

Role of AMOC in transient climate response to greenhouse gas forcing in two coupled models

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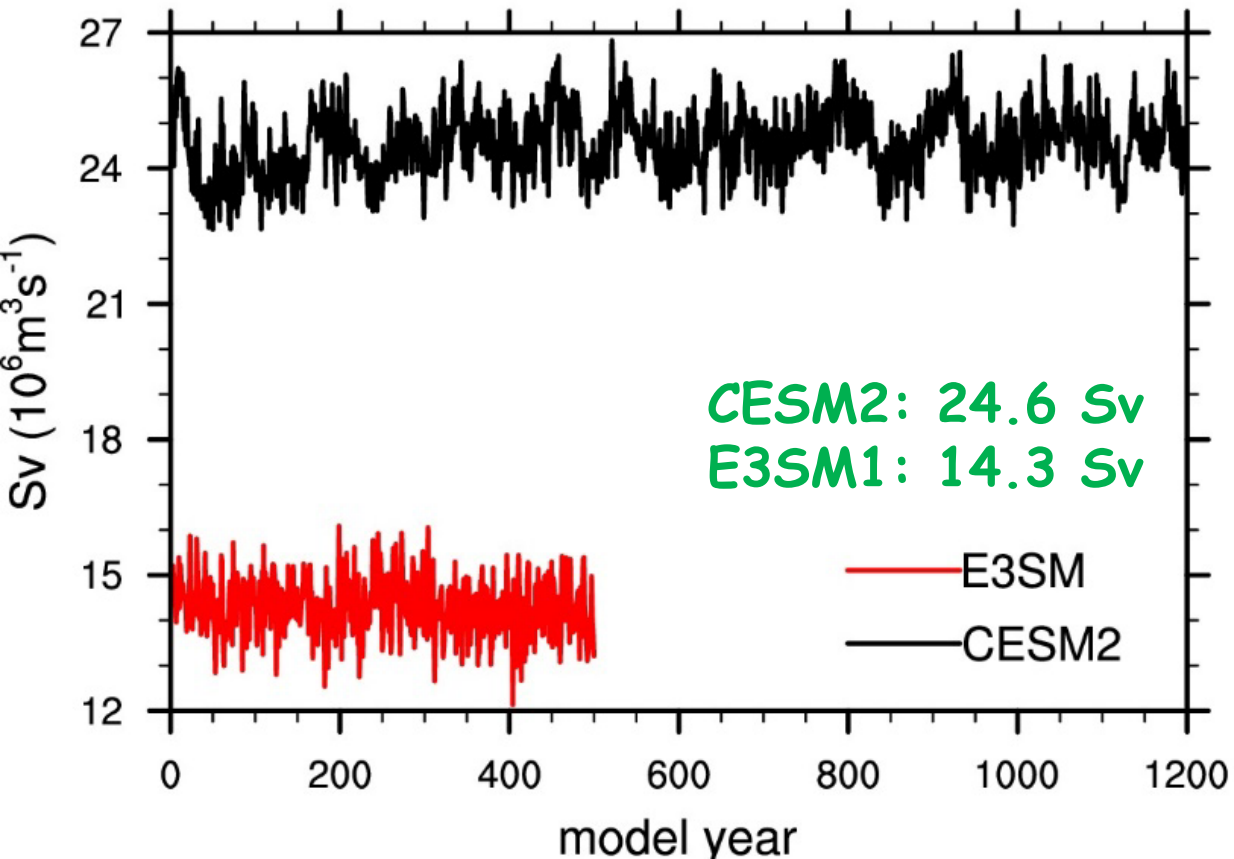
RGMA PI meeting, Oct. 13-16, 2020



