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Anthropogenic Attribution of Sea Level Rise Contributions from the West Antarctic Ice Sheet

Alex Bradley, C. Rosie Williams, Rob Arthern, Paul Holland, David Bett, Jan De Rydt



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How likely is it that the changes we've seen in
Antarctica are caused by climate change?

(and why does it matter?)

Glaciology and Attribution Science?

A melting glacier, an imperiled city and one farmer's fight for climate justice

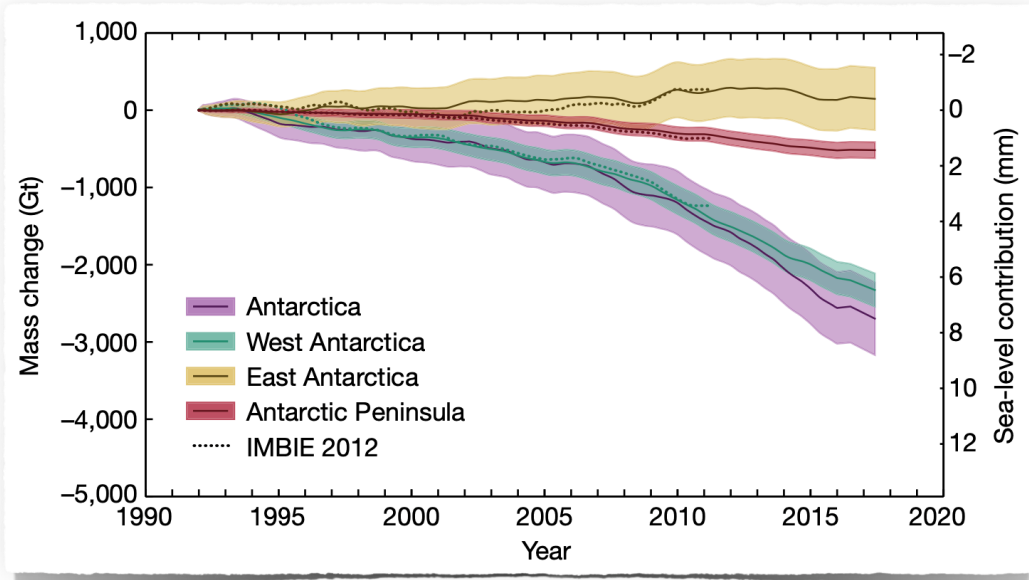
Washington Post, August 2022

Can we do the same thing
for Antarctica?

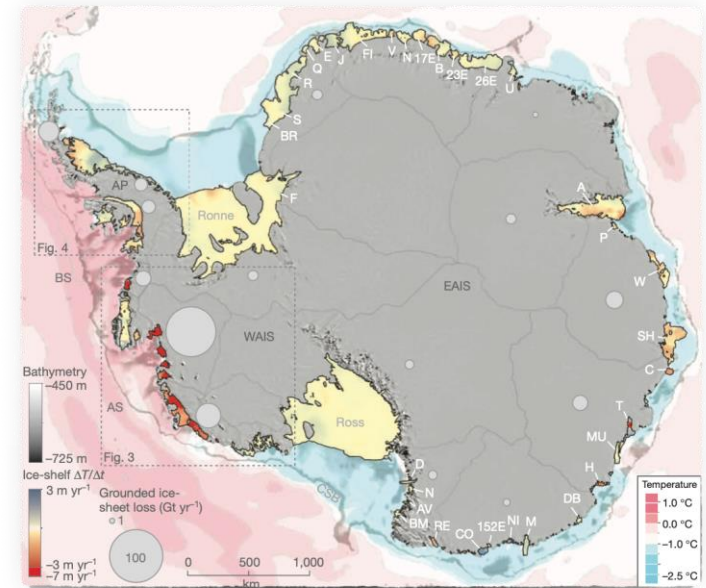
“When you must actually take responsibility for your [past] actions,” she said, “you will also change what you do right now.”

