

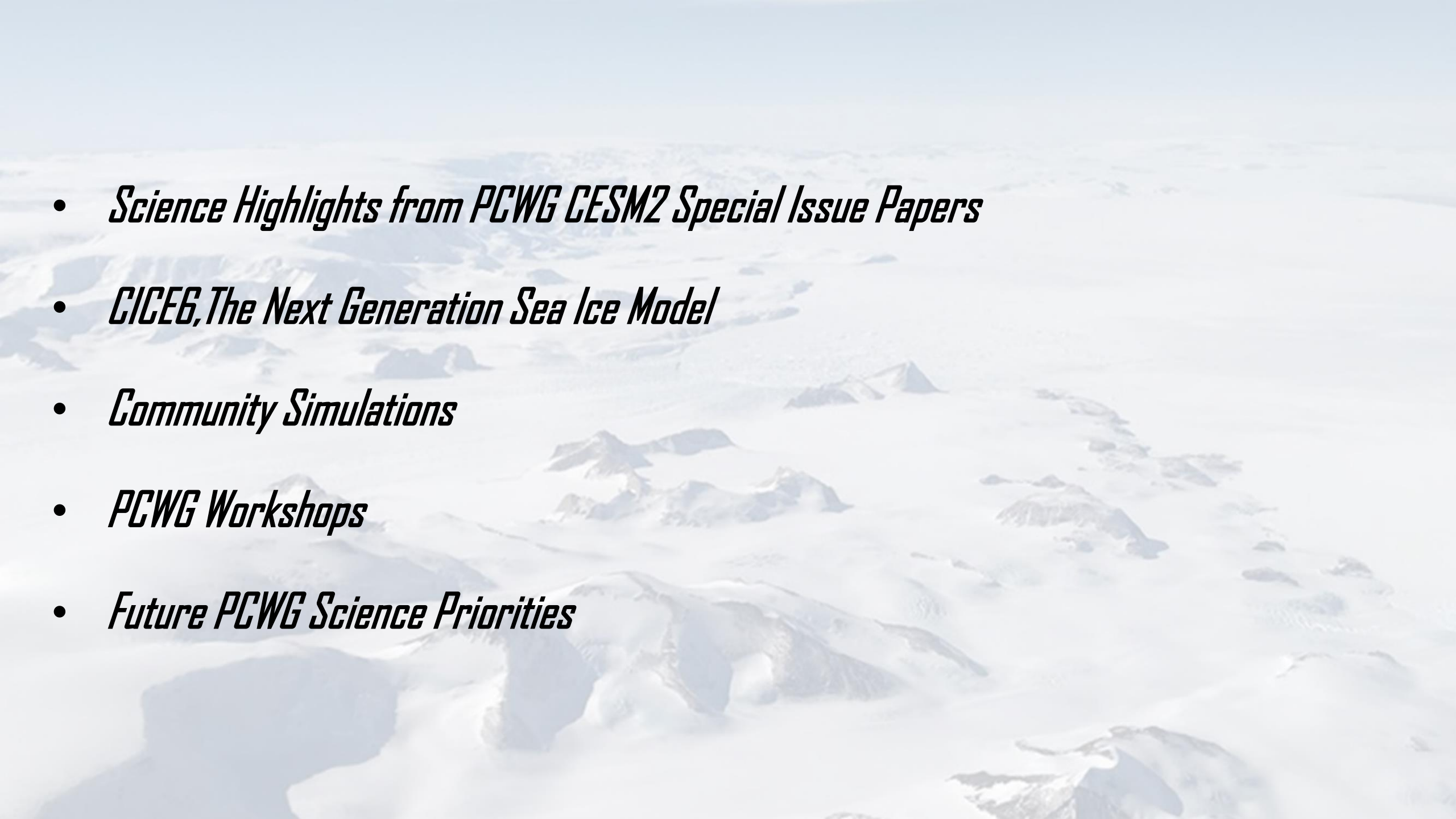
Polar Climate Working Group Update

June 2020 CESM Meeting



Co-chairs: M. Holland and H. Singh

CICE Consortium Liaisons: D. Bailey and A. DuVivier

- 
- *Science Highlights from PCWG CESM2 Special Issue Papers*
 - *CICE6, The Next Generation Sea Ice Model*
 - *Community Simulations*
 - *PCWG Workshops*
 - *Future PCWG Science Priorities*

PCWG CESM2 Special Issue Papers

*And likely a couple more to
come!*

Raphael, M.N., M.S. Handcock, M.M. Holland, L.L. Landrum (2020). An assessment of the temporal variability in the annual cycle of daily Antarctic sea ice in the NCAR CESM2: A comparison of the historical runs with observations. *Manuscript submitted to JGR-Atmos.*