CESM2 and E3SM1 ECS: 5.3 K

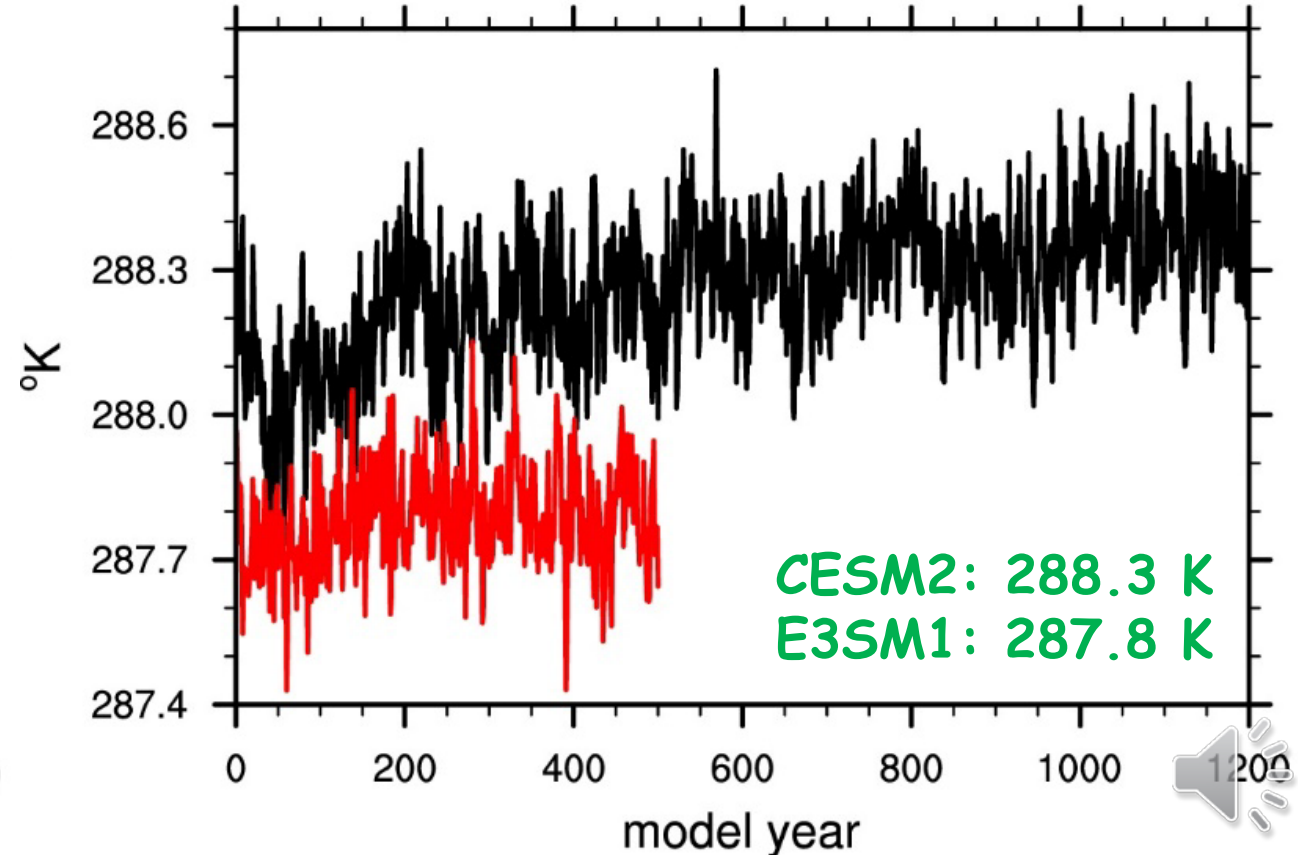
AMOC

PI-control

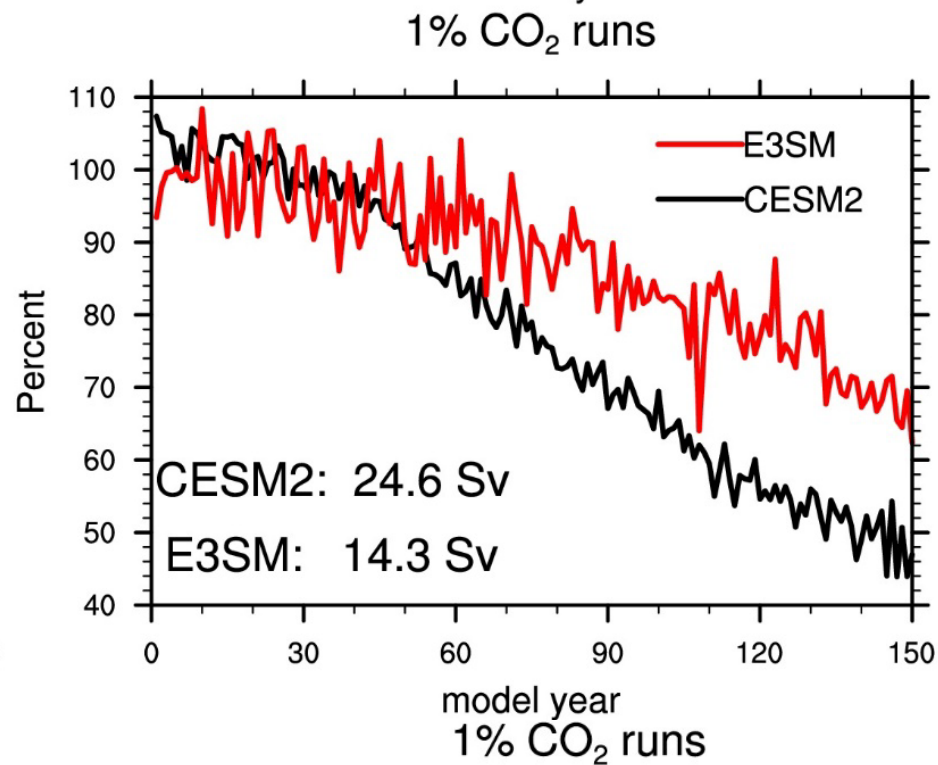
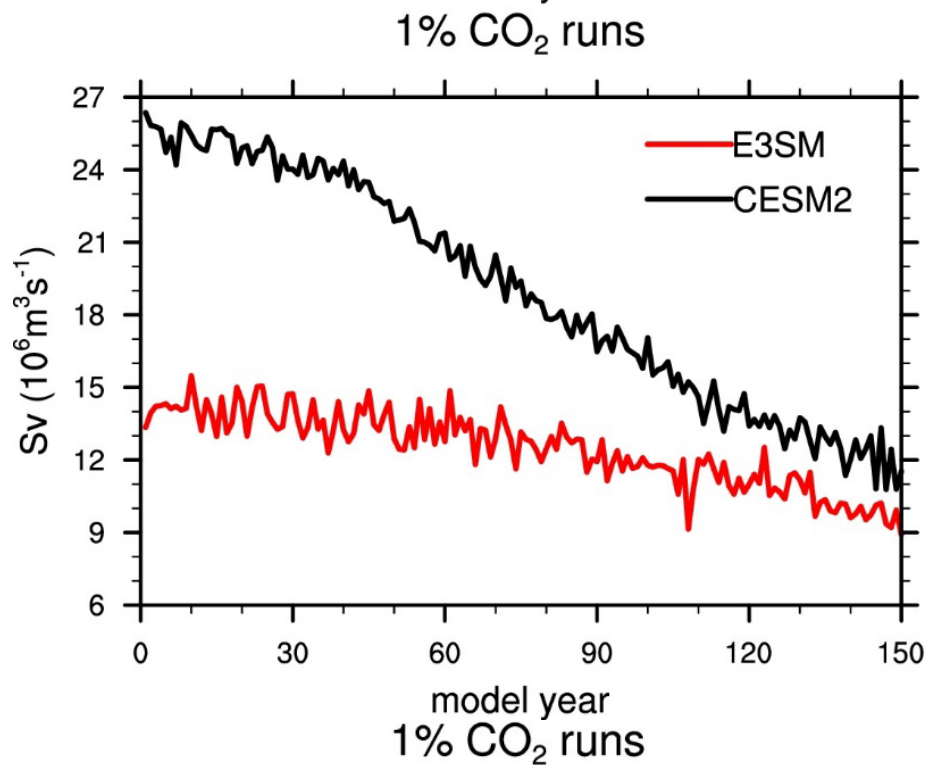


