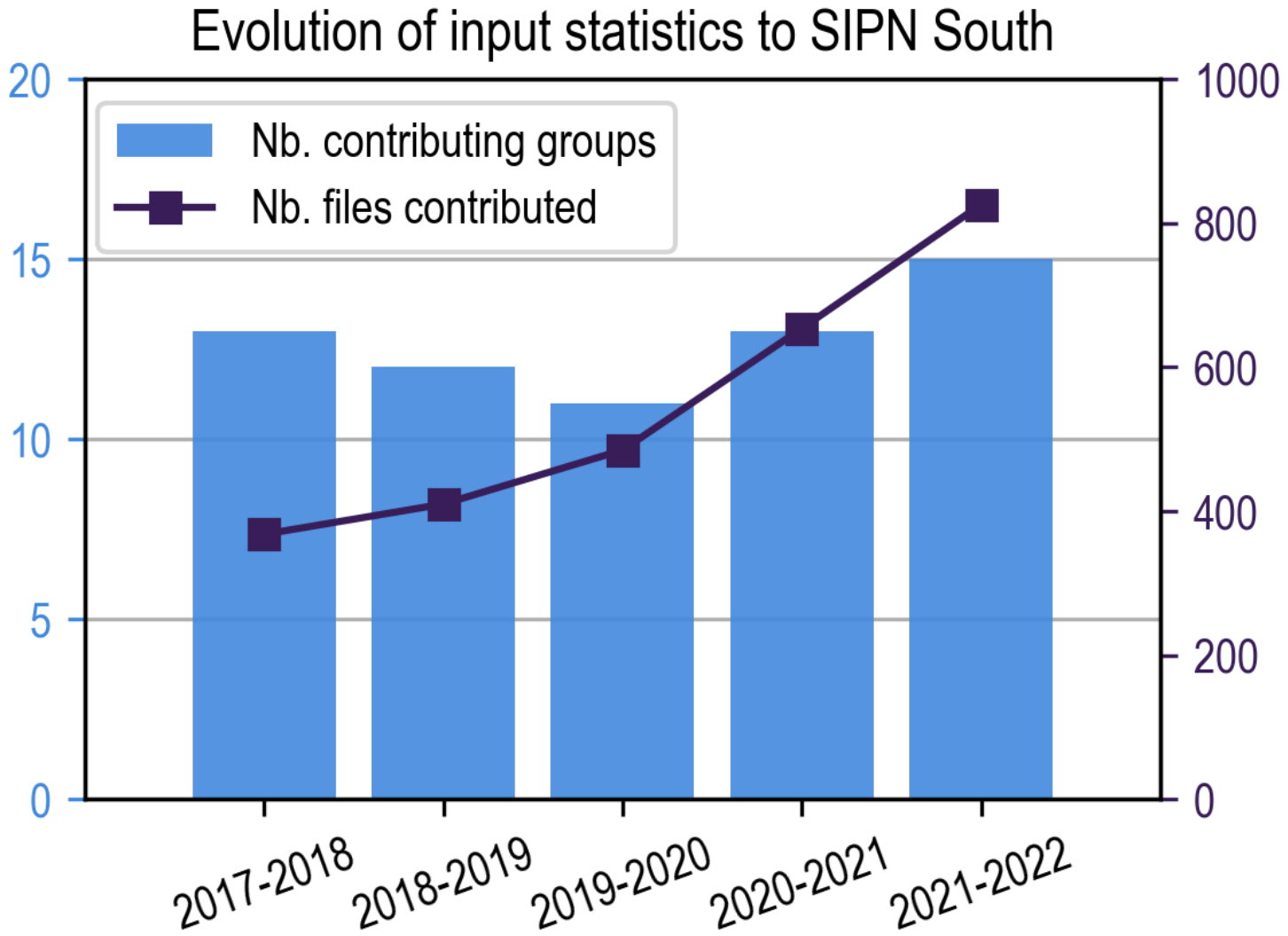
Sea ice in the Ross Sea appears to be very challenging to forecast

Probability of sea ice concentration exceeding 15%



Ensemble spread is large in the Ross Sea

→ Signature of important weather (unpredictable) variability ?


Evolution of input statistics to SIPN South
Nb. contributing groups
Nb. files contributed
20
15
10
5
0
1000
800
600
400
200
0
2017-2018
2018-2019
2019-2020
2020-2021
2021-2022

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

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

fmassonn / sipn-south-public

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Data and scripts to process Sea Ice Prediction Network South (SIPN South) analyses.

Edit

Manage topics

142 commits | 2 branches | 0 releases | 3 contributors

Branch: master | New pull request | Create new file | Upload files | Find File | Clone or download

fmassonn Fix title Fig IIEE — Latest commit de31b9b 3 days ago

data	Fix Barreira's issue (lat used instead of lon, thank W. Hobbs)	2 months ago
doc	Add Doc file	3 days ago
figs	Add Phil's Hovmoeller plot	11 months ago
scripts	Fix title Fig IIEE	3 days ago

Thank you

@FMassonnet

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www.climate.be/u/fmasson

Contributors to the 2021-2022 Southern Ocean summer sea ice prediction experiment

Table 1. Information about contributors to the summer 2021-2022 coordinated sea-ice forecast experiment.

	Contributor name	*Short name (in figures)*	*Forecasting method*	*# of forecasts*	*Initialization date*	*Diagnostics provided*
1	Sandra Barreira	Barreira	Statistical	3	Nov. 30th	SIA+rSIA+SIC
2	CanSIPSv2	CanSIPSv2	Coupled dynamical	20	Nov. 26th	SIA+rSIA
3	CMCC	cmcc	Coupled dynamical	50		SIA+rSIA+SIC
4	CNRM	CNRM	Coupled dynamical	51	Dec. 1st	SIA+rSIA+SIC+SIV
5	ECMWF	ecmwf	Coupled dynamical	51	Nov. 30th	SIA+rSIA
6	FIO-ESM	FIO-ESM	Coupled dynamical	1	Nov. 1st	SIA
7	GFDL	gfdl	Coupled dynamical	30	Nov. 30th	SIA+rSIA+SIC+SIV
8	Lamont	Lamont	Statistical	1	Nov. mean	SIA+rSIA+SIC
9	Walt Meier	Meier-NSIDC	Statistical	1	Dec. 1st	SIA
10	Met Office	MetOffice	Coupled dynamical	42	Nov. 25th	SIA+rSIA+SIC
11	Alek Petty	NASA-GSFC	Statistical	1	Nov. 30th	SIA
12	Nico Sun	NicoSun	Statistical	3	Nov. 30th	SIA+SIC+SIV
13	SINTEX-F2	SINTEX-F2	Coupled dynamical	24		SIA+rSIA
14	Sun Yat-sen University	SYSU	Statistical	1	Nov. 30th	SIA+rSIA+SIC
15	UCLouvain	ucl	Forced dynamical	10	Nov. 1st	SIA+rSIA+SIC+SIV