Bailey D. A., Holland M. M., DuVivier A. K., Hunke E. C., Turner A. K. (2020). Impact of a New Sea Ice Thermodynamic Formulation in the CESM2 sea ice component. *Manuscript submitted for publication to Journal of Advances in Modeling Earth Systems.*

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DeRepentigny, P., Jahn, A., Holland, M. M., Smith, A. (2020) Arctic Sea Ice in Two Configurations of the Community Earth System Model Version 2 (CESM2) During the 20th and 21st Centuries. *Manuscript submitted for publication to JGR: Oceans*

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DuVivier, A. K., Holland, M. M., Kay, J. E., Tilmes, S., Gettelman, A., Bailey, D. A. (2019) Arctic and Antarctic sea ice state in the Community Earth System Model Version 2. *Manuscript submitted to JGR: Oceans.*

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McIlhattan, E. A., Kay, J.E., & L'Ecuyer, T.S. (2020) Arctic Clouds and Precipitation in the Community Earth System Model Version 2. *Manuscript submitted to JGR: Atmospheres*

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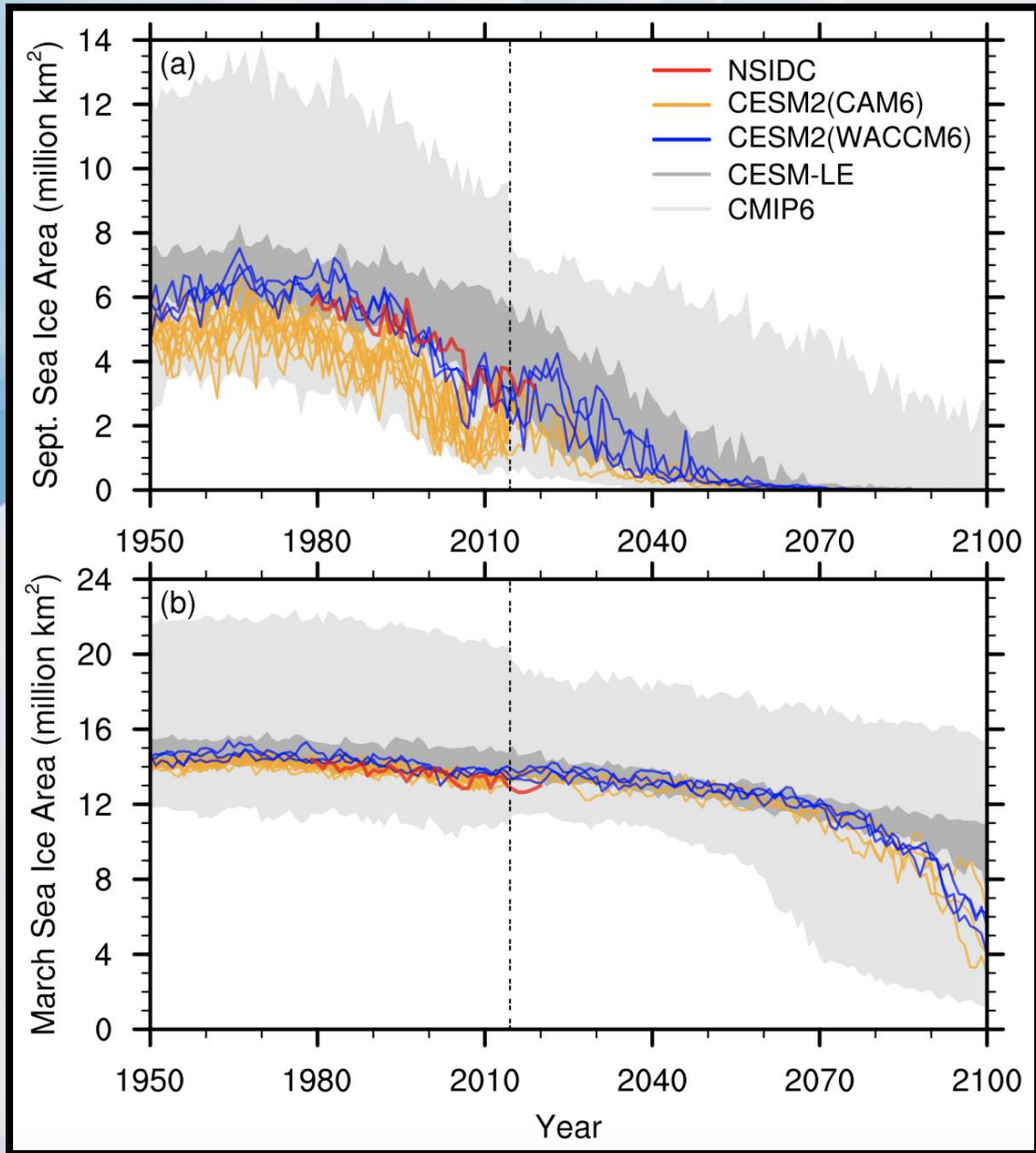
Singh H. K. A., Landrum L., Holland M. M. (2020) An Overview of Antarctic Sea Ice in the CESM2: Analysis of the Seasonal Cycle, Predictability, and Atmosphere–Ocean–Ice Interactions. *Manuscript submitted for publication to Journal of Advances in Modeling Earth Systems.*