Global mean surface air temperature

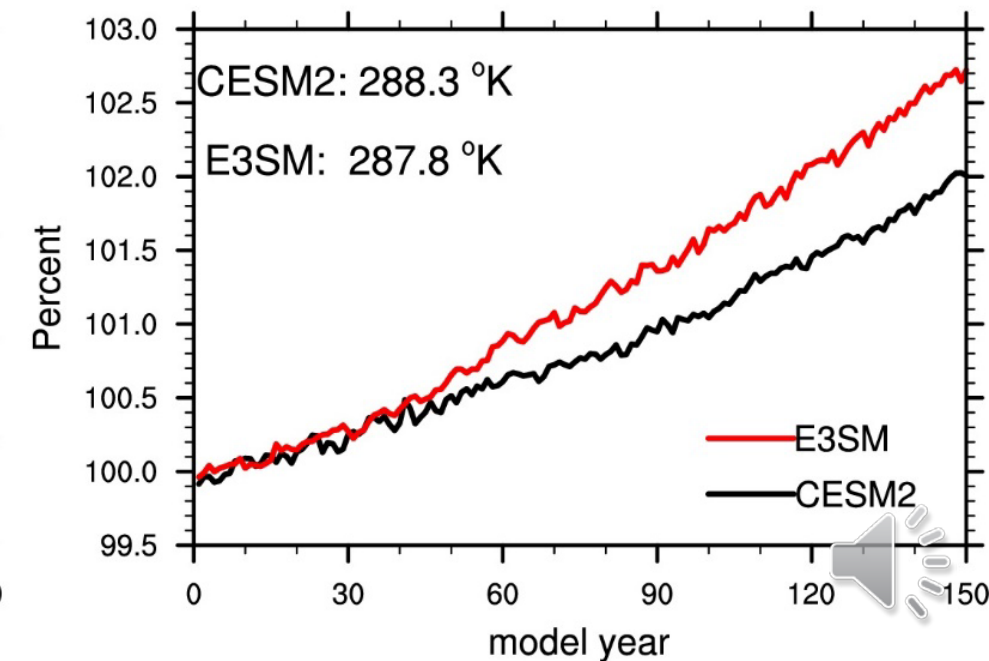
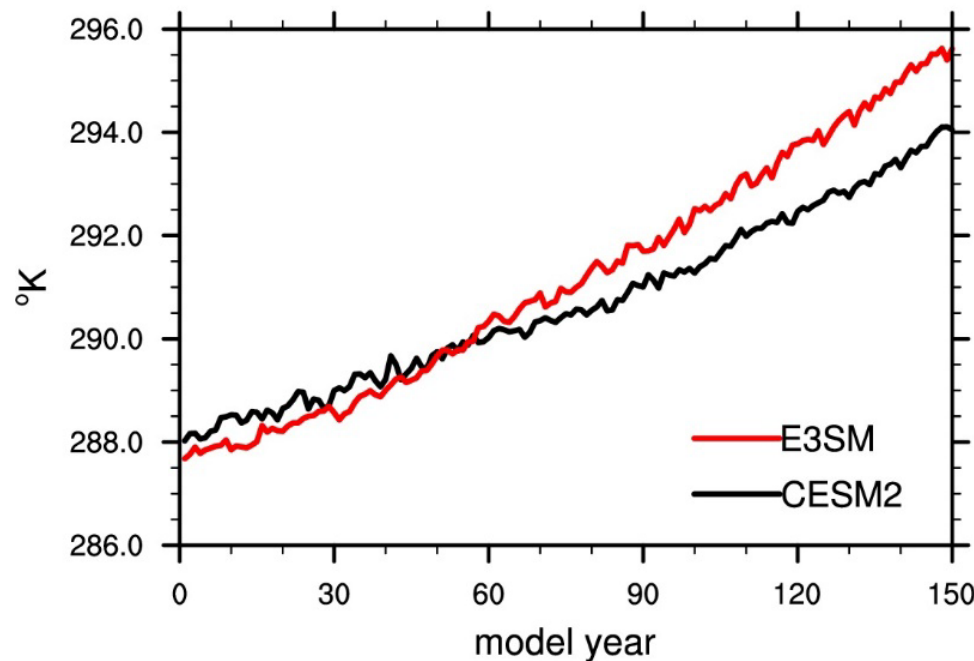
PI-control



AMOC index:
defined as the
maximum of the
Atlantic Meridional
Streamfunction
below 500 m depth.