Roda Verheyen

...this is a big challenge



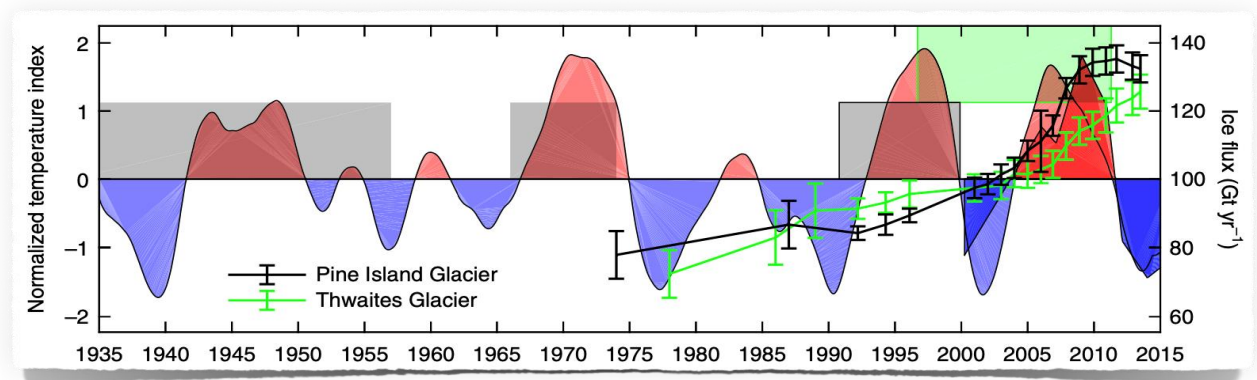
IMBIE team, 2018



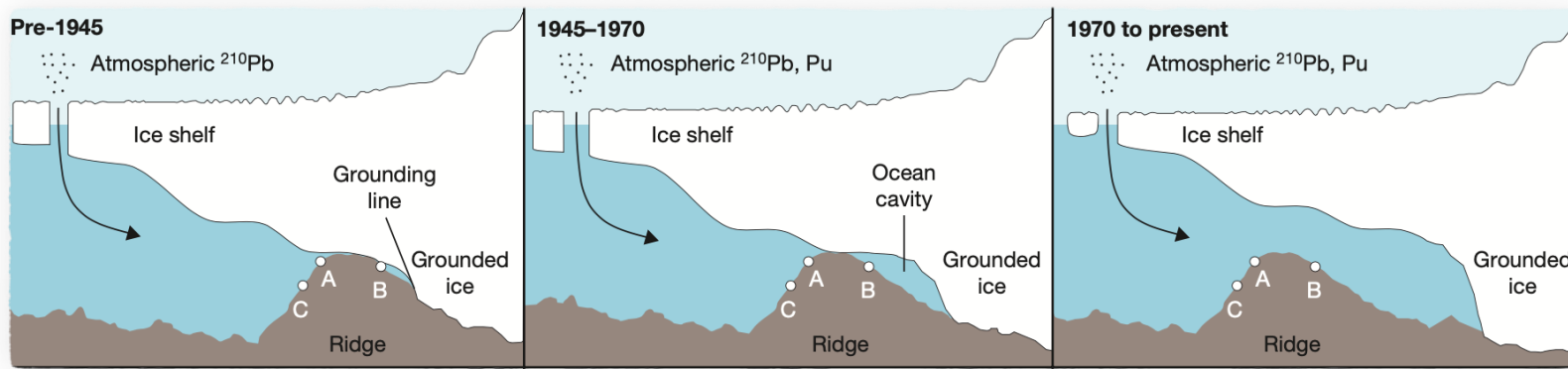
Pritchard et al., 2012

WAIS has lost mass throughout the satellite record, driven by changes in basal melting

Possibility of instabilities mean that it is not clear whether these changes can be attributed to climate change