[View PDF](#)

Webster M. A., DuVivier A. K., Holland M. M., Bailey D. A. (2020) Snow on Arctic sea ice in a warming climate as simulated in CESM2. *Manuscript submitted for publication to Journal of Advances in Modeling Earth Systems*

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Arctic Sea Ice Area Evolution



PCWG CESM2 Special Issue Papers: Science Highlights

Comparing Arctic sea ice evolution in

- CESM2 (CAM6)
- CESM2 (WACCM6)
- CESMI-LENS

DeRepentigny et al (2020)

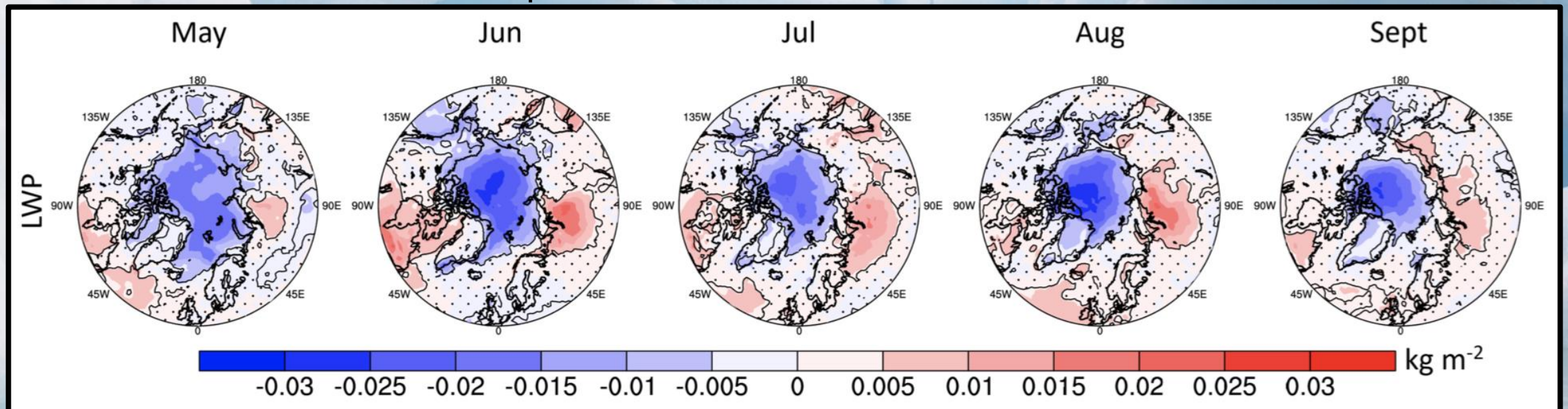
PCWG CESM2 Special Issue Papers: Science Highlights

Attributing differences in climatological Arctic sea ice state in

- CESM2 (CAM6)
 - CESM2 (WACCM6)
- to aerosol treatments and clouds.

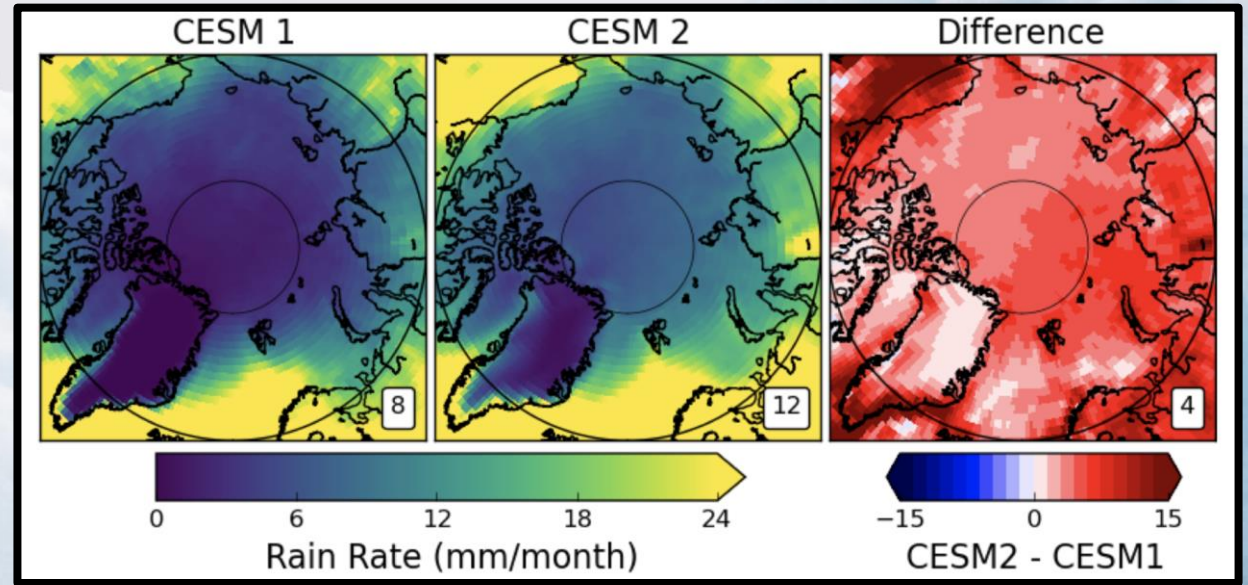
DuViviver et al (2020)

