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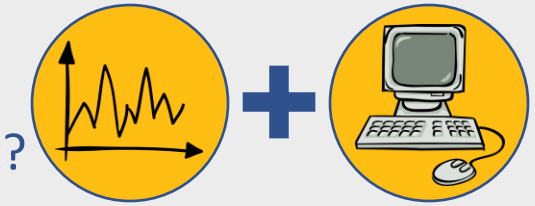
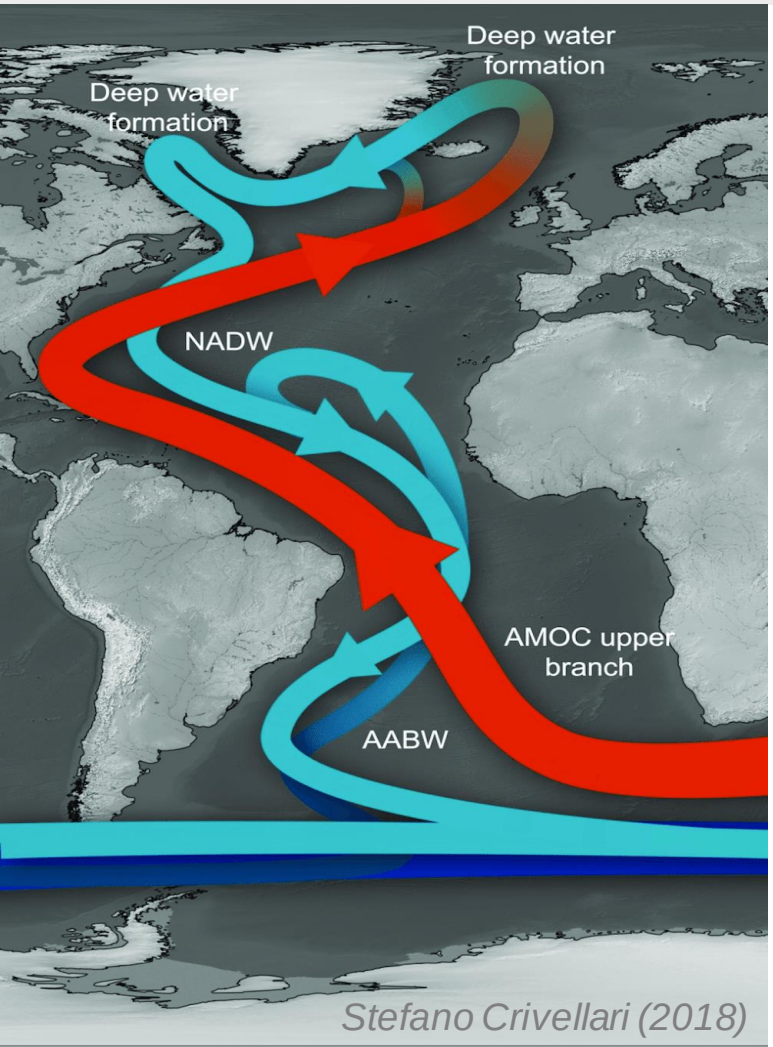
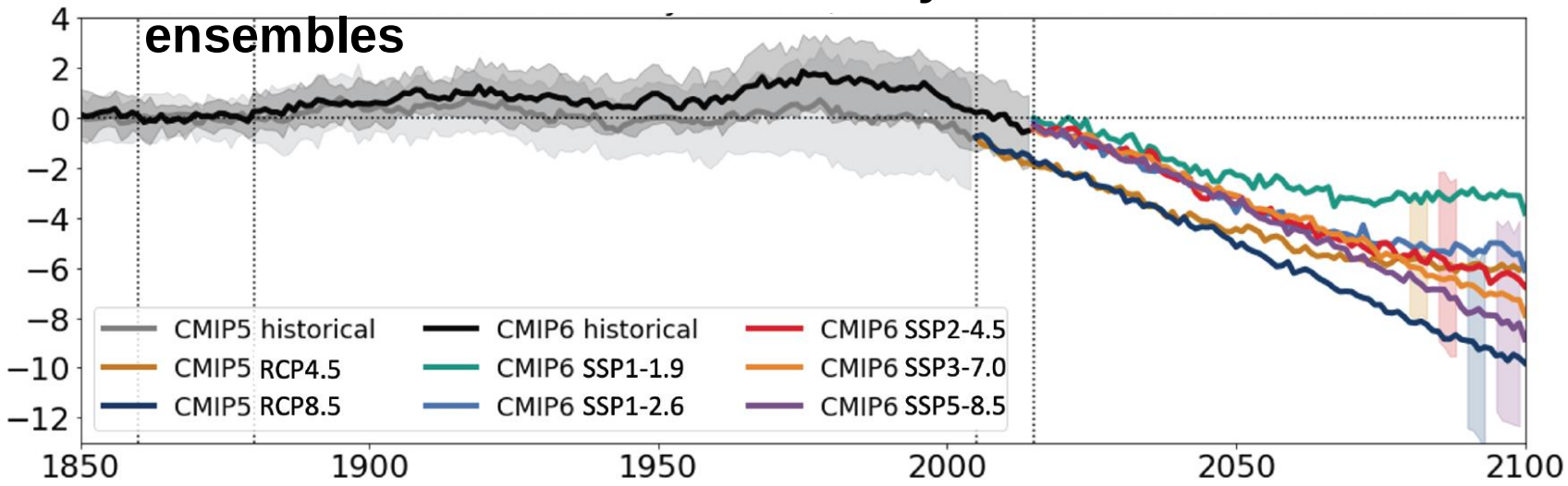
Paleoclimate