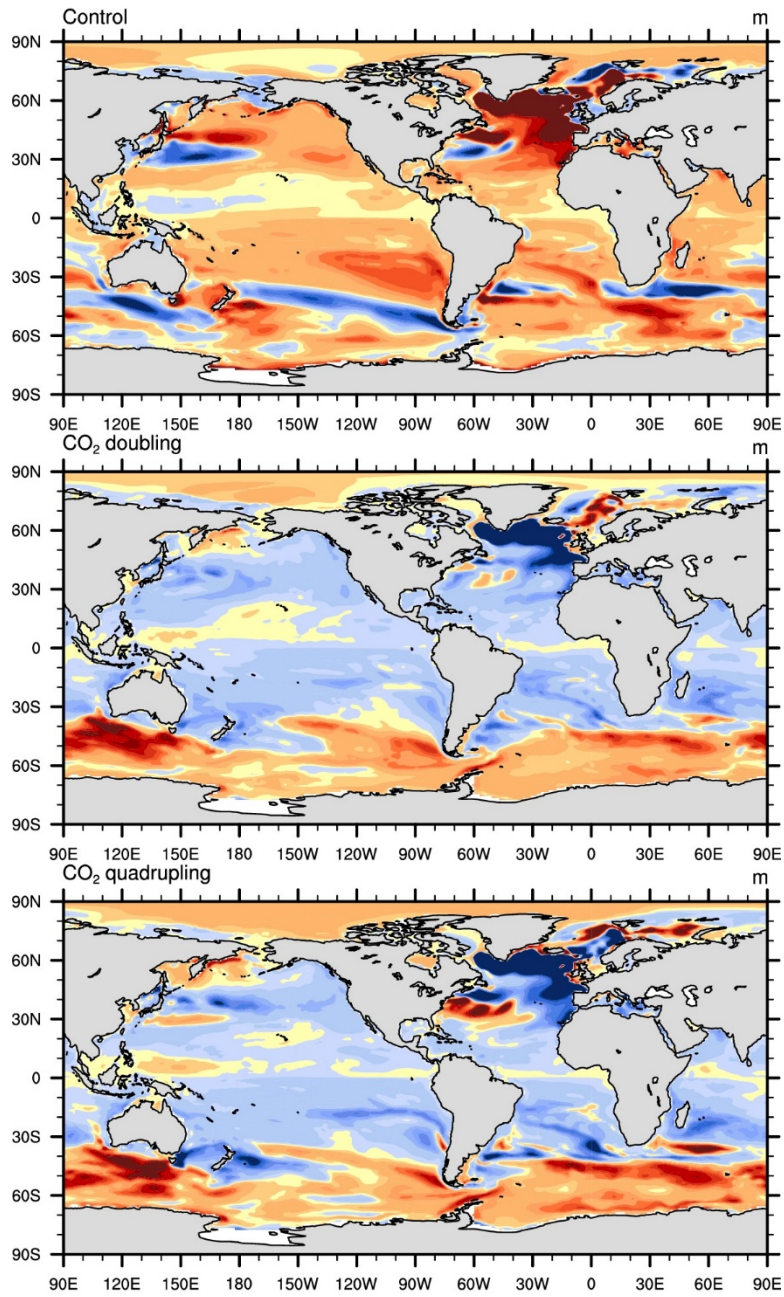


**Global mean
surface air
temperature**

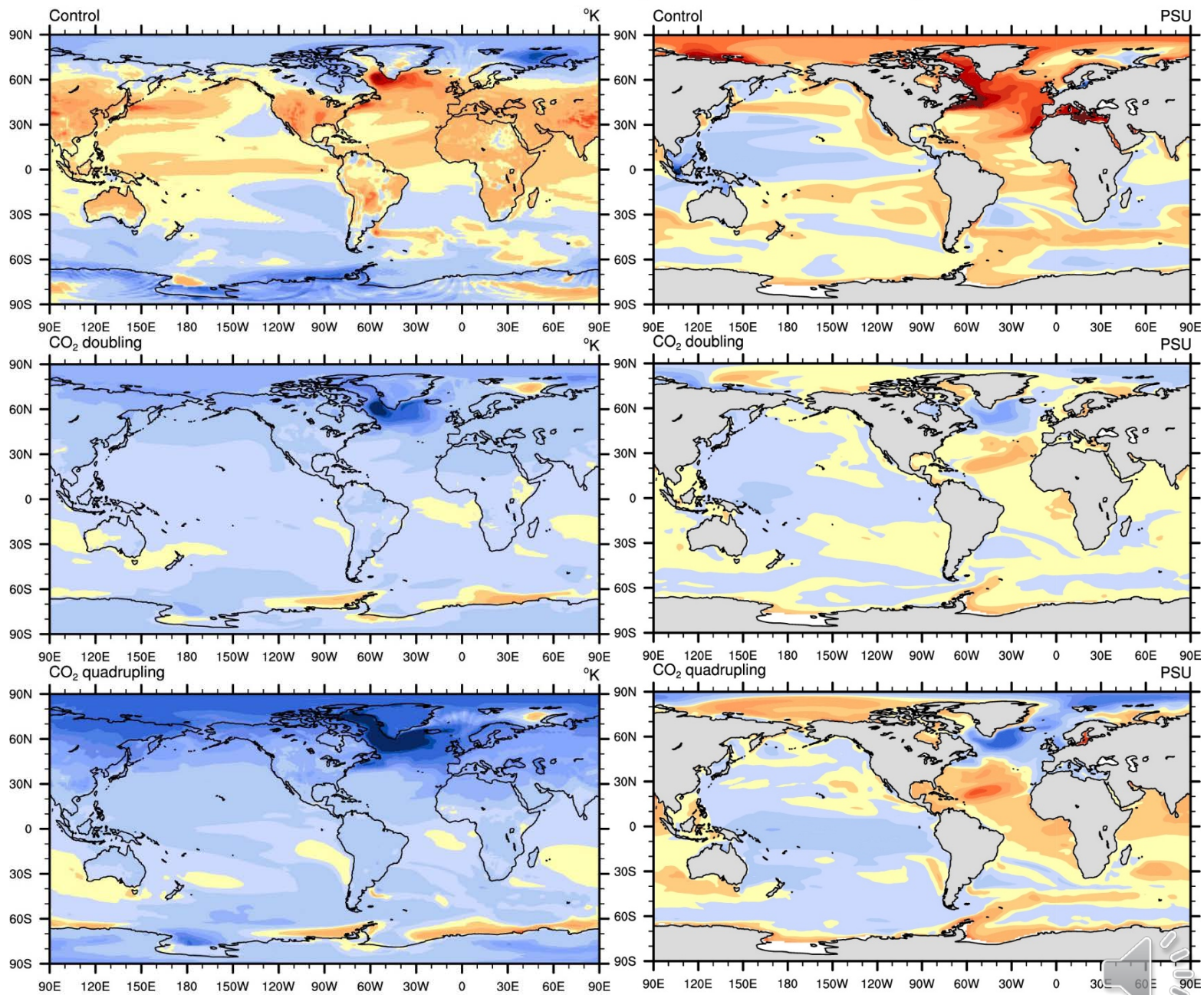


CESM2 minus E3SM1

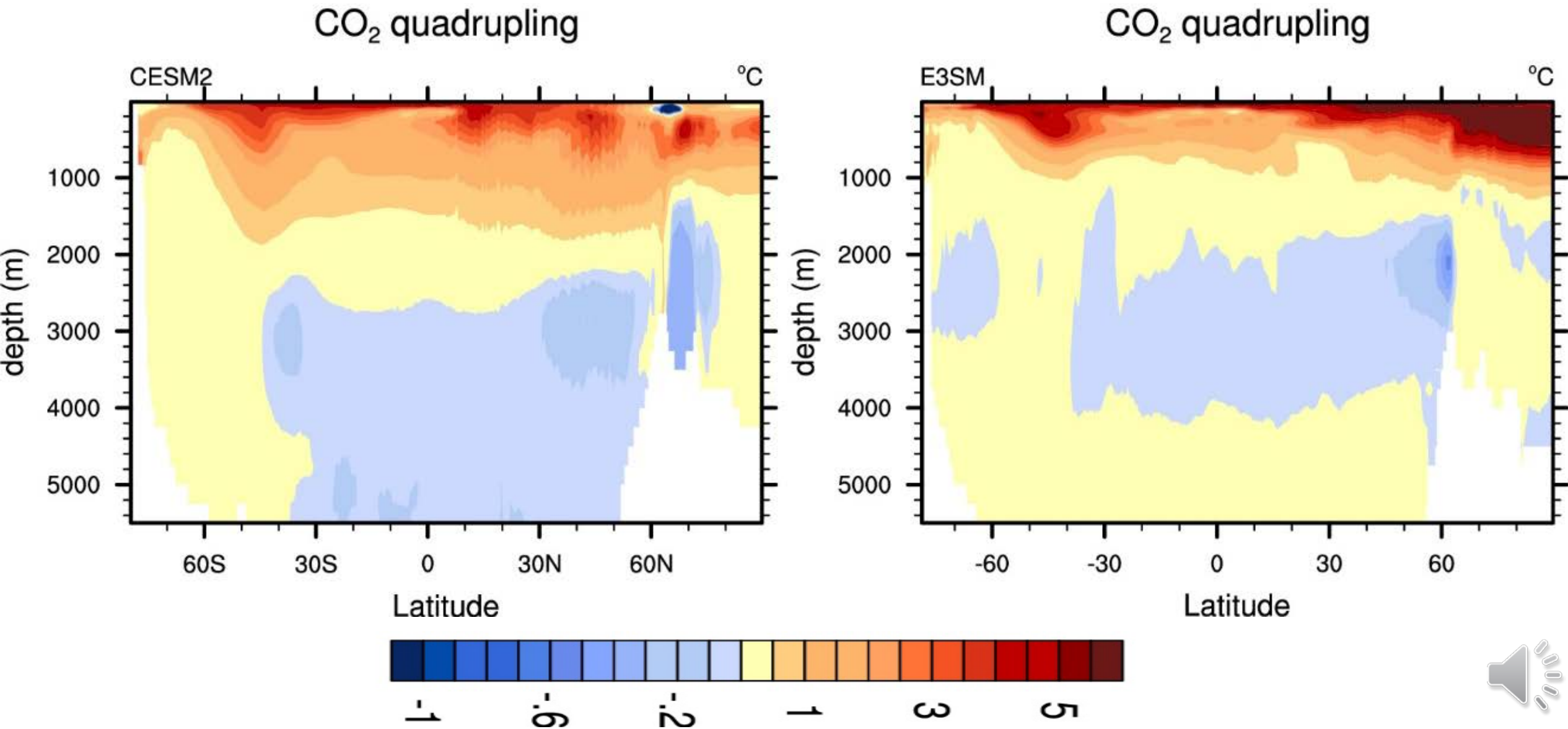
March/Sept mixed layer depth difference



Annual mean sea surface temperature/salinity difference



Global zonal mean temperature anomaly



Summary

- Although the ECS is the same for CESM2 and E3SM1 (5.3K), the AMOC mean state is quite different (24.6 vs. 14.3 Sv).
