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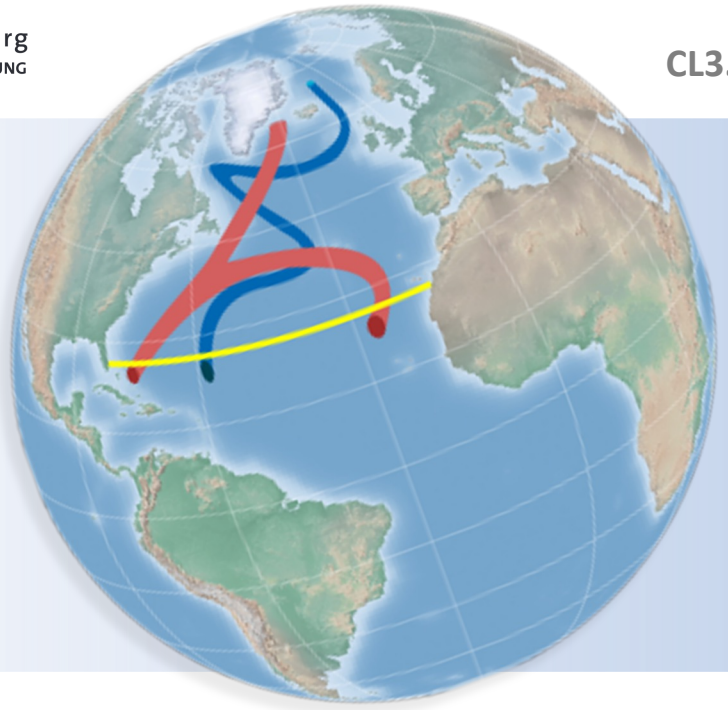

Causal attribution of low AMOC strengths to anthropogenic influence

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This presentation participates in OSPP
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Outstanding Student & PhD candidate Presentation contest

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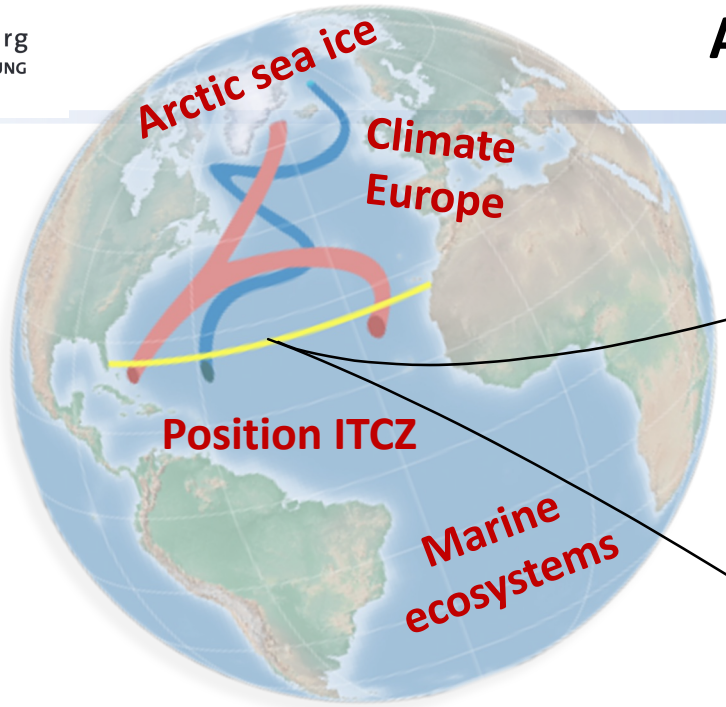
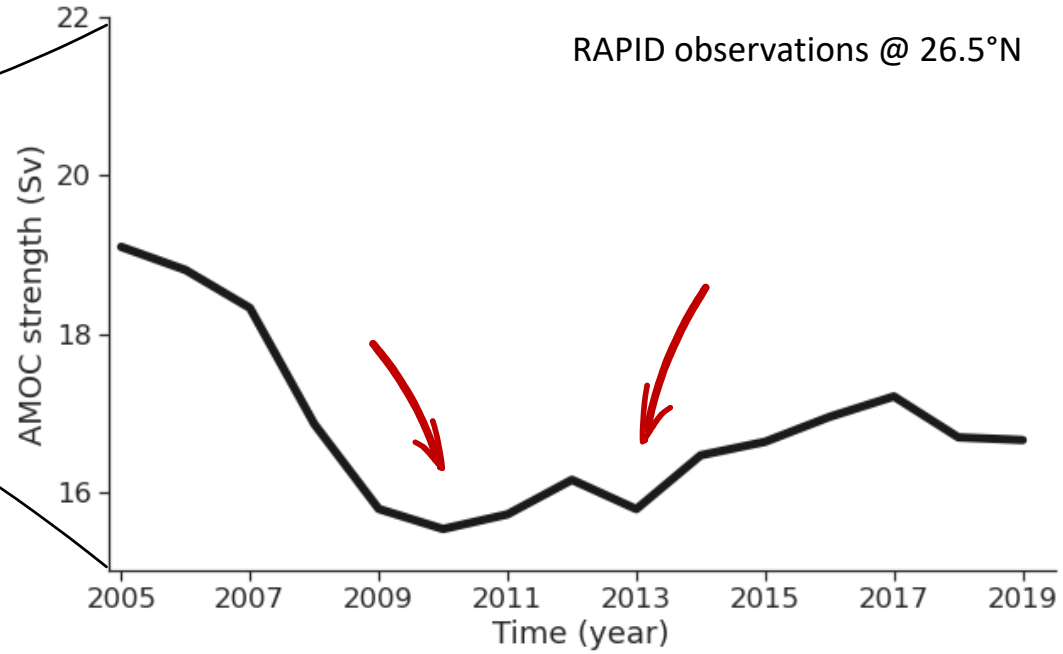
Are we slowing down the AMOC?