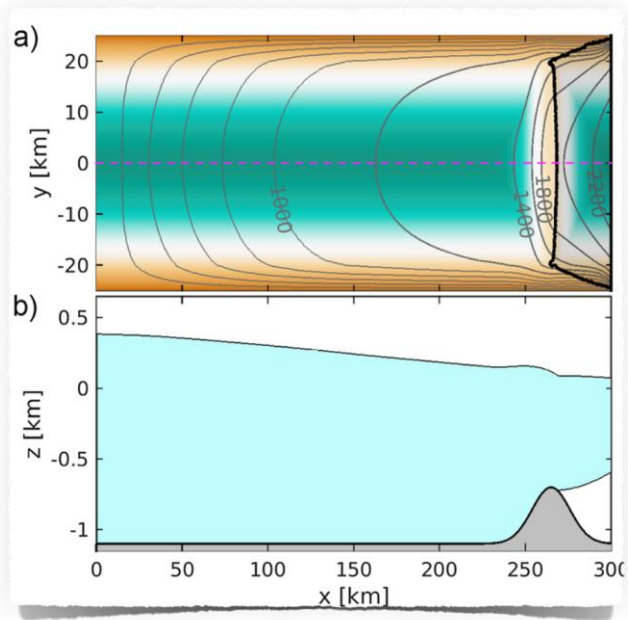
Jenkins et al., 2018



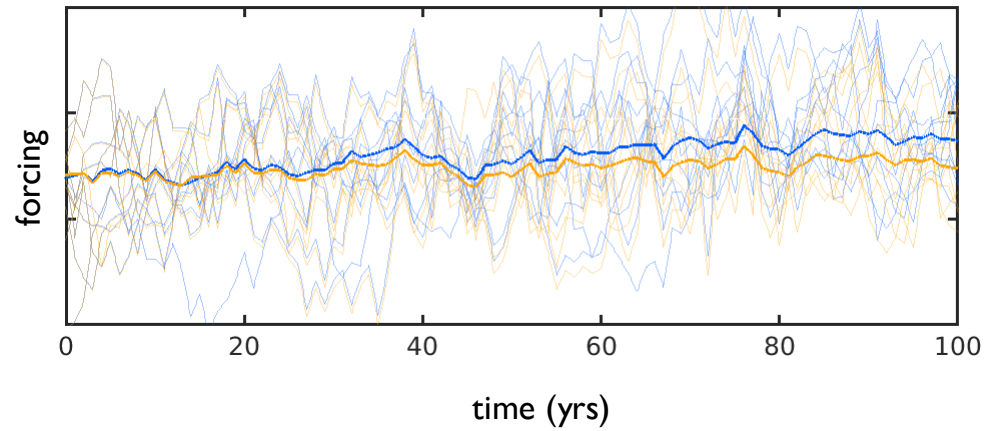
Smith et al., 2016

Ice dynamic feedbacks can result in rapid retreat following a natural melt anomaly, even without further climate forcing

Ice sheet retreat in a noisy climate?