- The weaker AMOC in E3SM1 is associated to a fresher subpolar North Atlantic leading to an absence of deep convection there.
- In response to rising CO_2 concentration, AMOC weakens more in CESM2 than in E3SM1. As a result, the upper/deeper ocean warms slower/faster in CESM2 than in E3SM1 in association to the overall weaker upper ocean stratification in CESM2 than in E3SM1.





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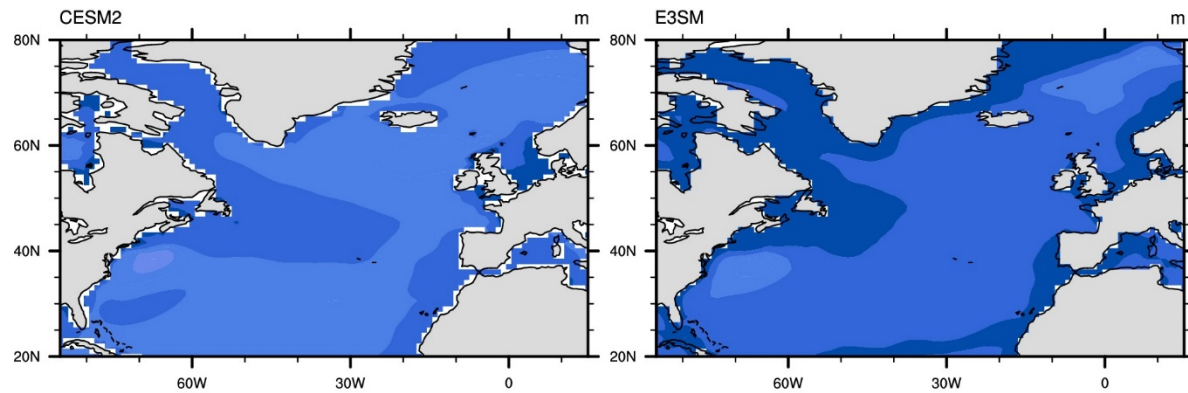
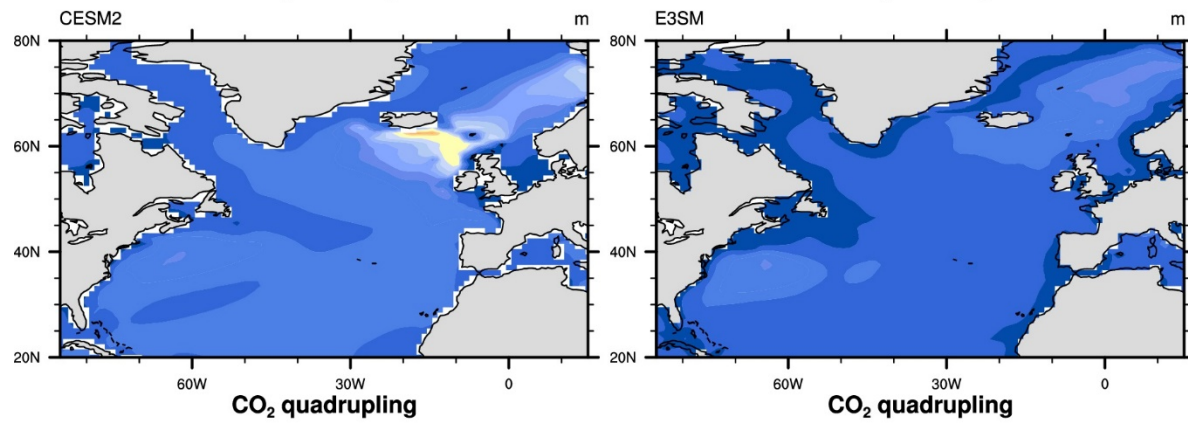
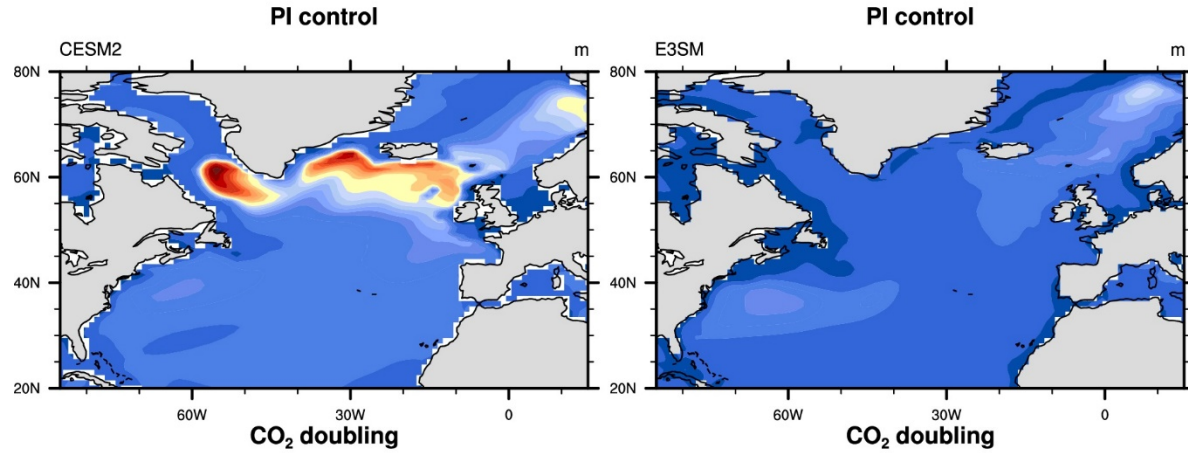