Previous studies

Present **detection** is difficult due to **short observations** and **high variability**

Santer et al. (1995), Baehr et al. (2007), Roberts et al. (2014), Lobelle et al. (2020)

This study

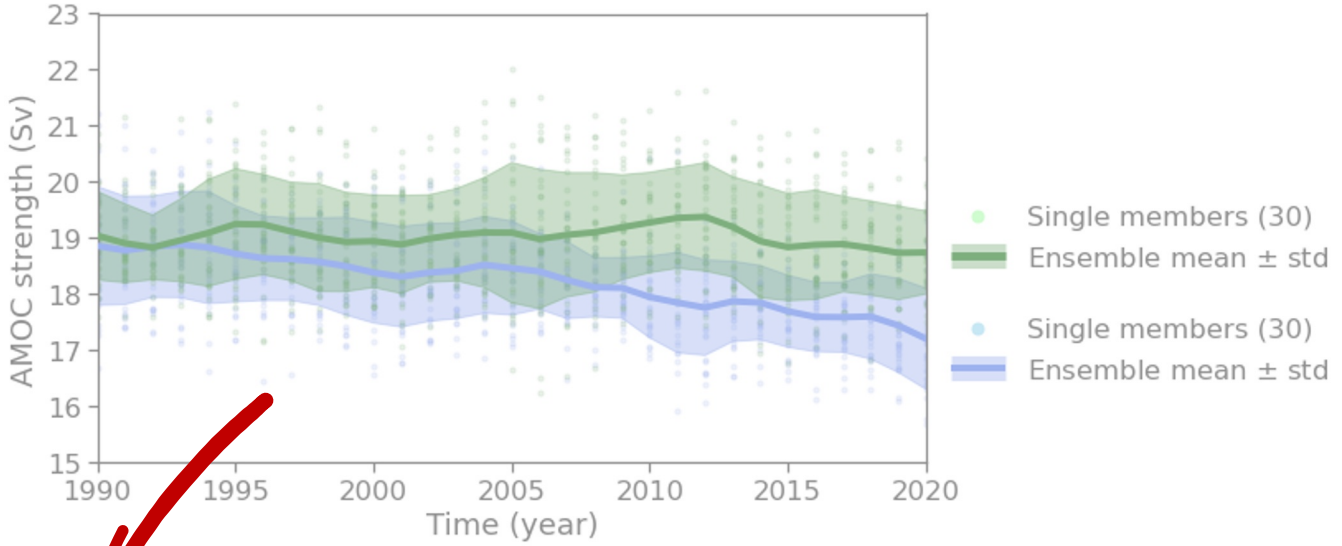
First **event attribution** approach to low AMOC strengths