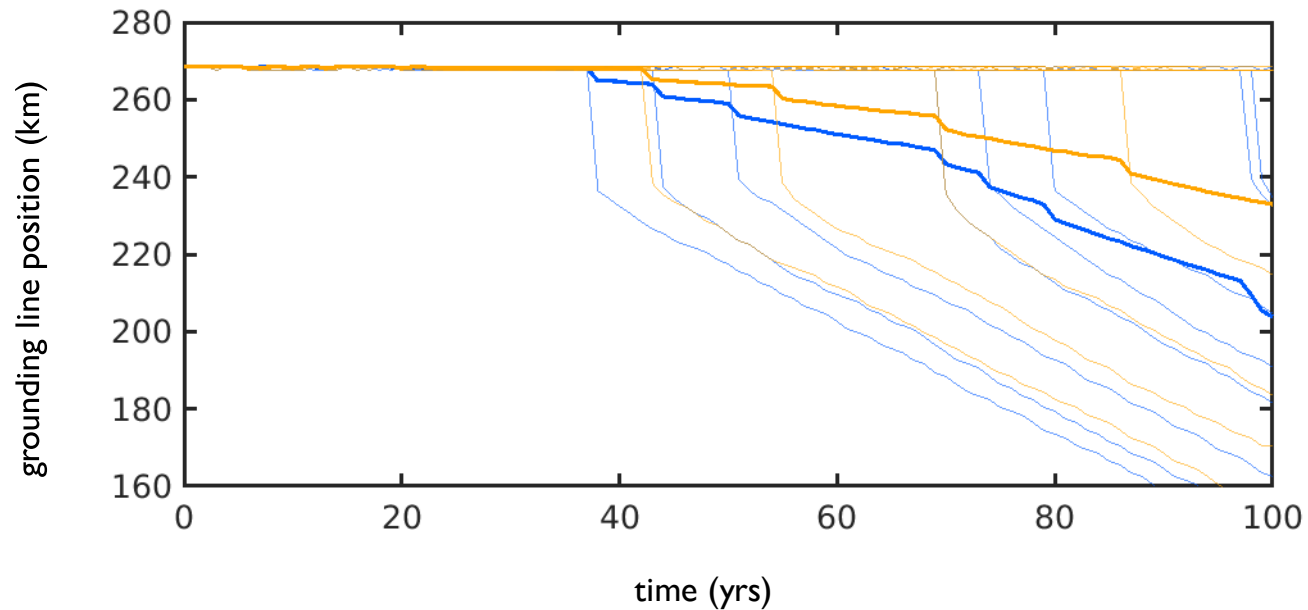
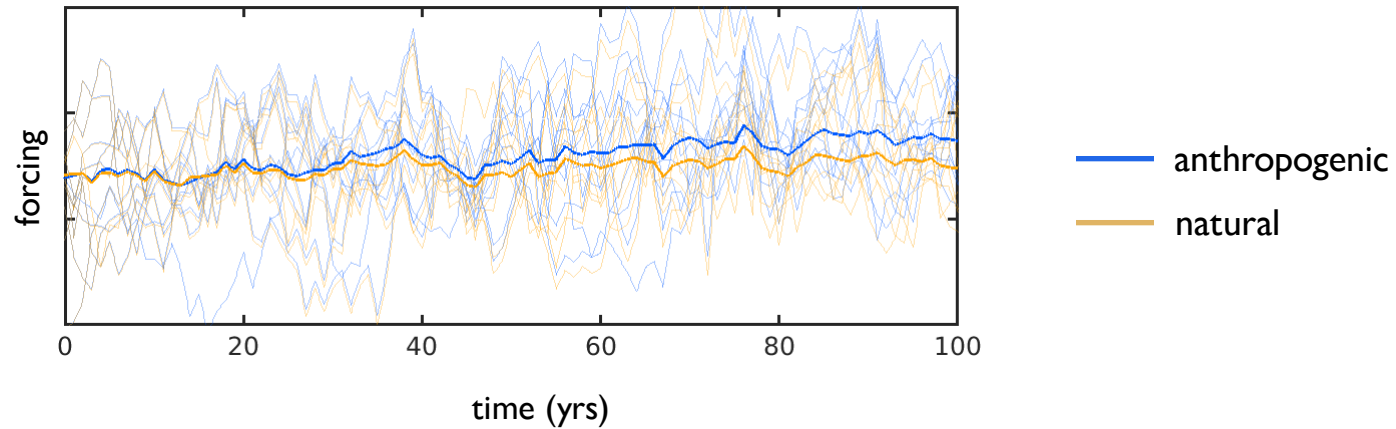