- How has the climate changed in the past?
- What caused those changes?
- How can we use paleoclimate to better inform the future?



Stefano Crivellari (2018)



*"The Atlantic Meridional Overturning Circulation (AMOC) will very likely **decline** over the 21st century for all SSP scenarios."*

*"There is medium confidence that the decline will not involve an **abrupt collapse** before 2100."*

—IPCC AR6

nature communications

Article

https://doi.org/10.1038/s41467-023-39810-w

Warning of a forthcoming collapse of the Atlantic meridional overturning circulation

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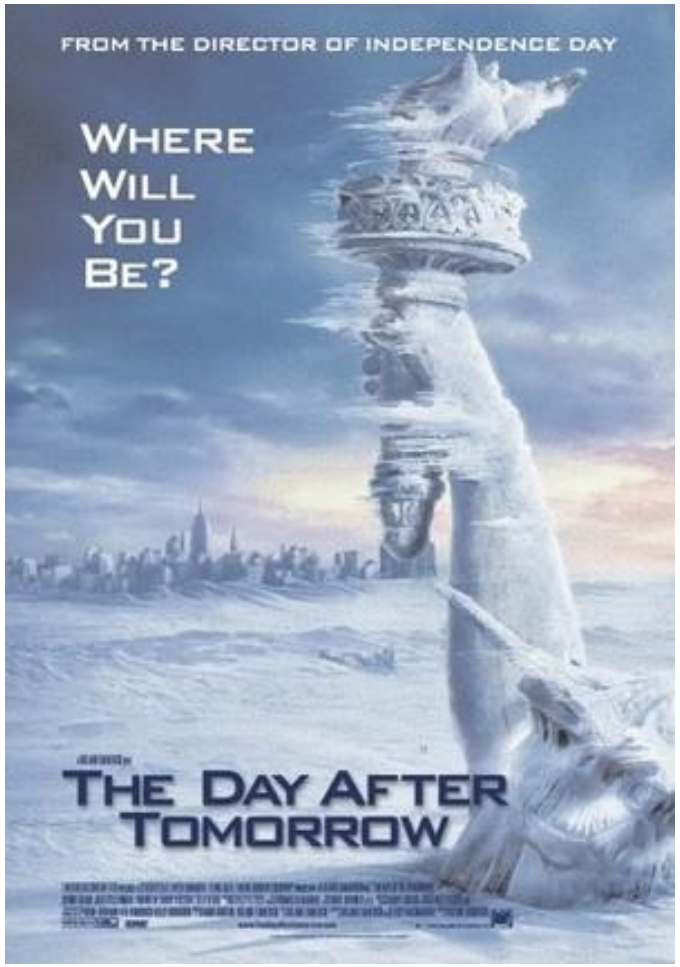
Check for updates

