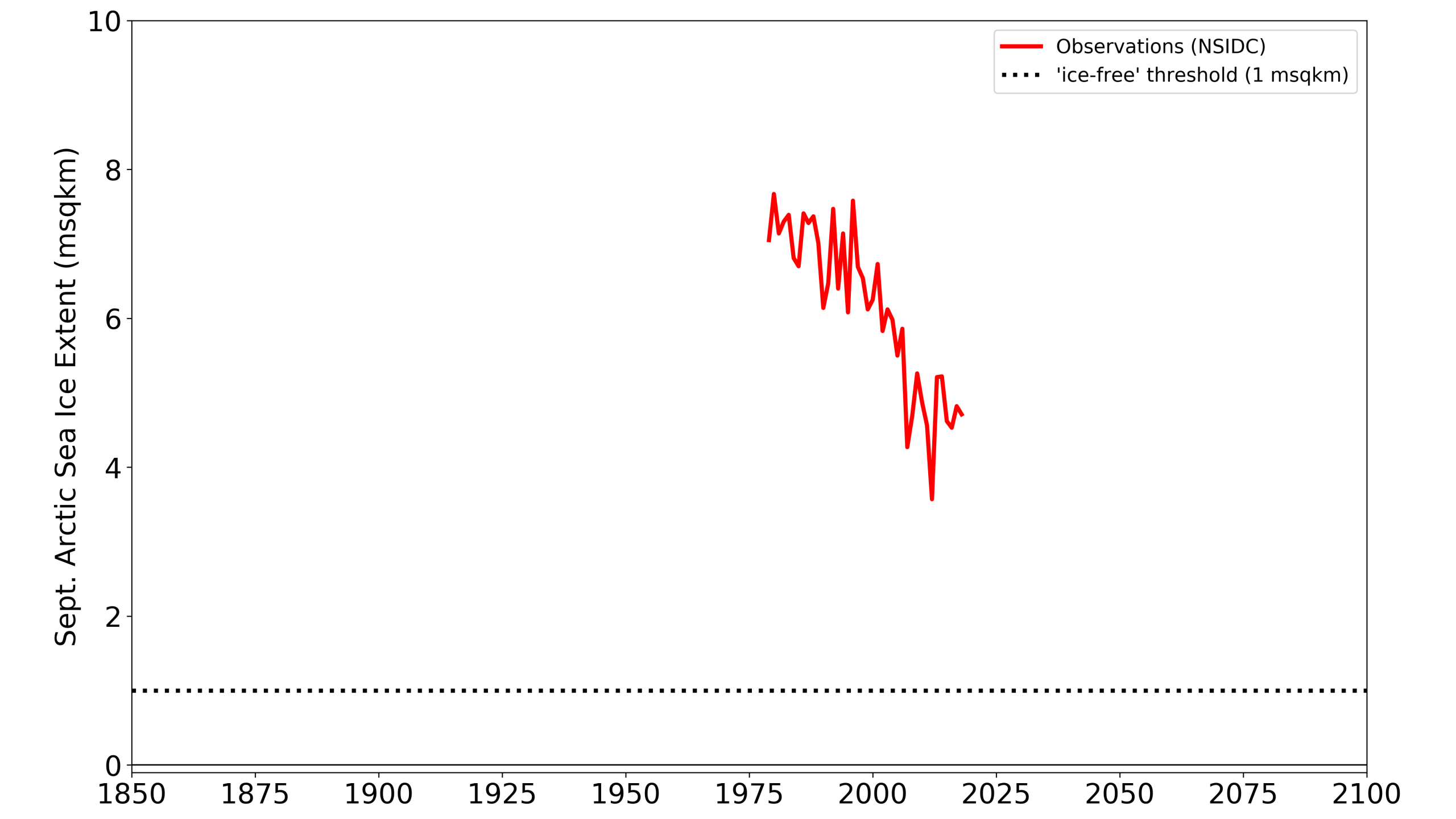
The influence of sea ice albedo on transient climate change: a case for tuning?

Jen Kay, University of Colorado

A PCWG effort with Dave Bailey, Alice DuVivier, Patricia DeRepentigny, Marika Holland, Alex Jahn, Madison Smith, Melinda Webster, Clara Deser, Ed BW, Hansi Singh, others too..