De Rydt and Gudmundsson, 2016



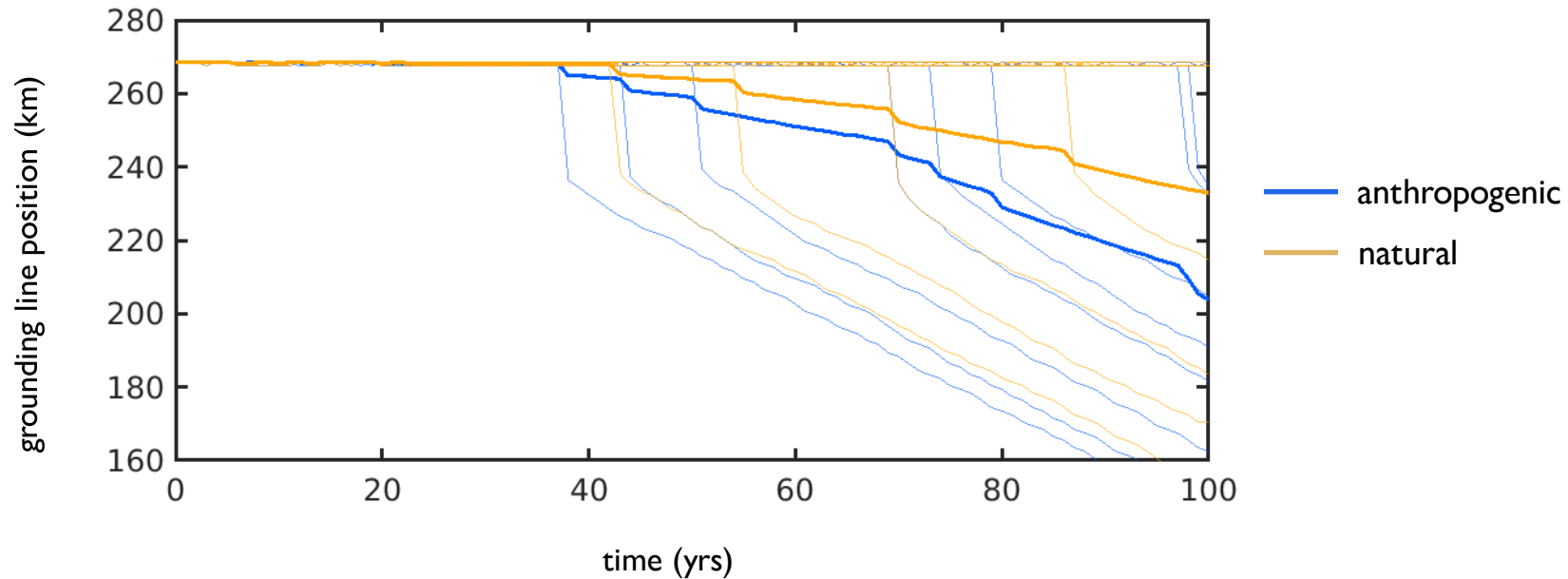
— anthropogenic
— natural (no trend)

Ice sheet retreat in a noisy climate is a stochastic phenomenon



Significant retreat of ice sheets is not necessarily an indicator of climate change