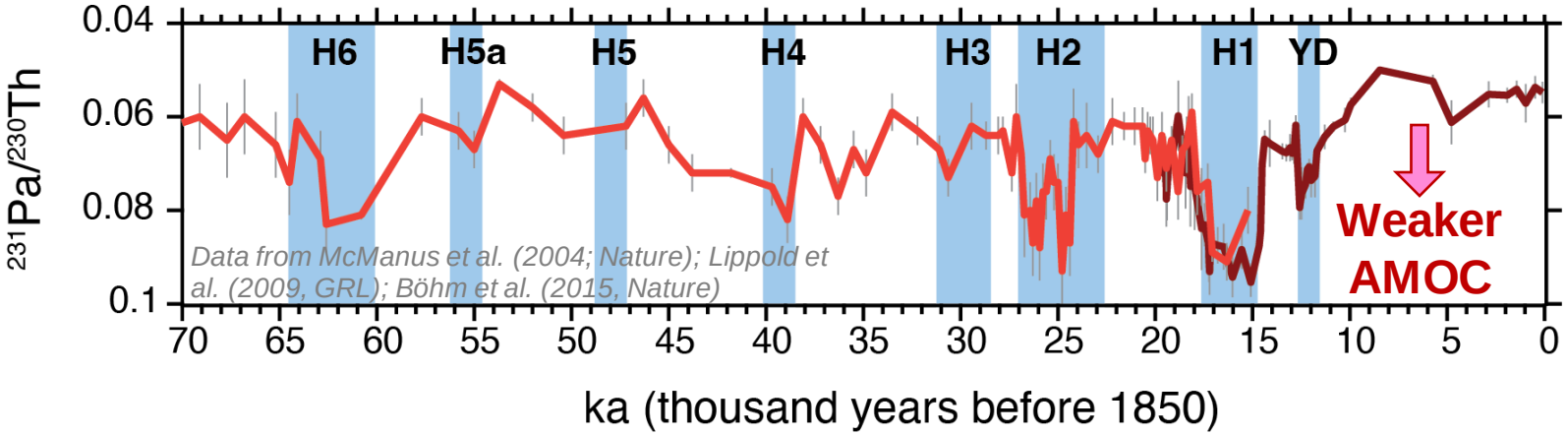
Peter Ditlevsen [1,3] & Susanne Ditlevsen [2,3]

The Atlantic meridional overturning circulation (AMOC) is a major tipping element in the climate system and a future collapse would have severe impacts on the climate in the North Atlantic region. In recent years weakening in circulation has been reported, but assessments by the Intergovernmental Panel on Climate Change (IPCC), based on the Climate Model Intercomparison Project (CMIP) model simulations suggest that a full collapse is unlikely within the 21st century. Tipping to an undesired state in the climate is, however, a growing concern with increasing greenhouse gas concentrations. Predictions based on observations rely on detecting early-warning signals, primarily an increase in variance (loss of resilience) and increased autocorrelation (critical slowing down), which have recently been reported for the AMOC. Here we provide statistical significance and data-driven estimators for the time of tipping. We estimate a collapse of the AMOC to occur around mid-century under the current scenario of future emissions.

