

OVERSHOOTING THE TIPPING POINT THRESHOLD FOR THE GREENLAND ICE-SHEET USING A COM- PLEX ICE-SHEET MODEL

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NILS BOCHOW

NILS.BOCHOW@UIT.NO



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UiT The Arctic
University of Norway



MOTIVATION

- Desultory efforts to reach warming goals by year 2100
- Can we exceed the goals and still be safe?
- Short term overshoot without triggering transition of system possible
- Greenland slow time scale & multiple states suspected

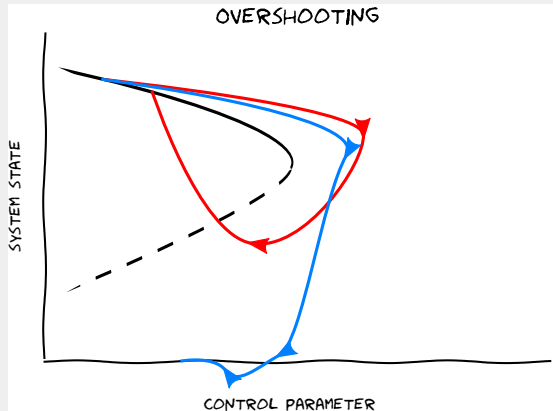


Figure: Sketch of bifurcation diagram with overshooting of tipping point.

STABILITY DIAGRAM

- Warming until year 2100 with subsequent cooling until 2200
- run for 40k years in total
- more than 2°C warming critical

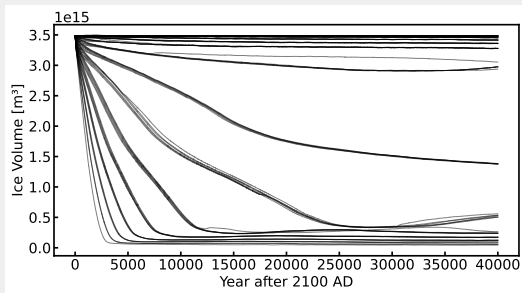


Figure: Corresponding time series for stability diagram.

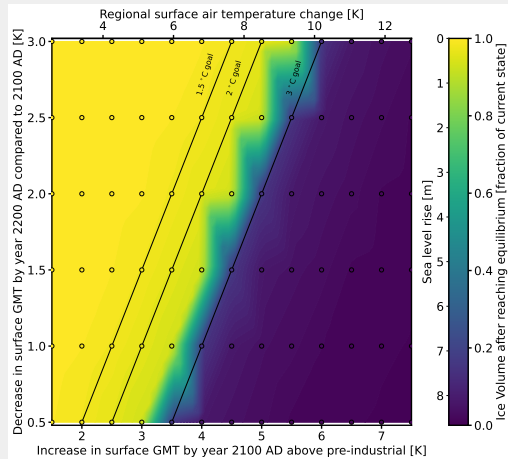


Figure: Stability diagram of GrIS for several warming and cooling scenarios.

TIME DEPENDENCE

- Warming until year 2100 with subsequent cooling to 2°C above pre-industrial
- Different cooling rates
- Massive sea-level rise

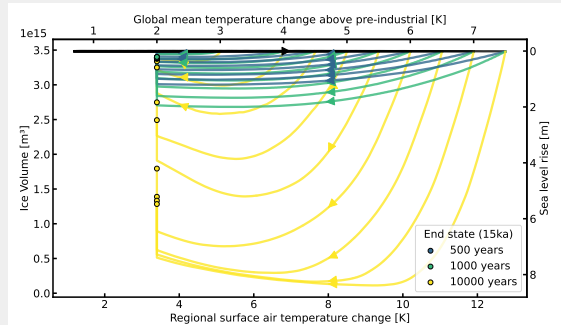
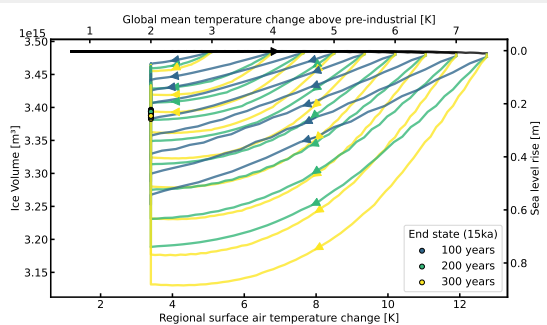


Figure: Overshoot diagram of GrIS for several convergence times back to 2°C above pre-industrial GMT.

CONCLUSION

- We can overshoot the threshold in the model for a relatively long period
- Overshoot and "saving" the ice sheet still linked to massive sea-level rise
- The GrIS might end up in a different ice sheet state if cooling takes too long (or if there is no effort to reduce the temperature at all)