Thank you!

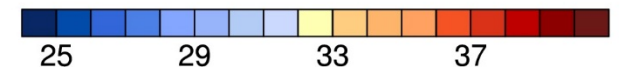
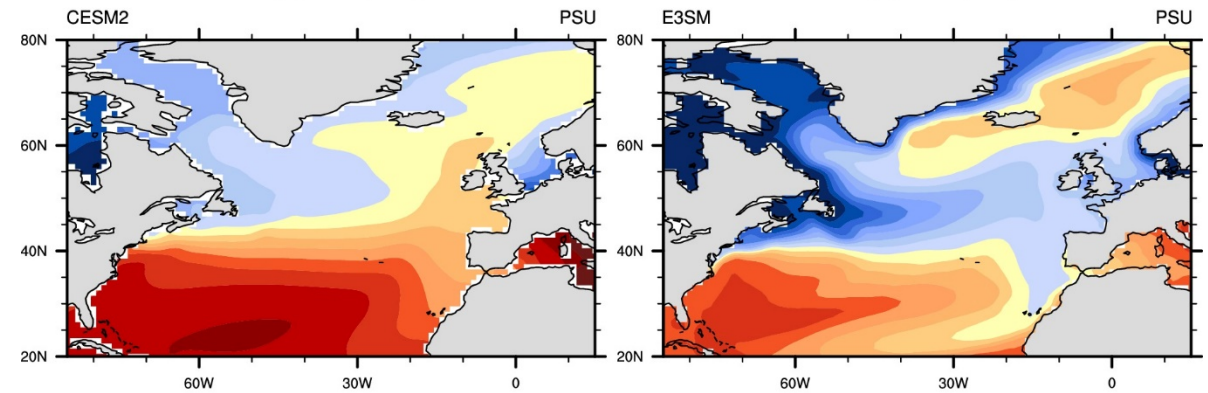
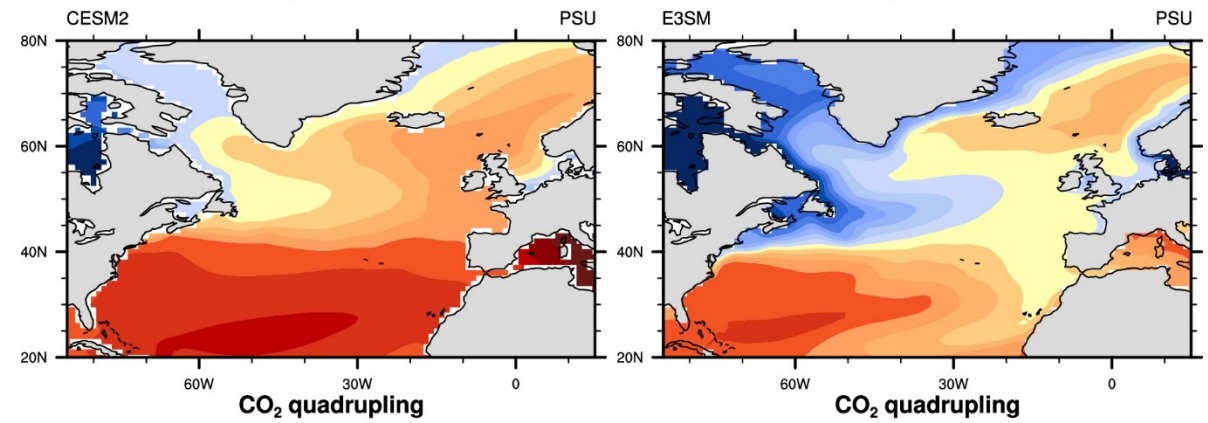
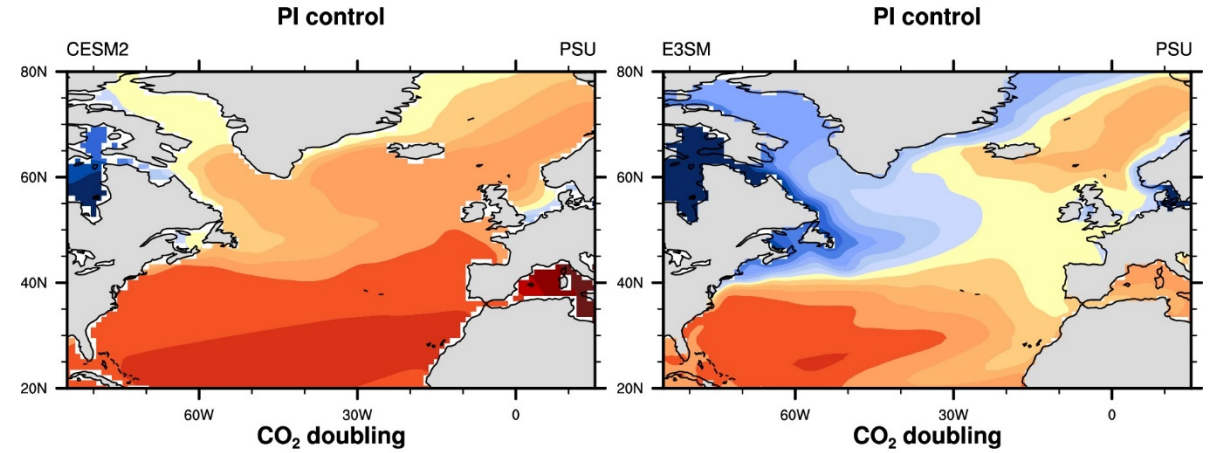
Questions?