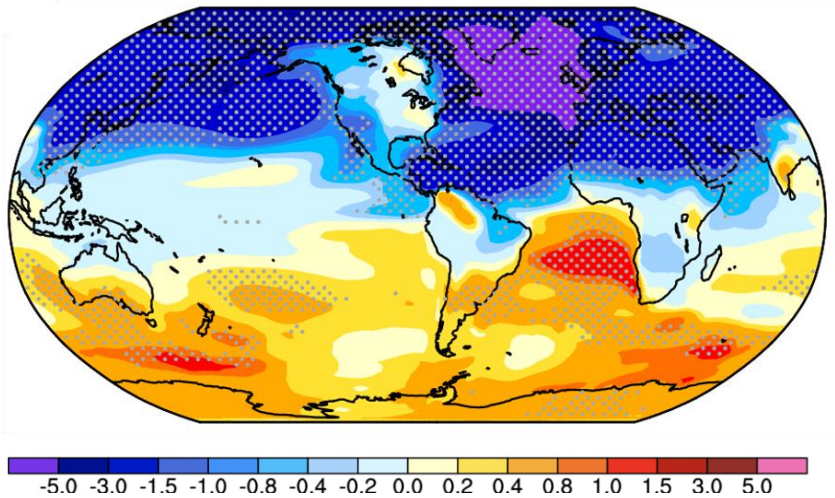


*"We estimate a **collapse** of the AMOC to occur **around mid-century** under the current scenario of future emissions."*

AMOC has collapsed in the past. Studies of these past events can inform us of the impact of a weaker AMOC on the global climate.

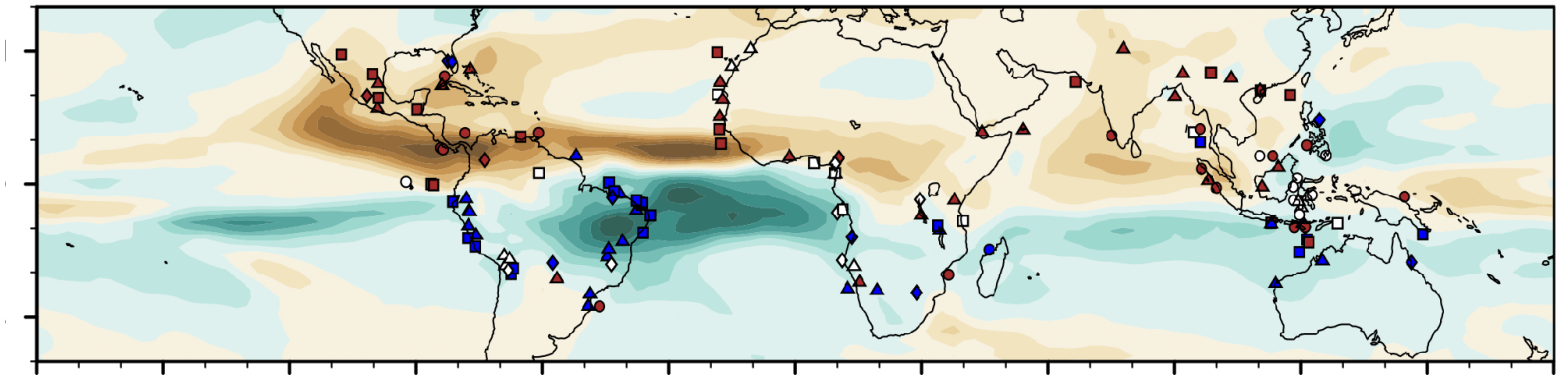


Temperature change (˚C)