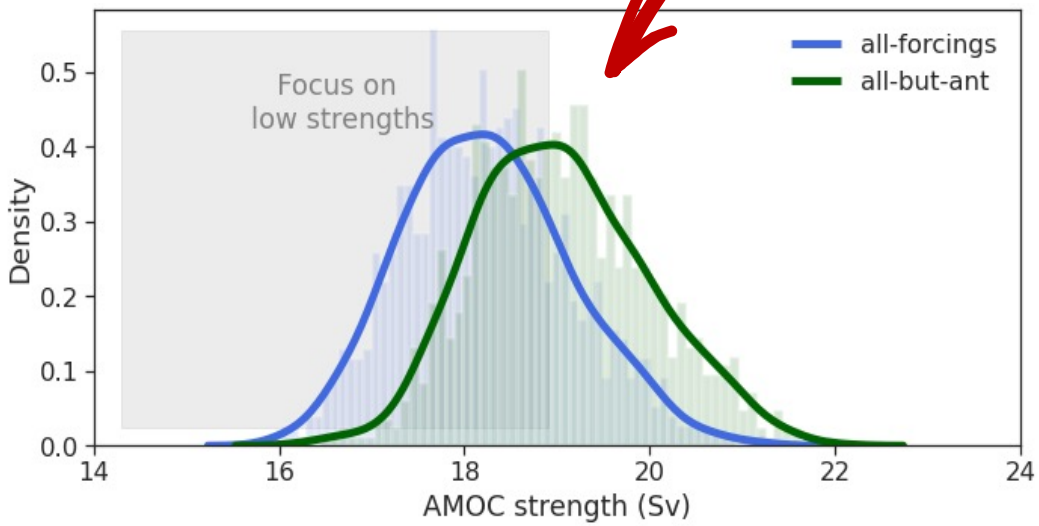
Attributing low AMOC through counterfactuals

MPI-ESM1.2-LR (CMIP6)

Factual
all-forcings

Counterfactual
all-but-anthropogenic





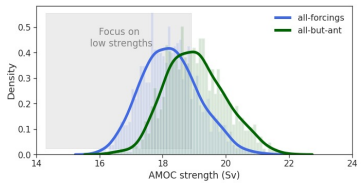
AMOC distribution is shifted to **lower** values with anthropogenic forcings

Probabilities of human causation

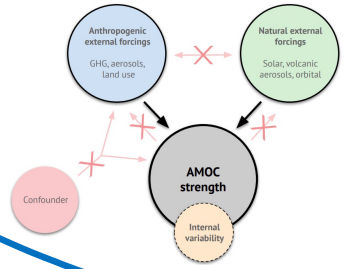
Causal counterfactual attribution

Pearl (2009), Hannart et al. (2016), Hannart & Naveau (2018)