Arctic Cloud Liquid Water Path Difference, CESM2(CAM6) – CESM2(WACCM6)



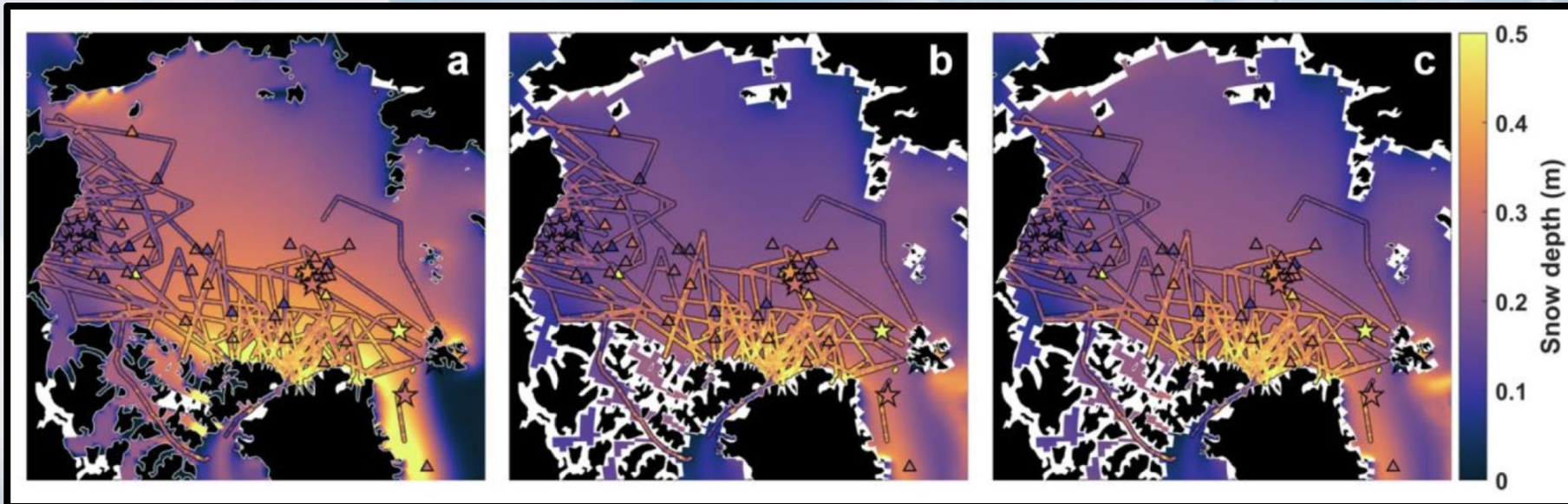
PCWG CESM2 Special Issue Papers: Science Highlights

Arctic Clouds and Precipitation



Snow on Arctic Sea Ice

McIlhatten et al (2020)

