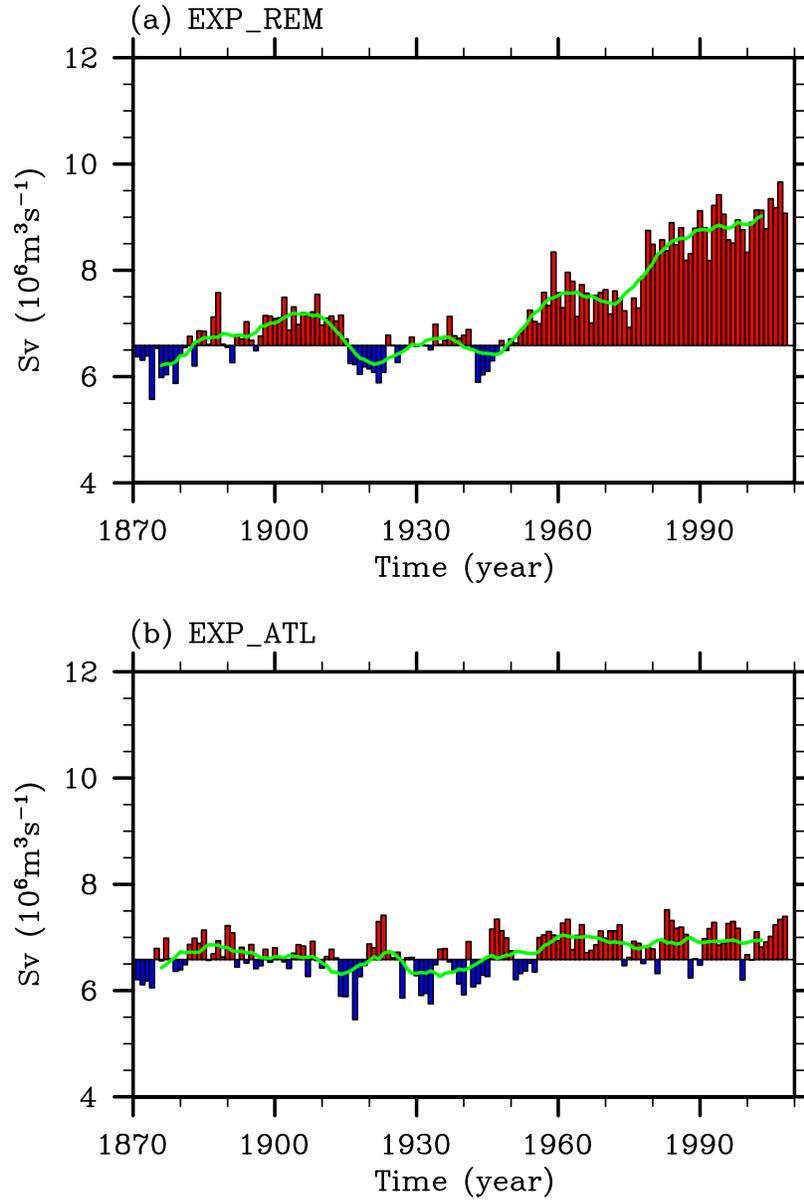


1 Table S1. Summary of the surface forcing fields prescribed for the four model experiments.

Experiments	Surface Forcing Fields Prescribed
EXP_REF	Forced for 138 years with the forcing fields in each model year randomly selected from the 20CR forcing fields during 1871 – 1900.
EXP_CTR	Forced for 1871-2008 using the 20CR.
EXP_REM	Same as in EXP_CTR south of 30°S; Same as in EXP_REF north of 30°S
EXP_ATL	Same as in EXP_REF south of 30°S; Same as in EXP_CTR north of 30°S

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CCSM3_POP: AMOC Index at 30°S



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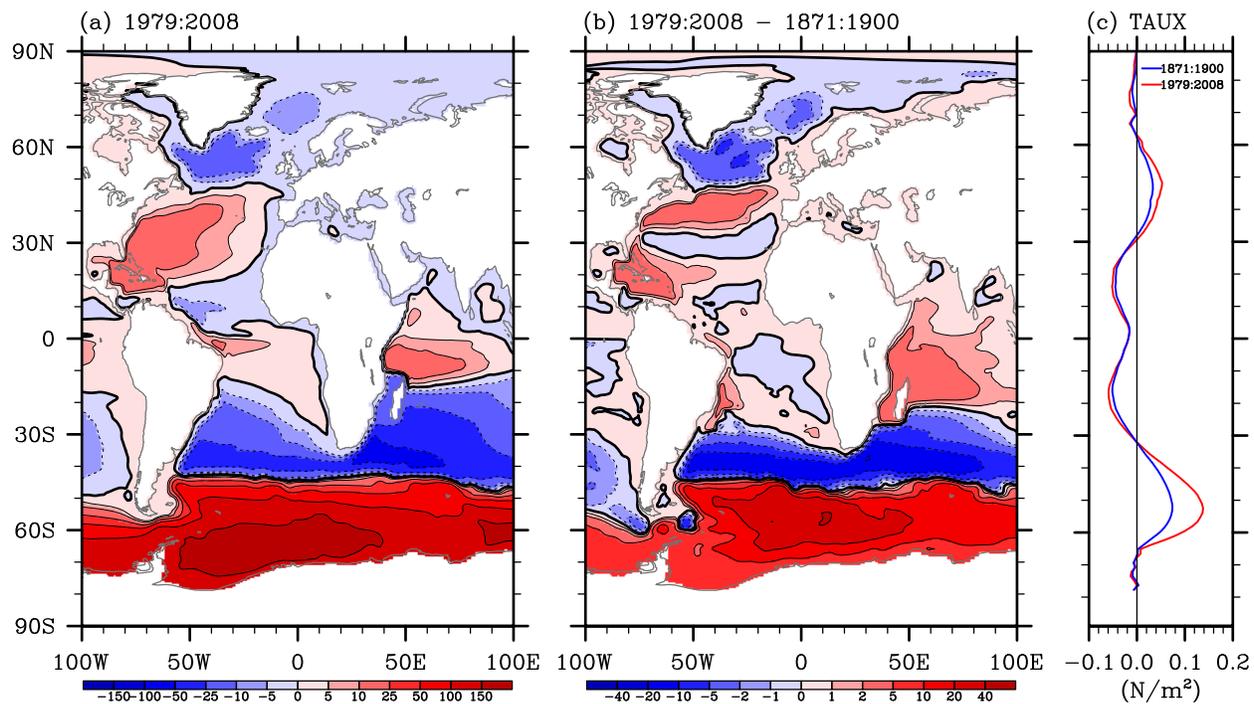
2 **Figure S1.** Time series of the simulated AMOC index (maximum overturning stream function)