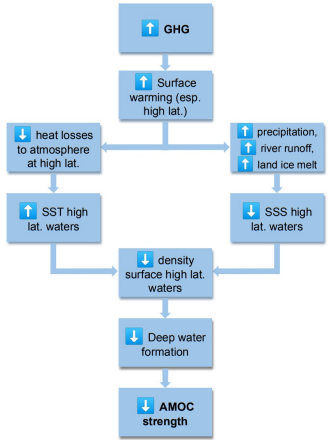
- Events
- Time window
- Model

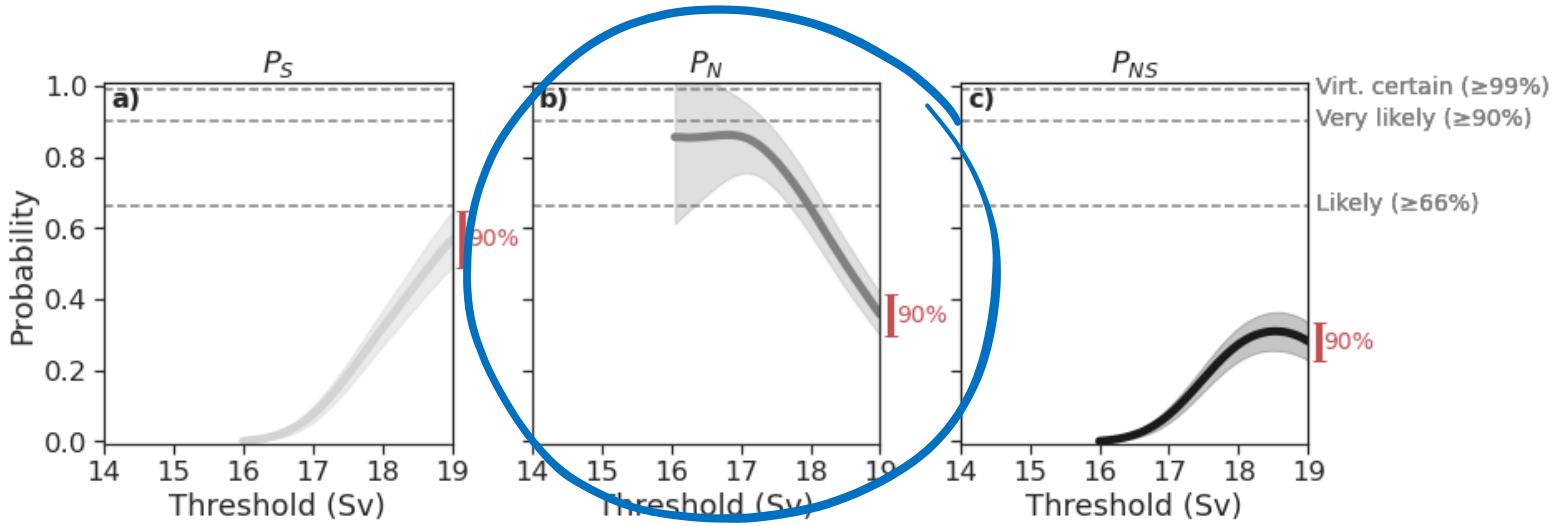


Causal model and assumptions



Physical processes





Human influence was **likely** a **necessary** cause of AMOC strengths between **16 and 18 Sv**

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Causal attribution of low AMOC strengths to anthropogenic influence

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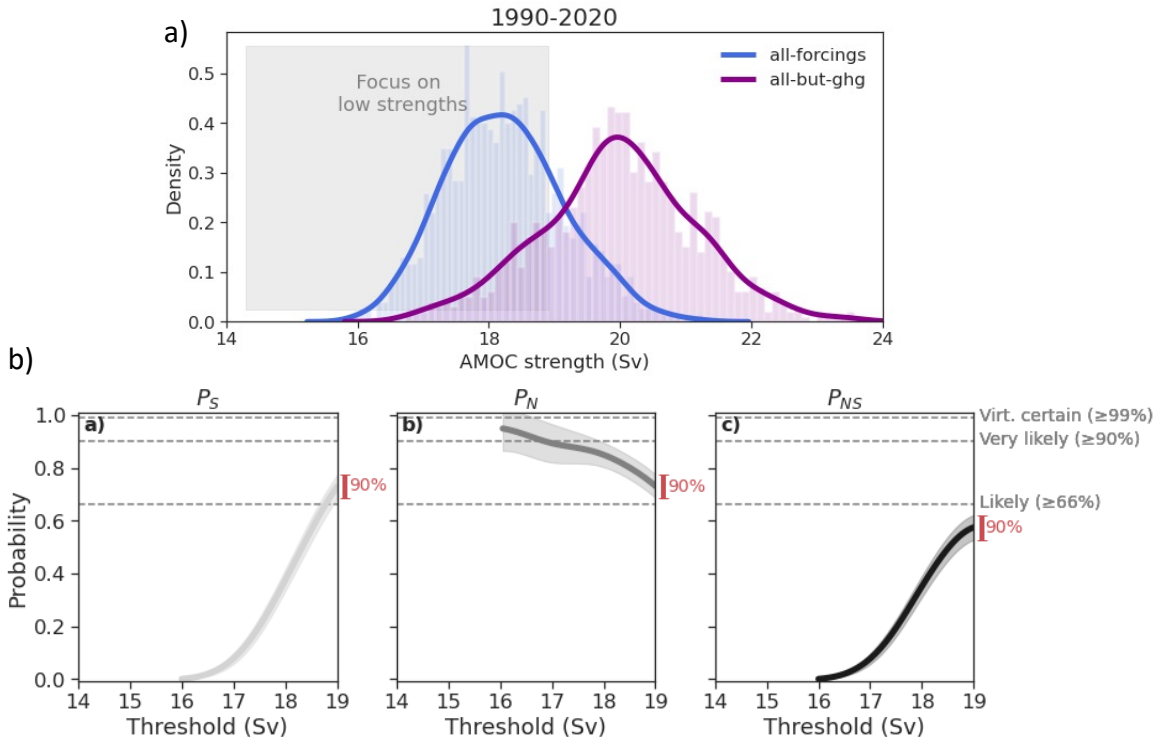
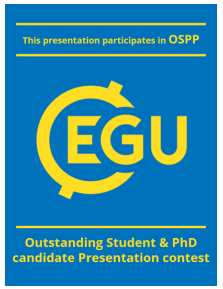
Check out more!