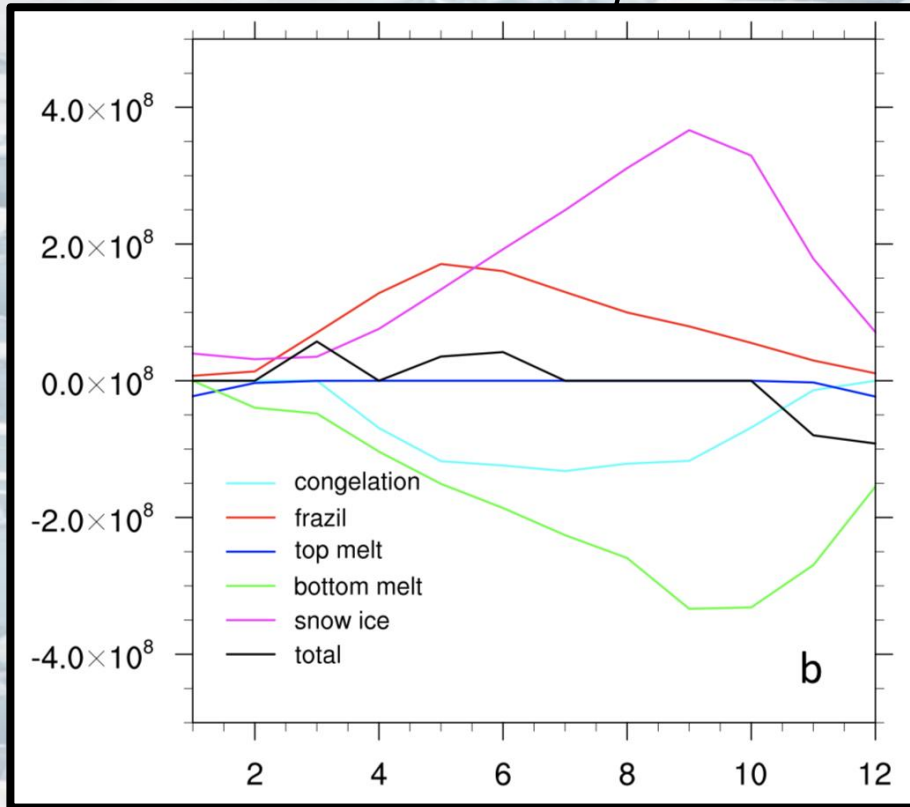


Webster et al (2020)

PCWG CESM2 Special Issue Papers: Science Highlights

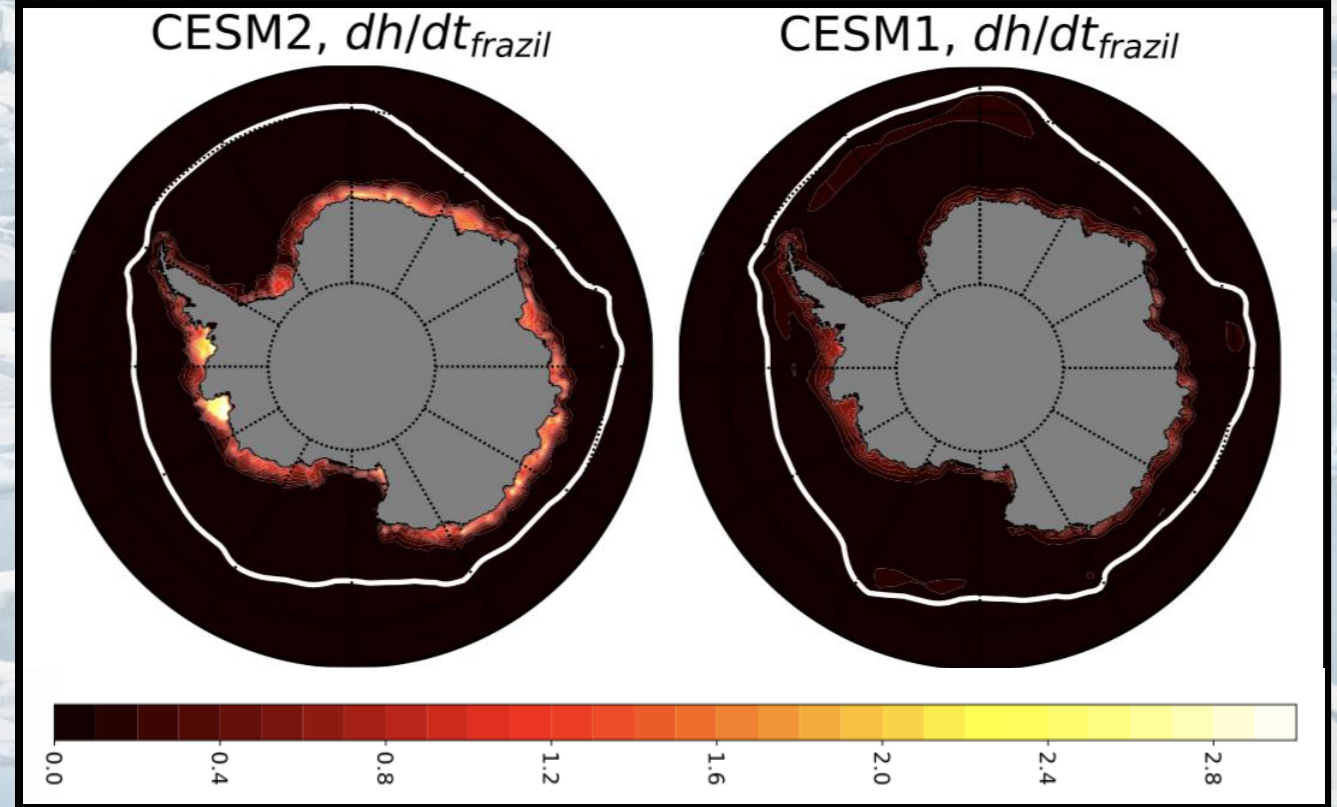
Attributing differences in climatological Antarctic sea ice state to mushy layer sea ice thermodynamics.