3 at 30°S obtained from (a) EXP_REM and (b) EXP_ATL. Green lines are obtained by performing

4 a 11- year running average.

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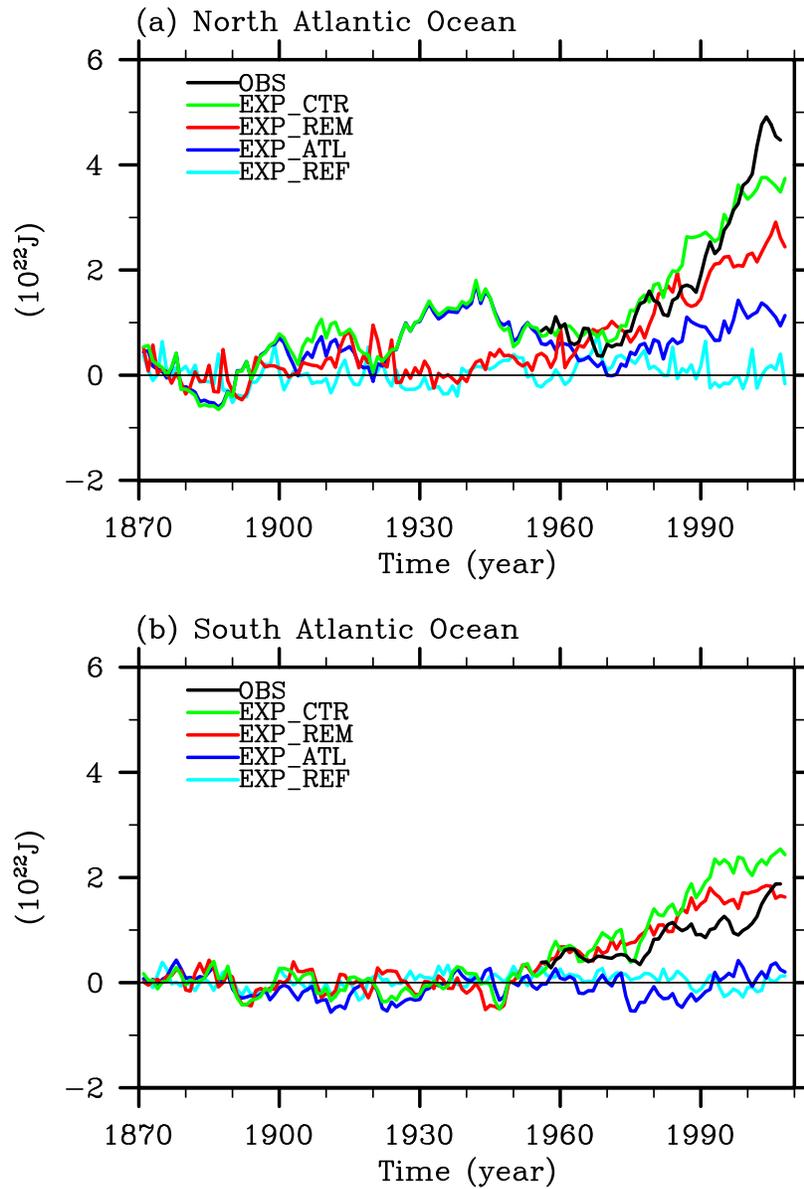
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 2 **Figure S2.** (a) Simulated barotropic streamfunction averaged for the 1979-2008 period obtained
 3 from EXP_CTR. (b) Difference in the simulated barotropic streamfunction between 1979-2008
 4 and 1871-1900 periods, obtained from EXP_CTR. The unit is Sv ($10^6 \text{m}^3 \text{s}^{-1}$). (c) Globally
 5 averaged zonal wind stress for 1871-1900 and for 1979-2008 periods, obtained from the 20CR.

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CCSM3_POP: ATL OCN Heat Content



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2 **Figure S3.** Simulated (a) North and (b) South Atlantic Ocean heat content changes in the upper
3 700 m in reference to the 1871-1900 baseline period obtained from the four model experiments.
4 The thick black lines in (a) and (b) are the observed heat contents recomputed from Levitus et al.
5 [2009] for the North (equator - 75°N) and South Atlantic (30°S - equator), respectively.