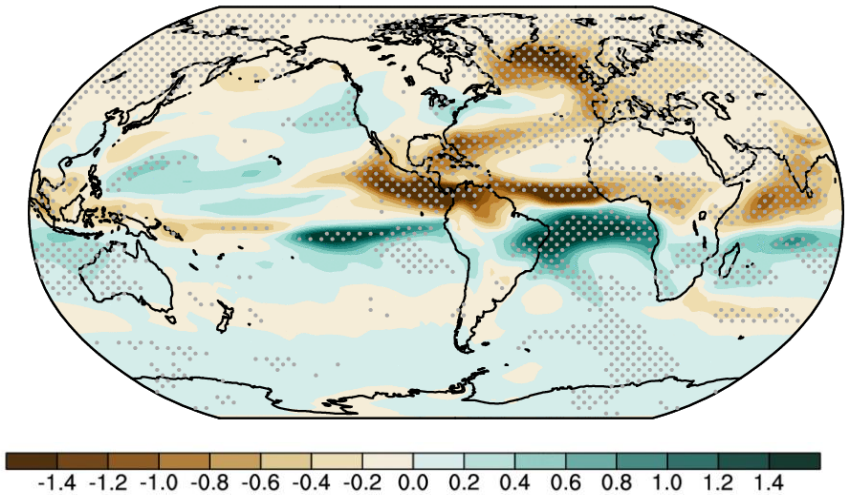
Scientific ocean drilling allows us to

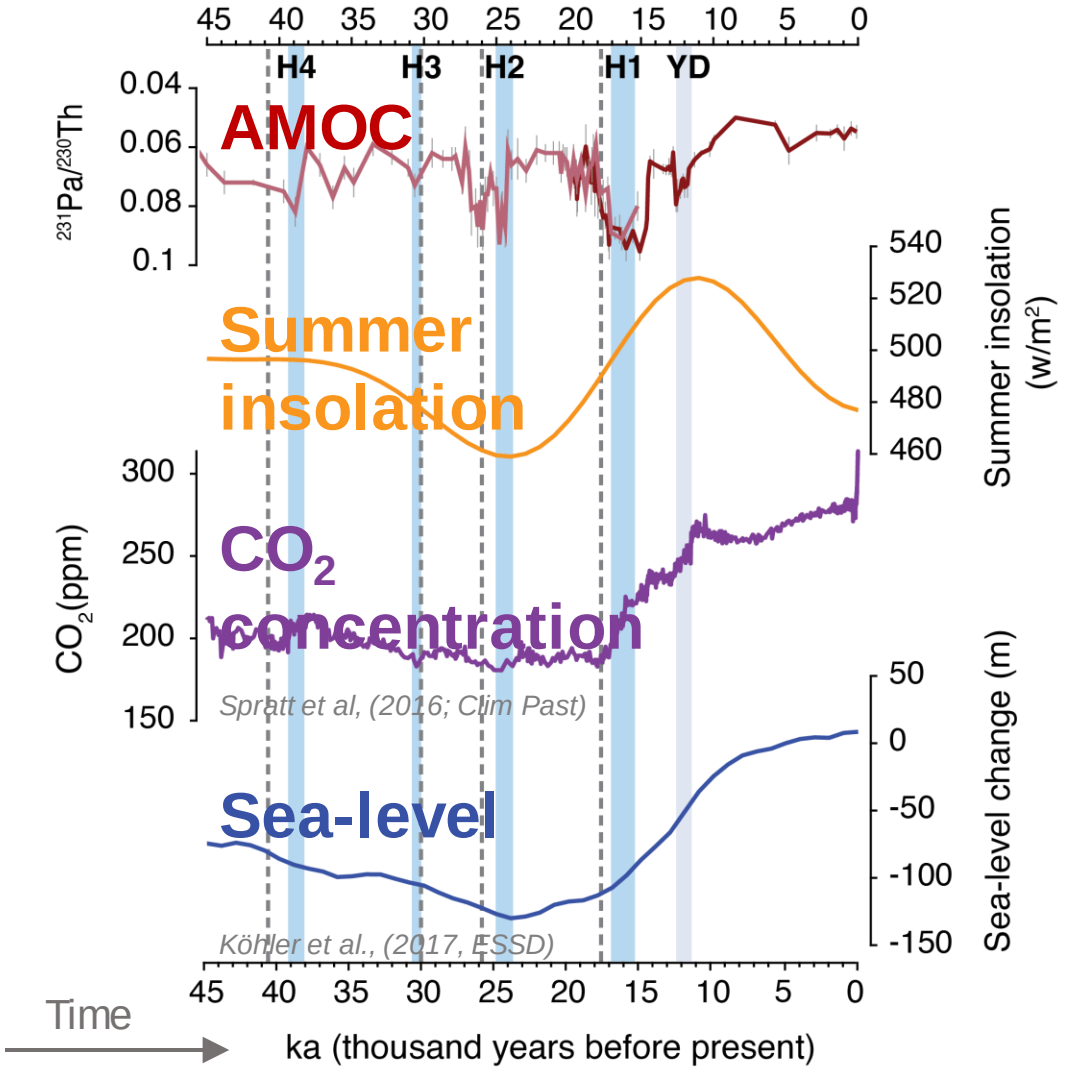
- reconstruct how climate has changed across time and space
- evaluate the performance of climate models
- understand how a weaker AMOC will impact climate in addition to greenhouse gasses