Sea Ice Growth Terms, Mushy – BL99



Bailey et al (2020)

Open Water Sea Ice Growth
CESM2, dh/dt_{frazil}

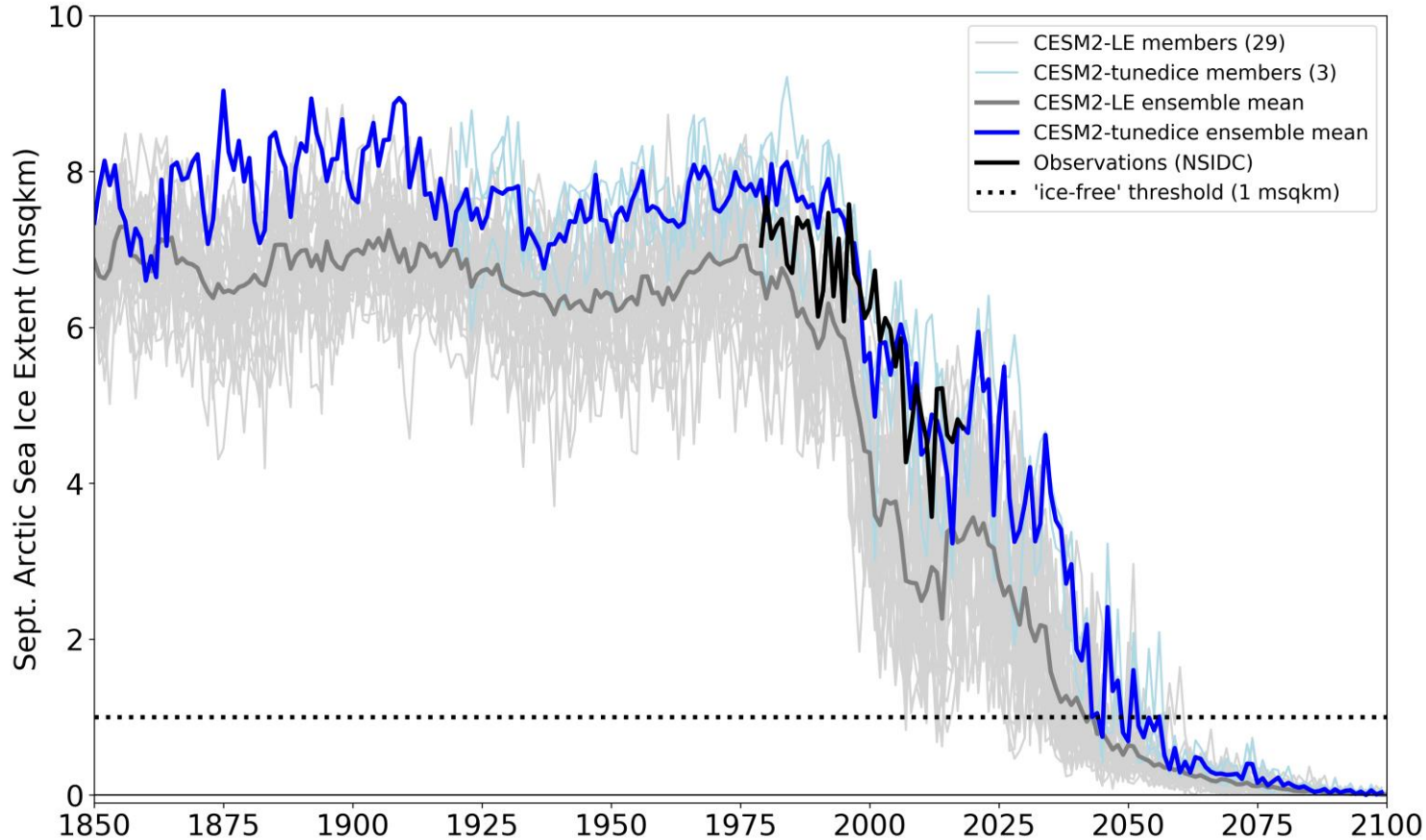


Singh et al (2020)