- Separate anthrop. **GHGs** and **aerosols**
- Influence of time **window** inspected
- Probabilities in **future** years





See more and vote here if you liked it! →

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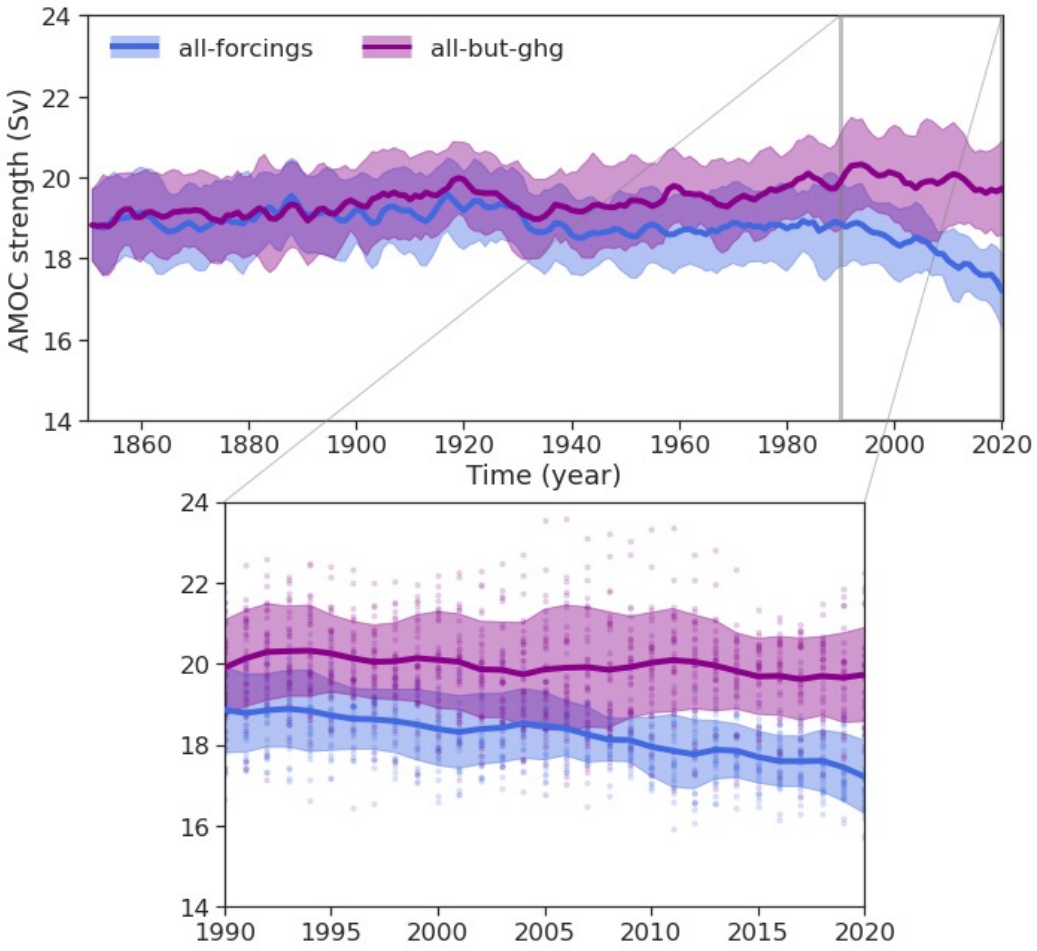
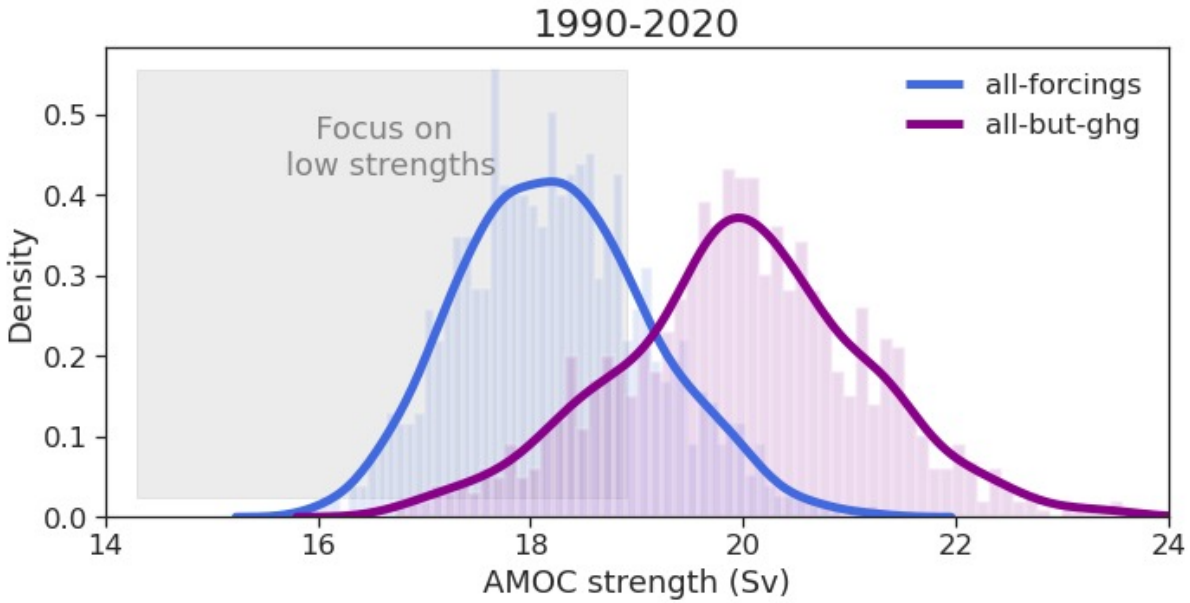
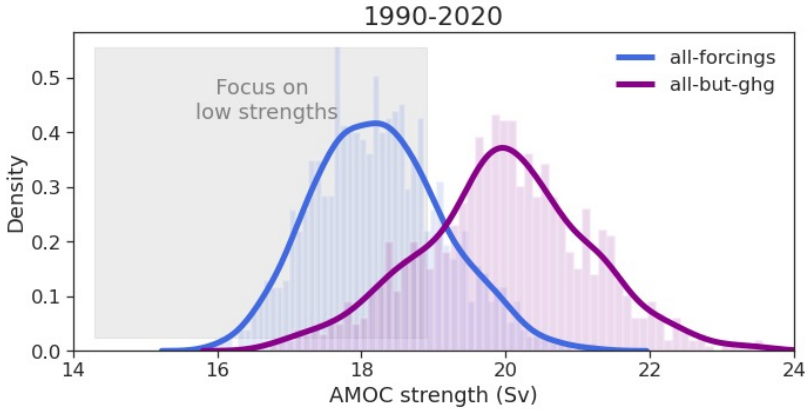
Additional material

