

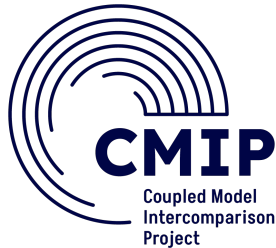
# Changes in deep-water formation amplify the Earth's Equilibrium Climate Sensitivity on multi-centennial time scales

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Fernanda D. A. O. Matos, Christian Stepanek, Jan Streffing, Tido Semmler, Gerrit Lohmann, Katherine Power, Qiong Zhang

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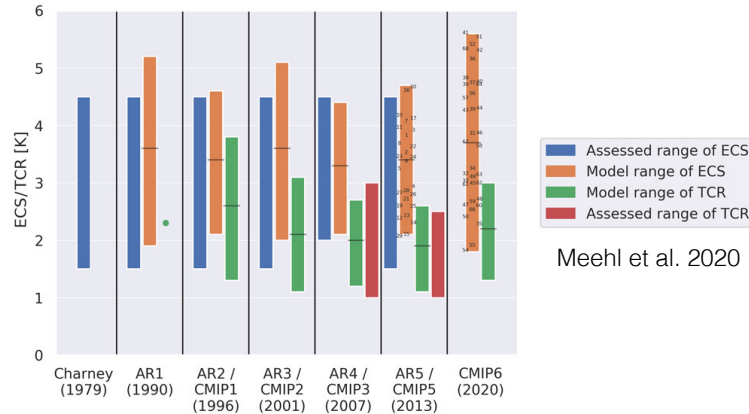
## Sensitivity of the Global Climate to Radiative Perturbation = Sensitivity of SAT to 2xCO<sub>2</sub>



abrupt-4xCO<sub>2</sub>

150 years

Equilibrium climate sensitivity (gregory method) and transient climate response



Meehl et al. 2020

CMIP6 → CMIP7

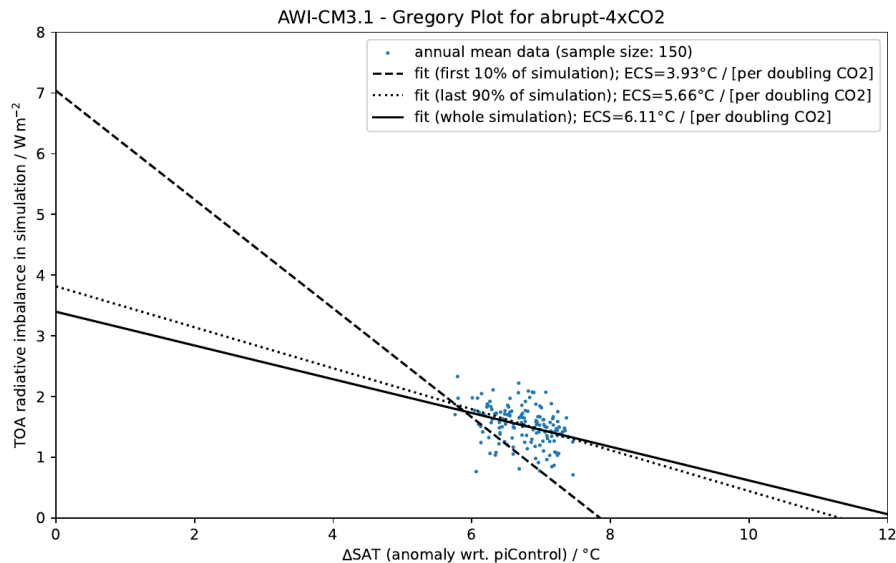
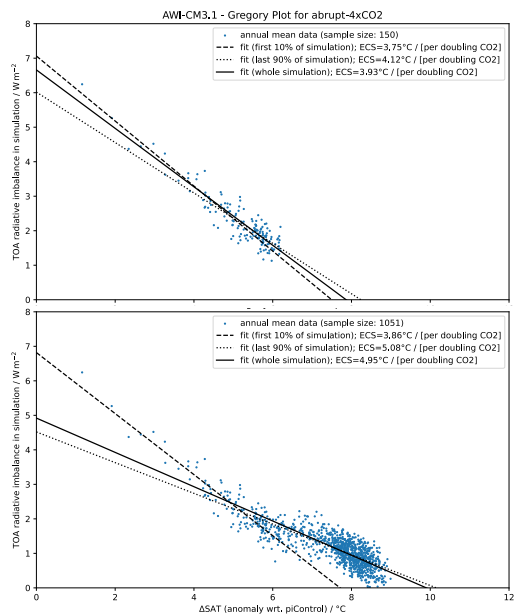
How can we better understand the Earth System Sensitivity to current and future radiative forcing?