CICE6: The Next Generation Sea Ice Model

- Land-fast sea ice
- Floe size distribution (*Roach et al*)
- SNICAR (*Zender et al*)
- Sea ice biogeochemistry (*Jeffrey et al*)
- ICEPACK column model
- Arakawa C grid (*Bailey et al; In Progress*)

Community Simulations: CESM2 Tuned Sea Ice Small Ensemble



(courtesy Jen Kay)

Albedo of snow over sea ice increased by tuning the dry snow grain radius

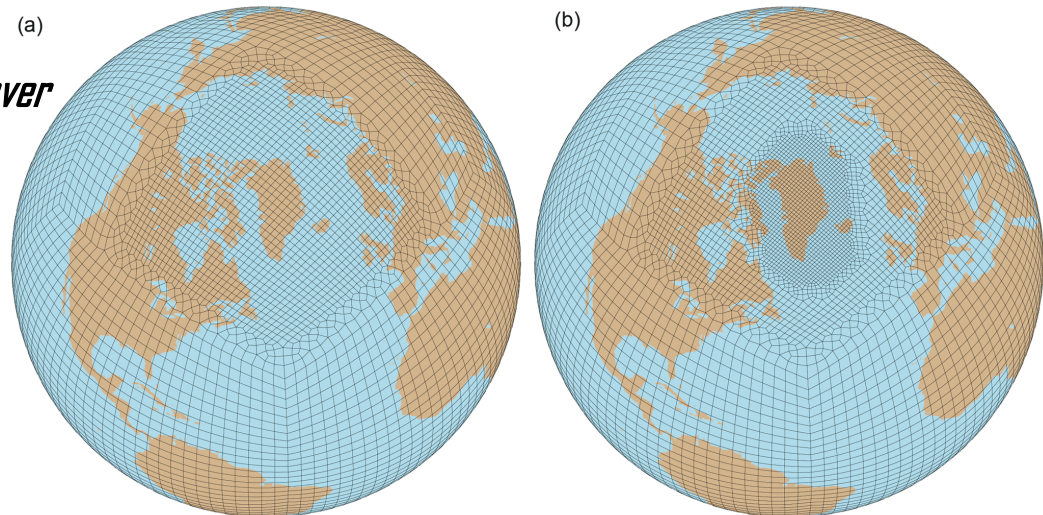
3 ensemble members

Tuned Ice CESM2 Runs:
Jen Kay

More Community Simulations

- CESM2 runs with CMIP5 forcing: Pre-industrial, 20th Century, RCP 8.5 Future (*Hannay et al*)
- Regionally-refined Arctic CESM2 configuration

Regionally-refined CESM CAM grid over Greenland



Arctic Regionally-refined CAM6:
Adam Herrington

Van Kampenhout et al (2019)

PCWG Workshops



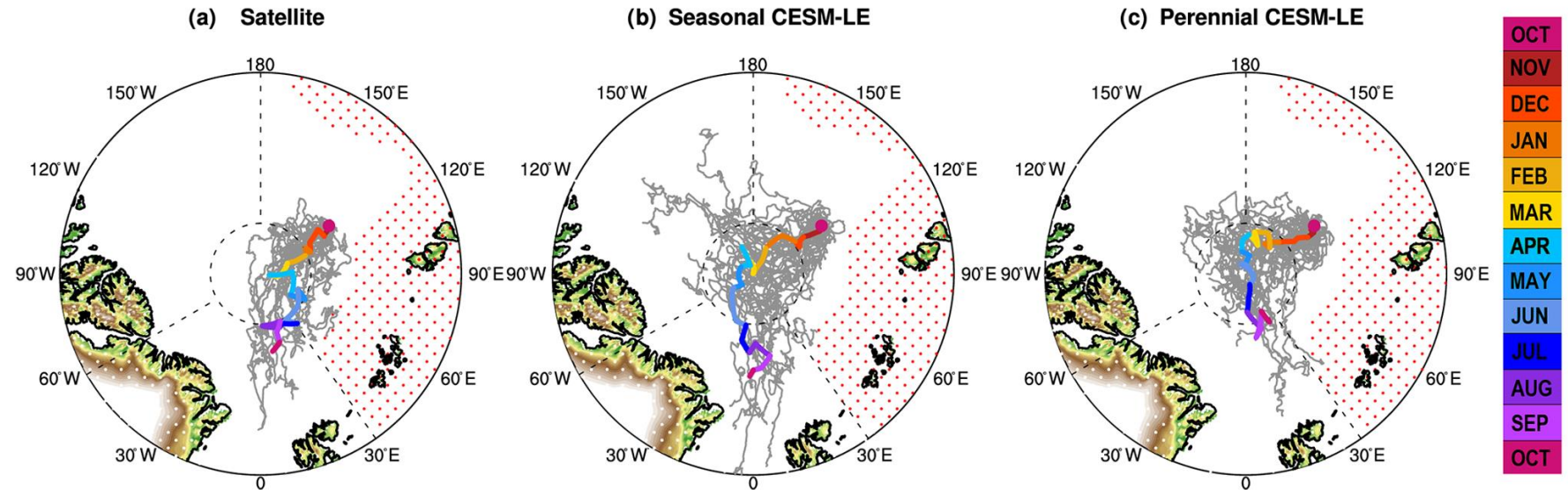
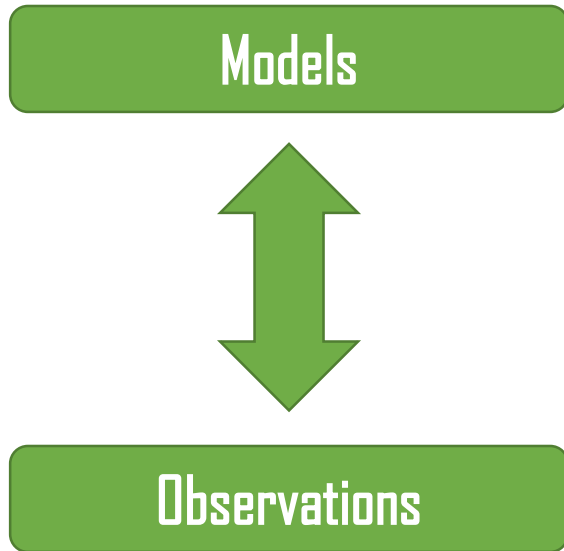
- **CESM Polar Modeling Workshop (Aug 2019)**
- **CICE & Icepack Community Workshop and Tutorial (Feb 2020)**