2020 CESM Workshop on Zoom


Observations (NSIDC)
'ice-free' threshold (1 msqkm)
Sept. Arctic Sea Ice Extent (msqkm)
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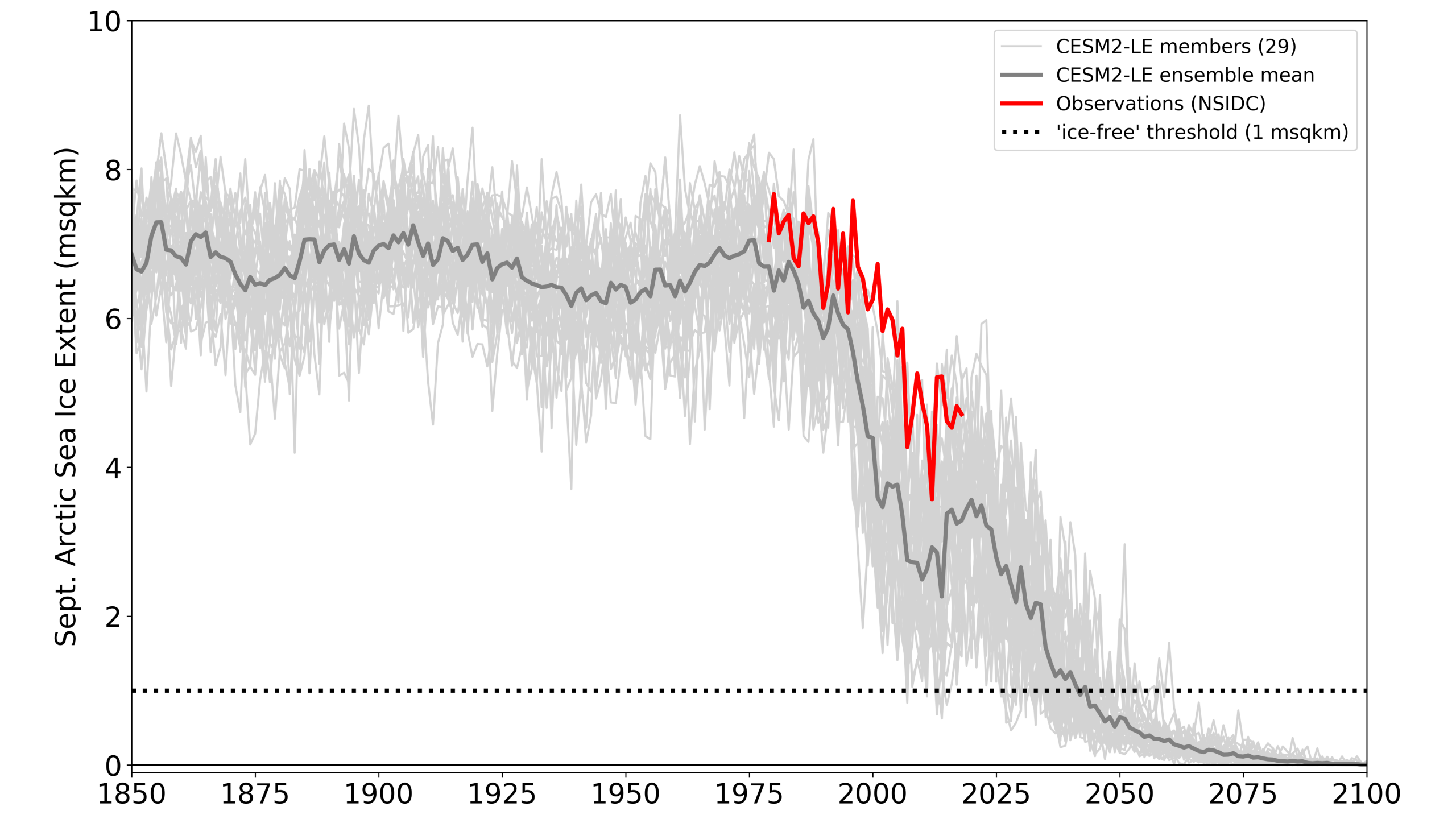
CESM2-LE members (29)
CESM2-LE ensemble mean
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Should we “street tune” CESM2 sea ice?