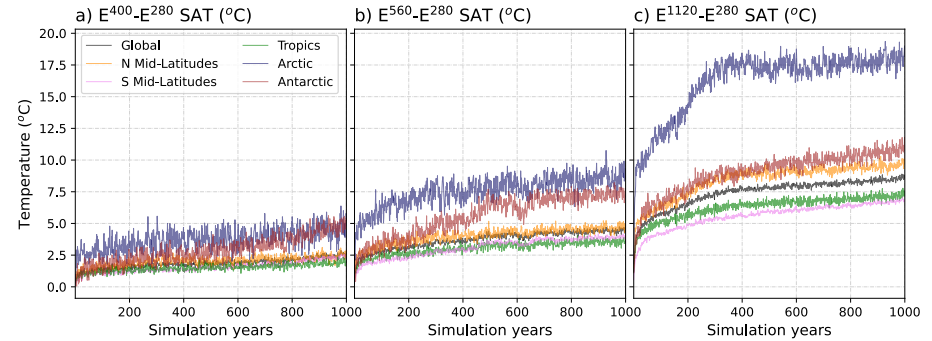
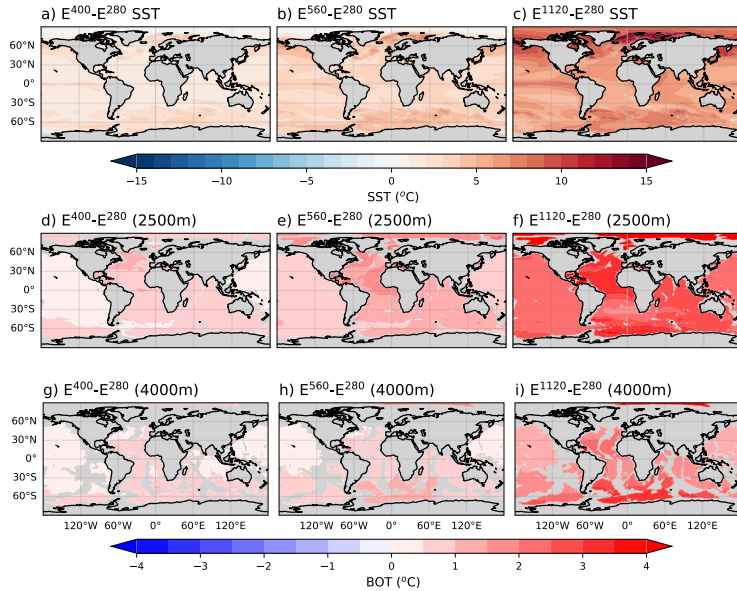
# Warming climates across timescales



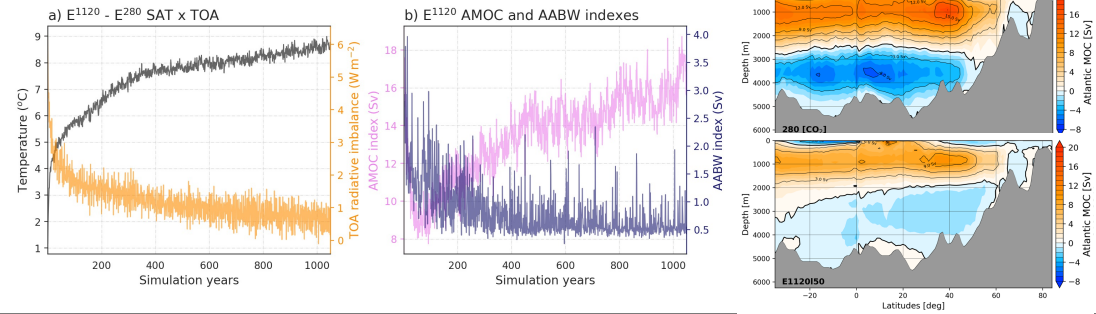
FESOM2 + OpenIFS <sup>ECMWF</sup>   $\equiv$  AWI-CM3.1  $\rightarrow$  2000 years



# Deep Water Formation and ECS



Multi-Centennial Variability



# Take-Home Messages



- ECS + 1.5°C after 150 years
- Multi-centennial variability in long-term simulations
  - SAT, AMOC, SST
- AMOC weakening and shoaling
- AABW suppression
- New mean state after +1000 years amplifying ECS
- We suggest a re-evaluation of the current CMIP ECS assessment, including longer simulations



# THANK YOU!

## OBRIGADA!

Do you have any questions?

[Fernanda.matos@awi.de](mailto:Fernanda.matos@awi.de)