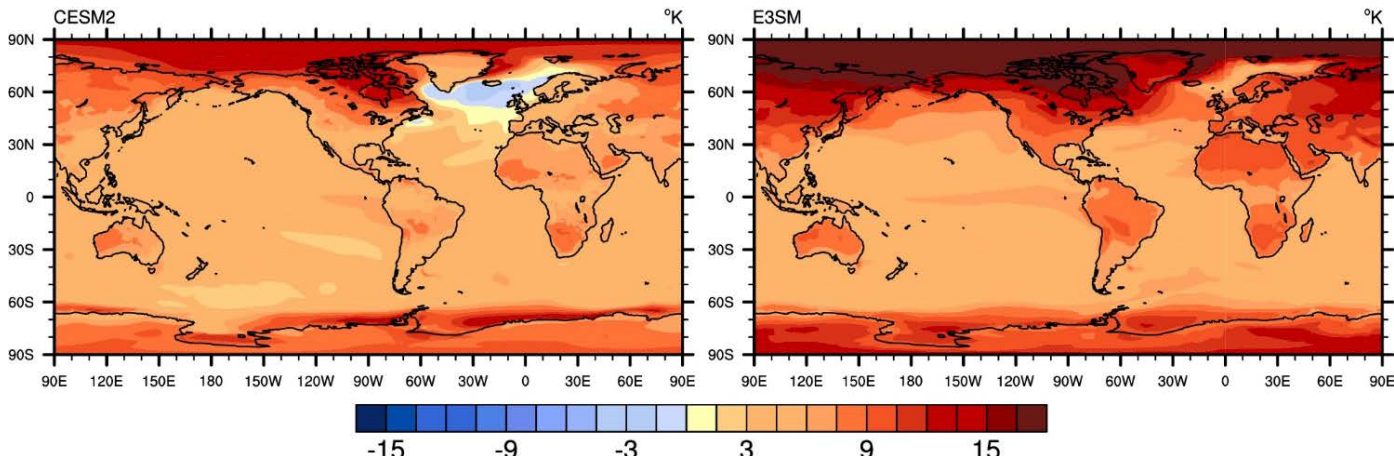
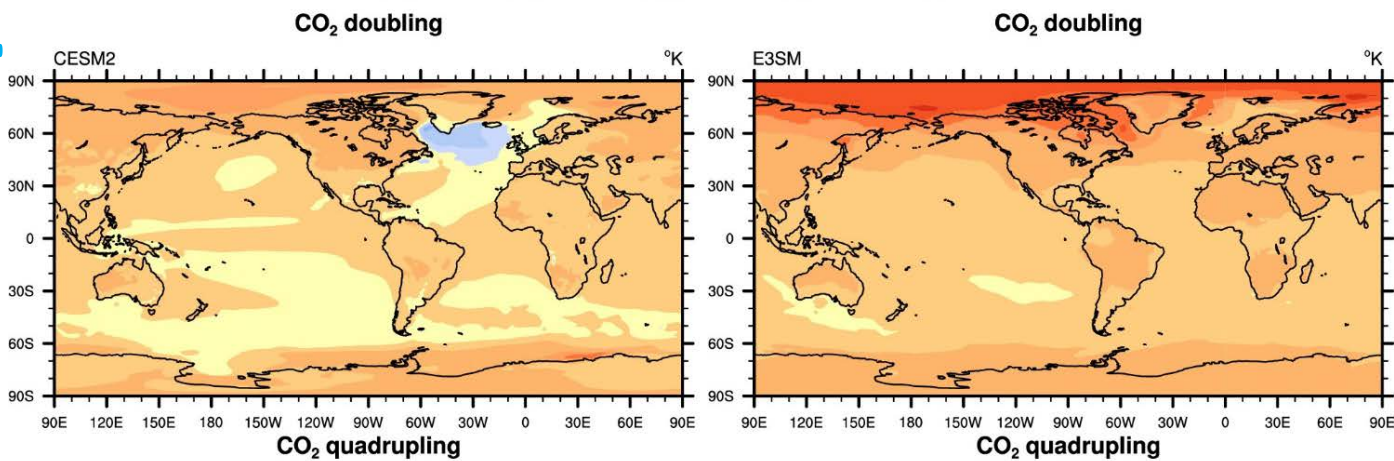
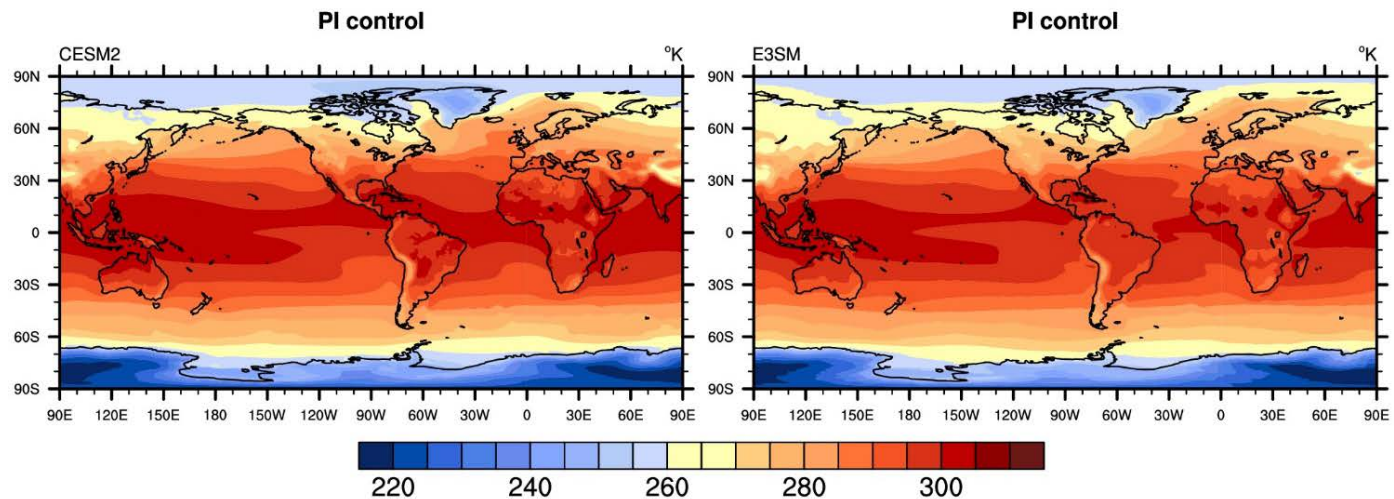
Annual mean mixed layer depth