Future Science



- Integrating observations with models

Satellite Simulators in the CESM2: Abigail Smith

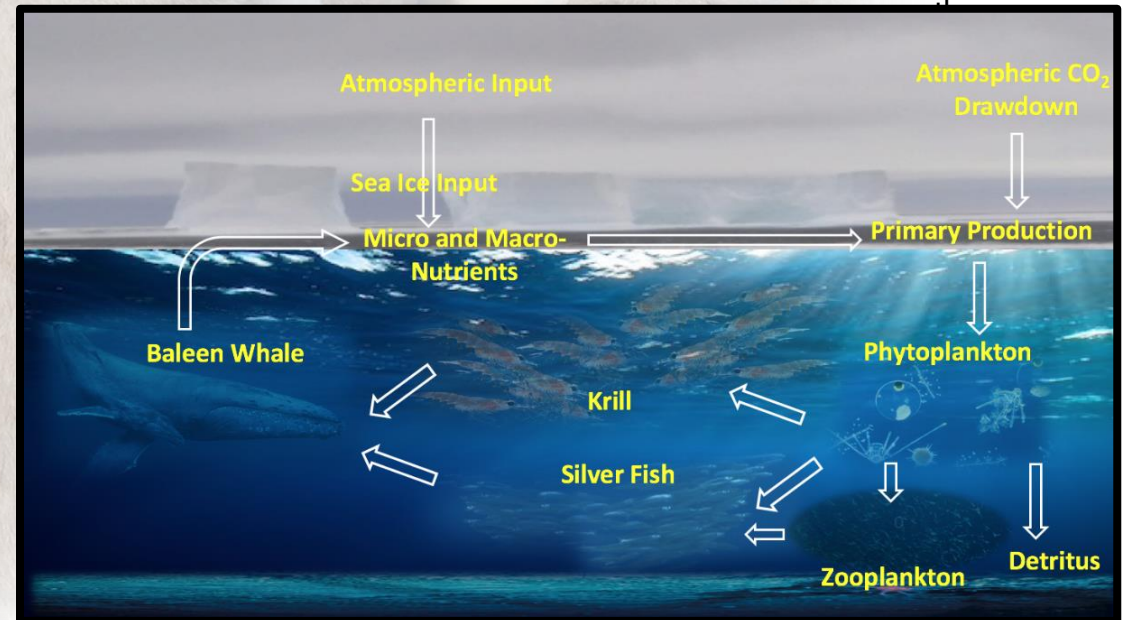


DuVivier et al (2020)

Future Science

- Coupling sea ice and ocean biogeochemistry
- Polar prediction and predictability
- Uncertainty in polar projections
- Navigating the new Arctic

WhalesAndClimate.org



We Seek Community Input!

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mholland@ucar.edu : Marika Holland

[dbailey@ucar.edu](mailto:d Bailey@ucar.edu) : Dave Bailey

duvivier@ucar.edu : Alice DuVivier

ccsm-polar-request@cgd.ucar.edu : Get on our mailing list!

Joint PCWG/LIWG/PaleoCWG Session

8:30 to noon, Wednesday June 17!