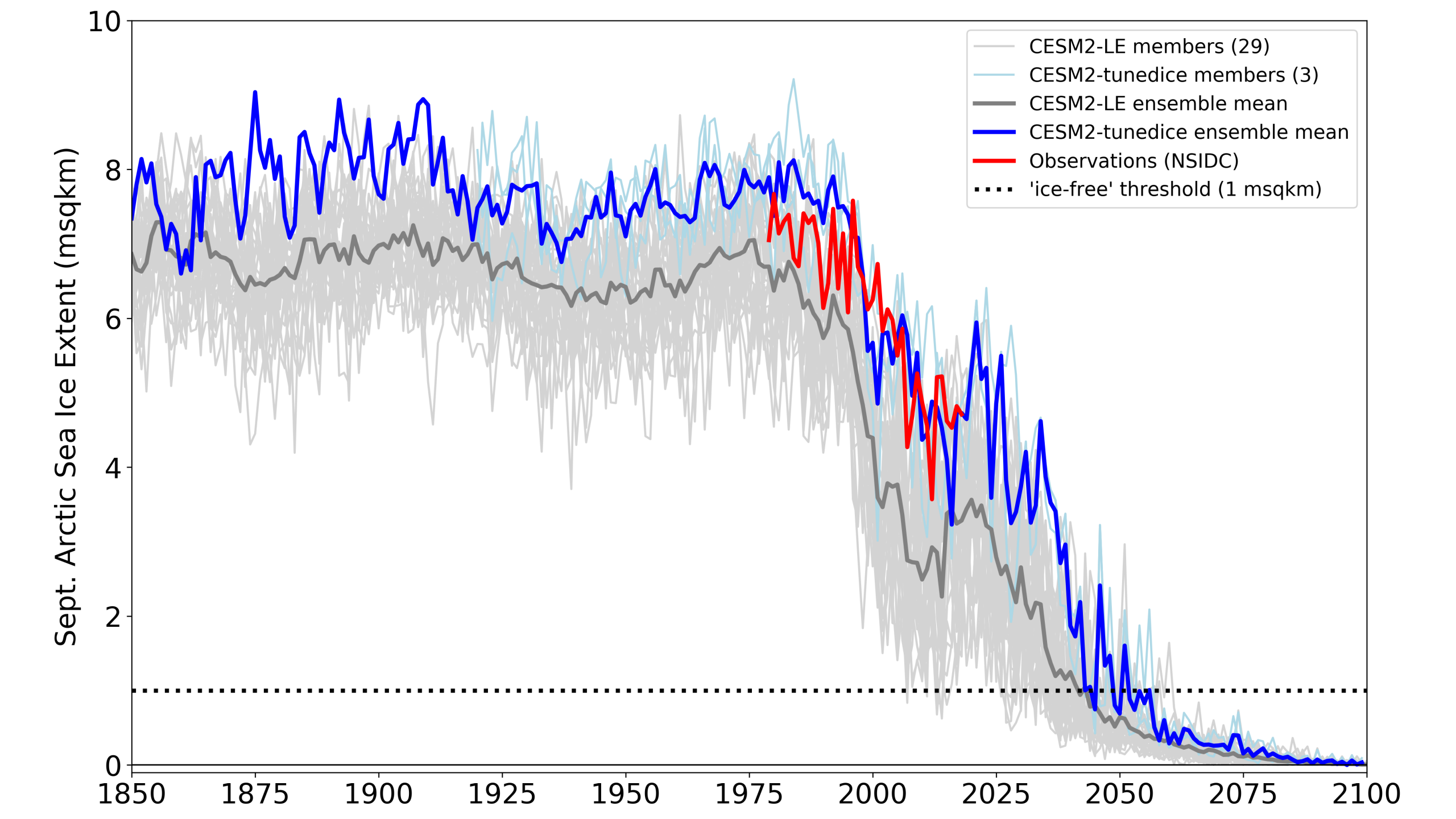
(remember context: CESM2 Labrador sea ice expansion! Very little interest in sea ice expansion/tuning after CESM2 development…)

A **street tune** is tuning in the cars actual environment, on the street in actual driving conditions.

CESM2-tuned ice experiments have:

1) r_snw = 1.5 (from 1.25) → this will result in slightly smaller snow grain radius and higher albedo,
2) dt_mlt = 1.0 (from 1.50) → the melt onset temperature is 0.5C higher.