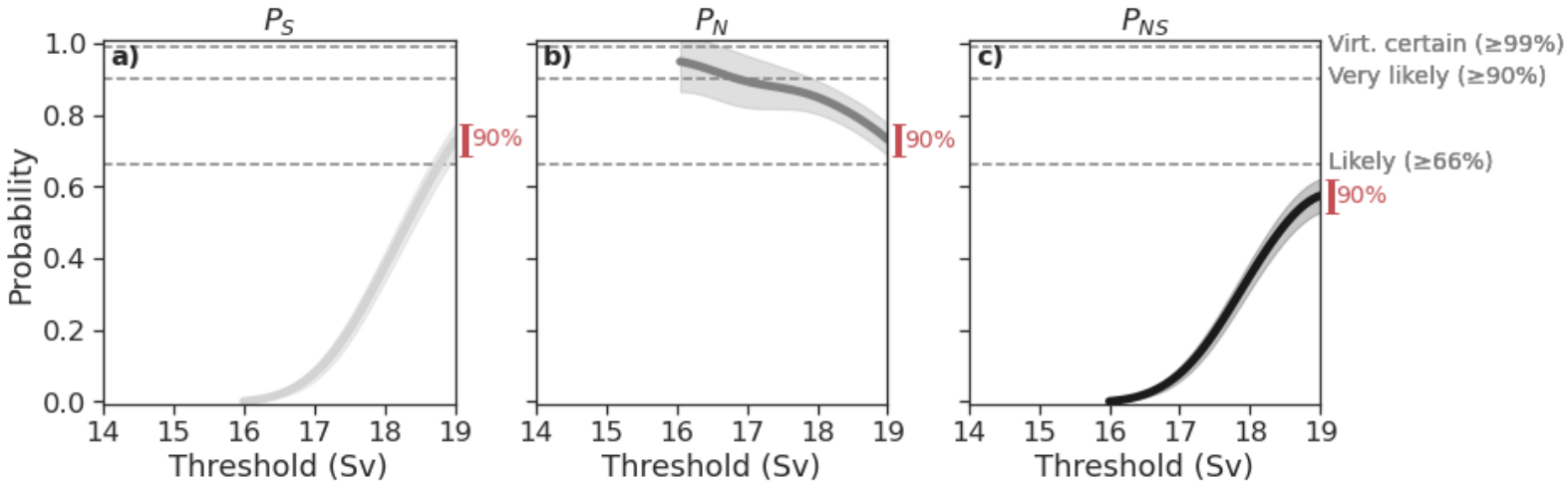


When considering a counterfactual world **without only anthropogenic GHGs**, the difference with the factual ensemble is more pronounced than before.



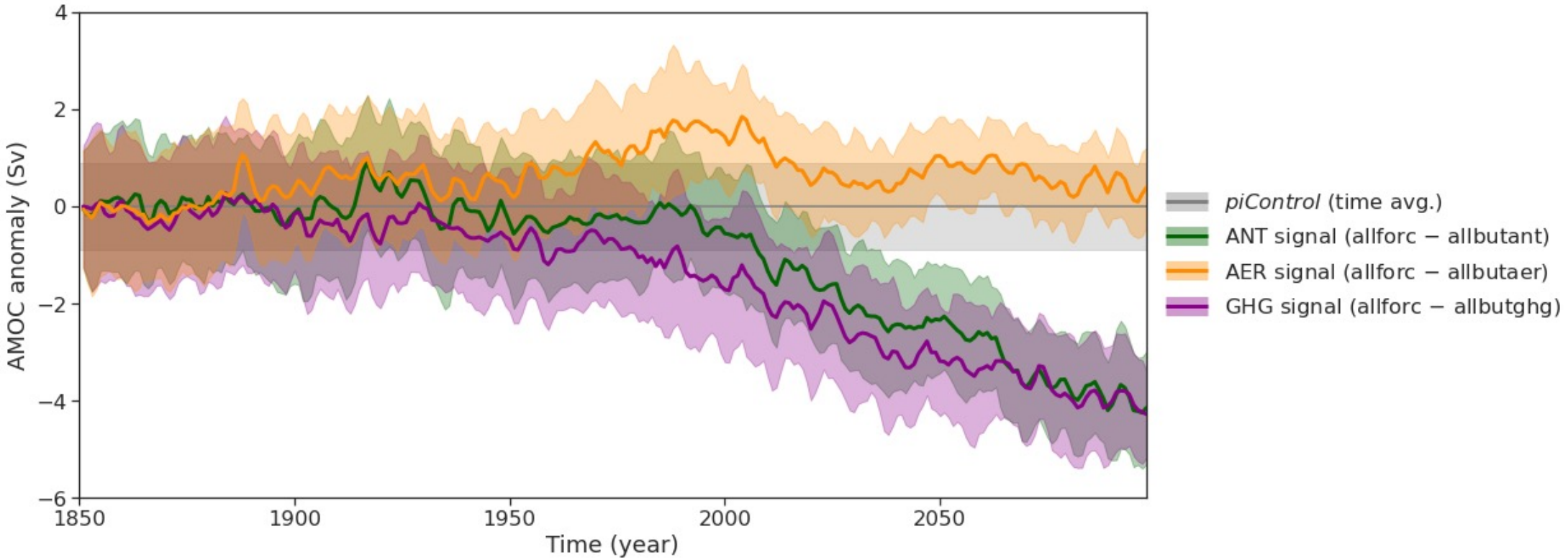
Additional material





The **probabilities of causation** of anthropogenic GHGs are **larger** than those of all anthropogenic external forcings together, due to the counteracting effect of aerosols.

Additional material



Thanks to the different counterfactual ensembles that we simulated, we are able to tell apart the contribution to the **AMOC signal from the different forcings**. These signals allow us to better understand the previous results and the opposing effects of aerosols and GHGs.