Ice sheet retreat in a noisy climate is a stochastic phenomenon



stochastic
retreat



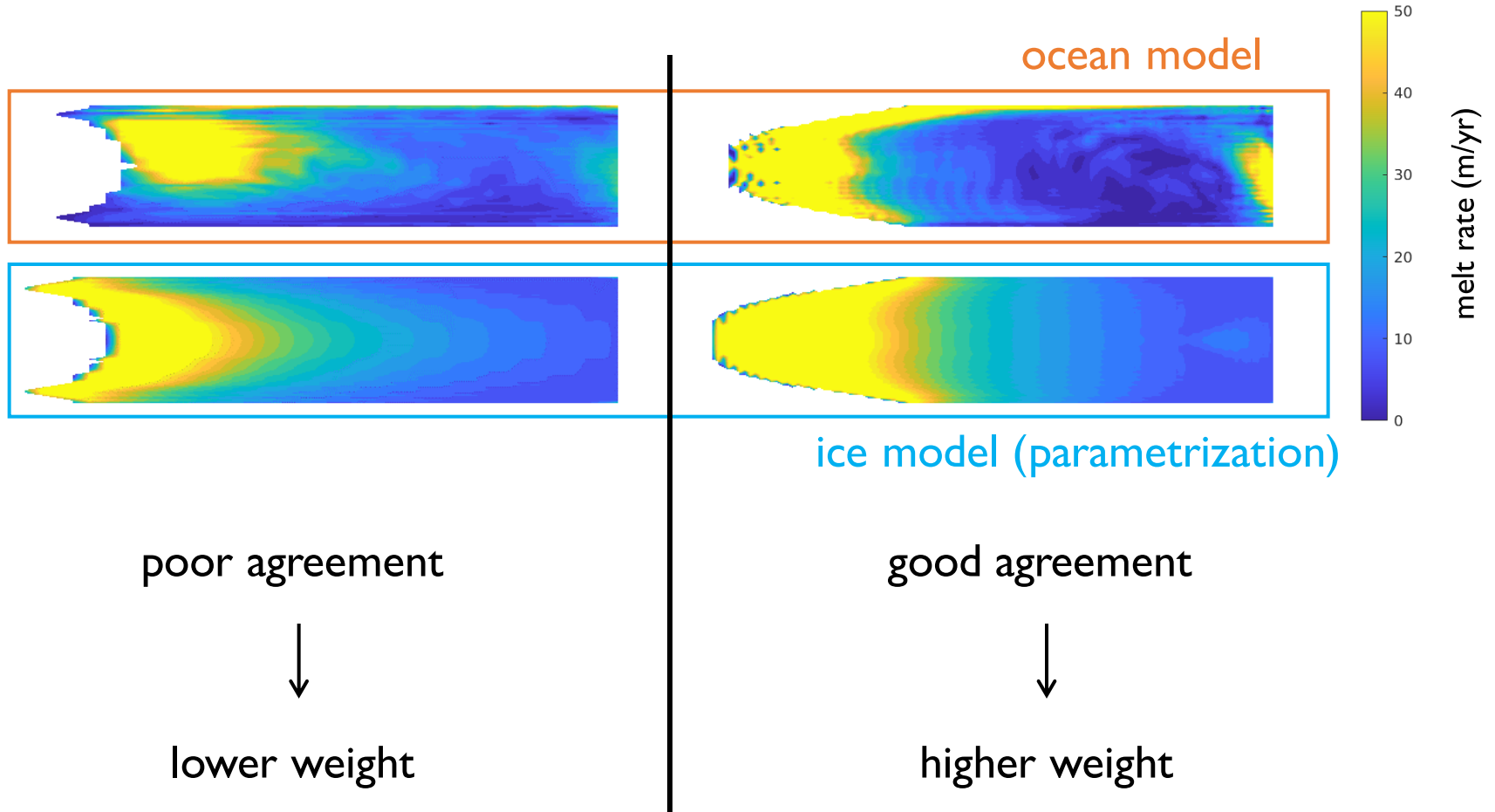
need large
ensemble of
simulations



but...results of each
sensitive to choices in
melt parametrization

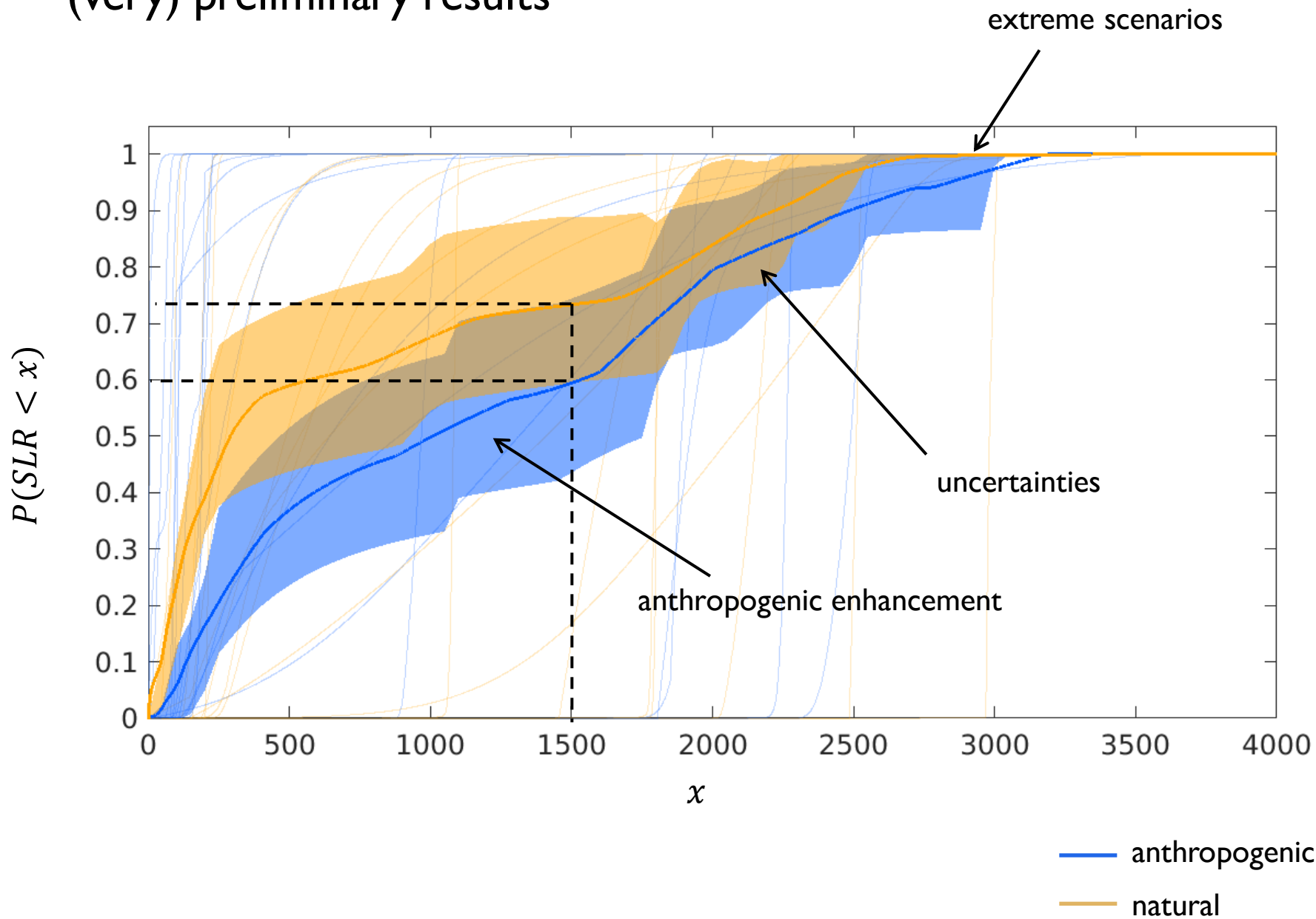
?

'pseudo-coupled' Bayesian calibration approach



Simulations whose parametrized melting agrees better with ocean model given higher weight

(very) preliminary results



Summary

Trying to do attribution science on Antarctica is hard, but worthwhile

Significant retreat of Antarctic ice sheets is not necessarily an indicator of climate change. Retreat is a stochastic phenomenon.

Anthropogenic forcing makes extreme scenarios more likely, but there is significant uncertainty in potentially unstable systems



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