No other tuning was done.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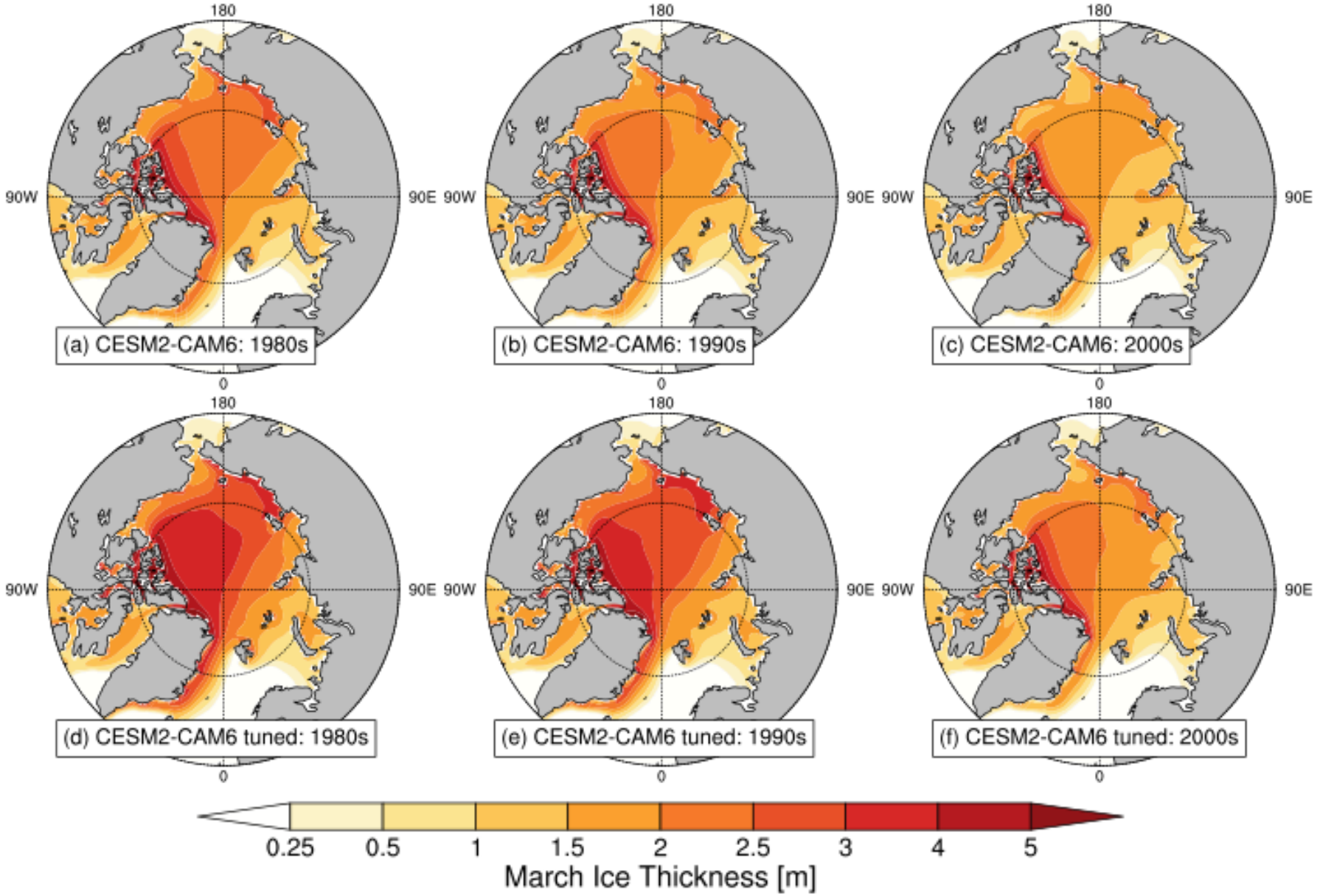

Figure. Ensemble mean, decadal mean March Arctic ice thickness during the 1980s (left), 1990s (center) and 2000s (right) in the CESM2-CAM6 (top) and the CESM2-CAM6 tuned ice (bottom). Note that the spacing of the color shading is uneven to highlight the thinner ice categories. Figure from Patricia DeRepentigny (CU)

Summary

CESM2 Large Ensemble simulations confirm that CESM2-CAM6 historic Arctic sea ice extent loss is greater than observed. See also *DeRepentigny et al. (revised, JGR-Oceans).*

Sea ice mean state is one of many factors that affect sea ice loss rates.

With "street tuning", CESM2 has thicker sea ice and observed Arctic sea ice loss that is closer to observed. Climate impacts outside of the Arctic/Antarctic are still under investigation, but initial results show modest non-polar impacts.