Annual mean sea surface salinity

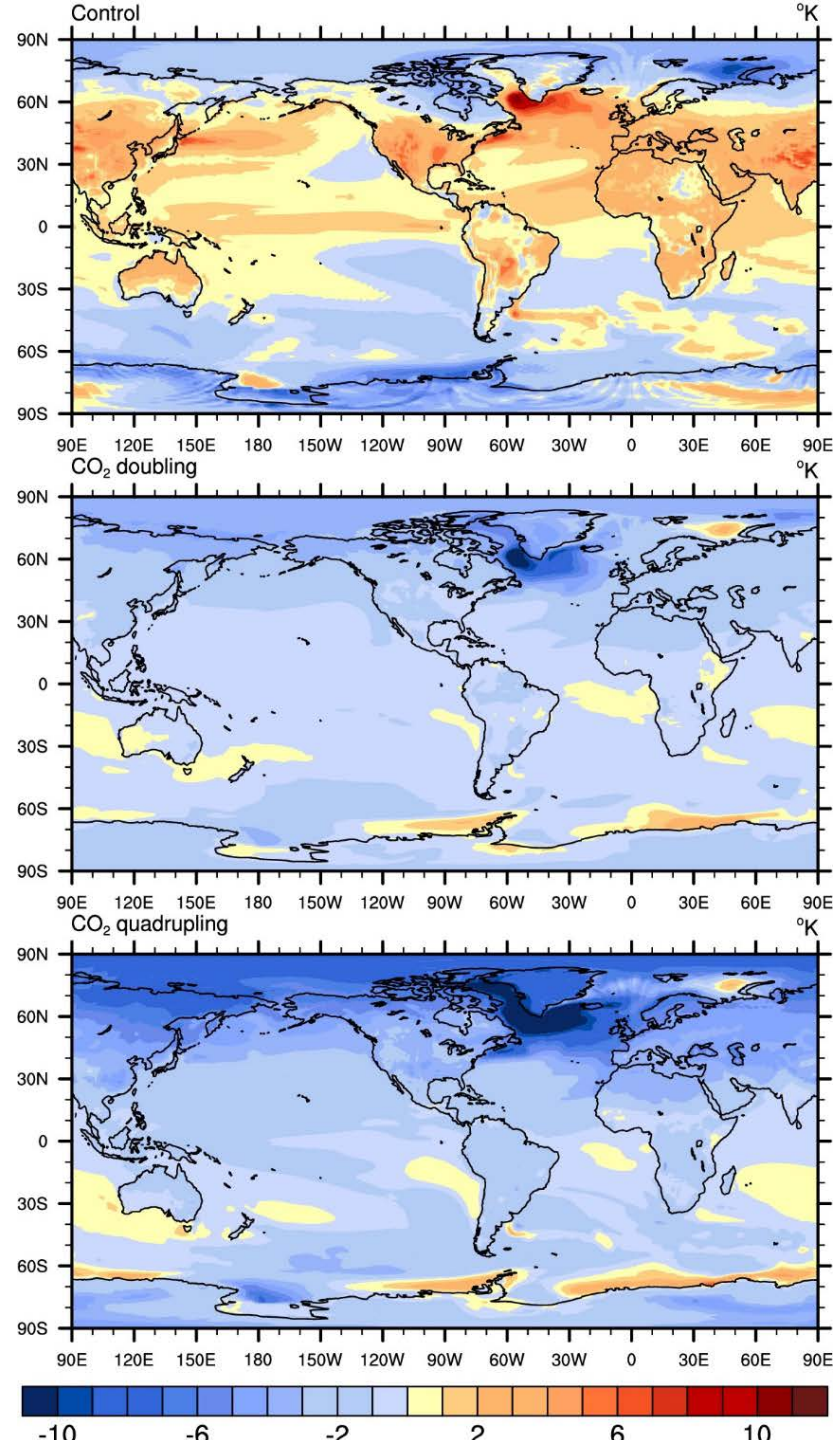


Surface air temperature



Surface air temperature anomaly

between CESM2 and E3SM1



Atlantic zonal mean salinity