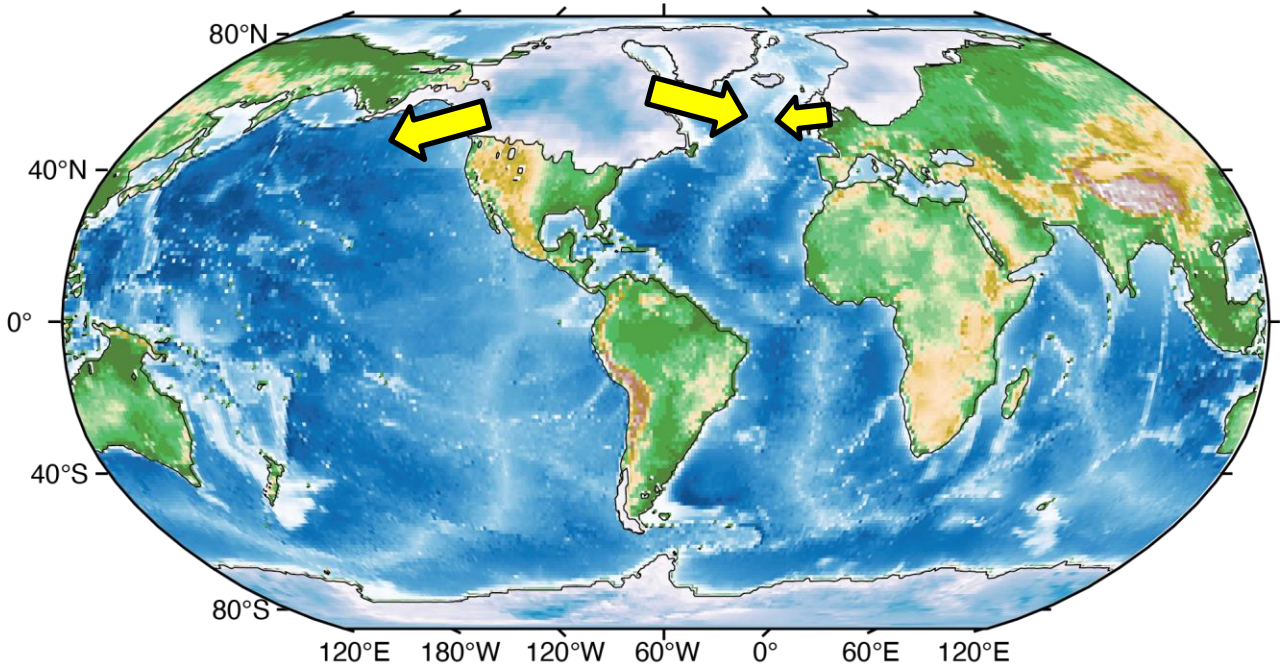


Lawman, Sun, et al. (in prep)

Precipitation change (mm/day)







Topography and ice sheet thickness data from ICE-6G_C

Drivers of past climate changes are complicated. We need more high-quality paleoclimate reconstructions to better understand the *causes*, *dynamics*, and *impacts* of these past events.

"How have ocean biogeochemical and physical processes contributed to today's climate and its variability, and how will this system change over the next century?"

- Priority Science Questions identified in DSOS 2015-2025