

Table S1. Unavailable data fields in ESM and scenarios. (× means unavailable).

Model		ocean temperature	AMOC intensity	Sea ice fraction	P-E	Upward heat flux	1000hPa wind	TOA net radiation
BNU-ESM	G1							
	G10a							
	G4							
	G4cdnc							
CanESM2	G1					×		
	G10a					×		
	G4					×		
	G4cdnc					×		
HadGEM2-ES	G1					×		
	G10a					×		
	G4					×		
	G4cdnc					×		
ISPL-CM5A-LR	G1					×		
	G10a			×		×		×
	G4	×	×	×	×	×	×	×
	G4cdnc			×		×		×
MIROC-ESM	G1							
	G10a			×		×		
	G4							
	G4cdnc			×		×		
NorESM1-M	G1							
	G10a							
	G4							
	G4cdnc							

Table S2. Differences in AMOC Flux (Sv) for each ESM having data available. Differences significant at the 95% are marked in bold according to the signed Wilcoxon rank test.

Experiments	BNU-ESM	CanESM2	HadGEM2-ES	IPSL-CM5A-LR	MIROC-ESM	NorESM1-M	Ensemble
4xCO2-piC	-9.1	-6.1	-4.9	-3.5	-4.5	-7.6	-6.0
RCP4.5-piC	-4.8	-2.6	0.6	-1.0	-1.6	-3.2	-2.1
G1-piC	-1.8	0.2	-0.5	-0.5	-0.5	-0.8	-0.7

G1oa-piC	-2.8	-0.2	-2.6	-1.1	-0.2	-1.3	-1.4
G4cdnc-piC	-2.2	-1.1	2.0	-0.5	-0.4	-2.7	-0.8
G4-piC	-3.3	-1.8	1.3		-1.2	-2.3	-1.5
G1oa-4xCO2	6.4	5.9	2.3	2.4	4.2	6.2	4.6
G1-4xCO2	7.3	6.3	4.4	3.0	3.9	6.8	5.3
G4cdnc-RCP4.5	2.6	1.5	1.4	0.5	1.1	0.5	1.3
G4-RCP4.5	1.4	0.8	0.8		0.4	1.0	0.9
G1oa-G1	-0.9	-0.4	-2.1	-0.6	0.3	-0.5	-0.7
G4cdnc-G4	1.1	0.7	0.6		0.8	-0.4	0.6
$G4 - RCP4.5$	20%	12%	17%		9%	14%	14%
$G1 - 4XC02$							
$G4cdnc - RCP4.5$	35%	24%	32%	16%	29%	8%	24%
$G1 - 4XC02$ $G4 - RCP4.5$	56%	52%	54%		31%	186%	76%
$G4cdnc - RCP4.5$ $G4 - RCP4.5$	23%	13%	32%		8%	15%	18%
$G1oa - 4XC02$ $G4cdnc - RCP4.5$	40%	25%	60%	20%	27%	8%	30%
$G1oa - 4XC02$							

Table S3. Differences in upward Heat Flux (Wm^{-2}) in the three deep convective regions at North Atlantic for each ESM having data available. Differences significant at the 95% are marked in bold according to the signed Wilcoxon rank test.

Experiments	BNU-ESM	CanESM2	HadGEM2-ES	IPSL-CM5A-LR	MIROC-ESM	NorESM1-M	Ensemble
4xCO2-piC	-48.9				-27.8	-34.9	-37.2
RCP4.5-piC	-26.7				-16.7	-15.2	-19.5
G1-piC	-15.6				-3.0	-6.3	-8.3
G1oa-piC	-27.4					-7.9	-17.7
G4cdnc-piC	-19.1					-11.9	-15.5
G4-piC	-22.4				-14.2	-13.7	-16.8
G1oa-4xCO2	21.5					27.0	24.2
G1-4xCO2	33.3				24.9	28.5	28.9
G4cdnc-RCP4.5	7.6					3.2	5.4
G4-RCP4.5	4.3				2.5	1.4	2.7
G1oa-G1	-11.8					-1.5	-6.7
G4cdnc-G4	3.3					1.8	2.5
$G4 - RCP4.5$	13%				10%	5%	9%
$G1 - 4XC02$ $G4cdnc - RCP4.5$	23%					11%	17%
$G1 - 4XC02$ $G4 - RCP4.5$	56%					44%	50%
$G4cdnc - RCP4.5$ $G4 - RCP4.5$	20%					5%	13%
$G1oa - 4XC02$ $G4cdnc - RCP4.5$	35%					12%	24%
$G1oa - 4XC02$							

Table S4. Differences in Arctic September Sea Ice ($10^6 km^2$) for each ESM having data available. Differences significant at the 95% are marked in bold according to the signed Wilcoxon rank test.

Experiments	BNU-ESM	CanESM2	HadGEM2-ES	IPSL-CM5A-LR	MIROC-ESM	NorESM1-M	Ensemble
4xCO2-piC	-8.6	-3.4	-4.5	-6.8	-6.1	-6.1	-5.9
RCP4.5-piC	-1.6	-3.0	-2.9	-4.3	-6.0	-2.5	-3.4
G1-piC	0.1	-0.3	-1.0	-0.3	-0.7	0.1	-0.3
G1oa-piC	-1.3	-1.2	-2.5	-1.4		-1.4	-1.6

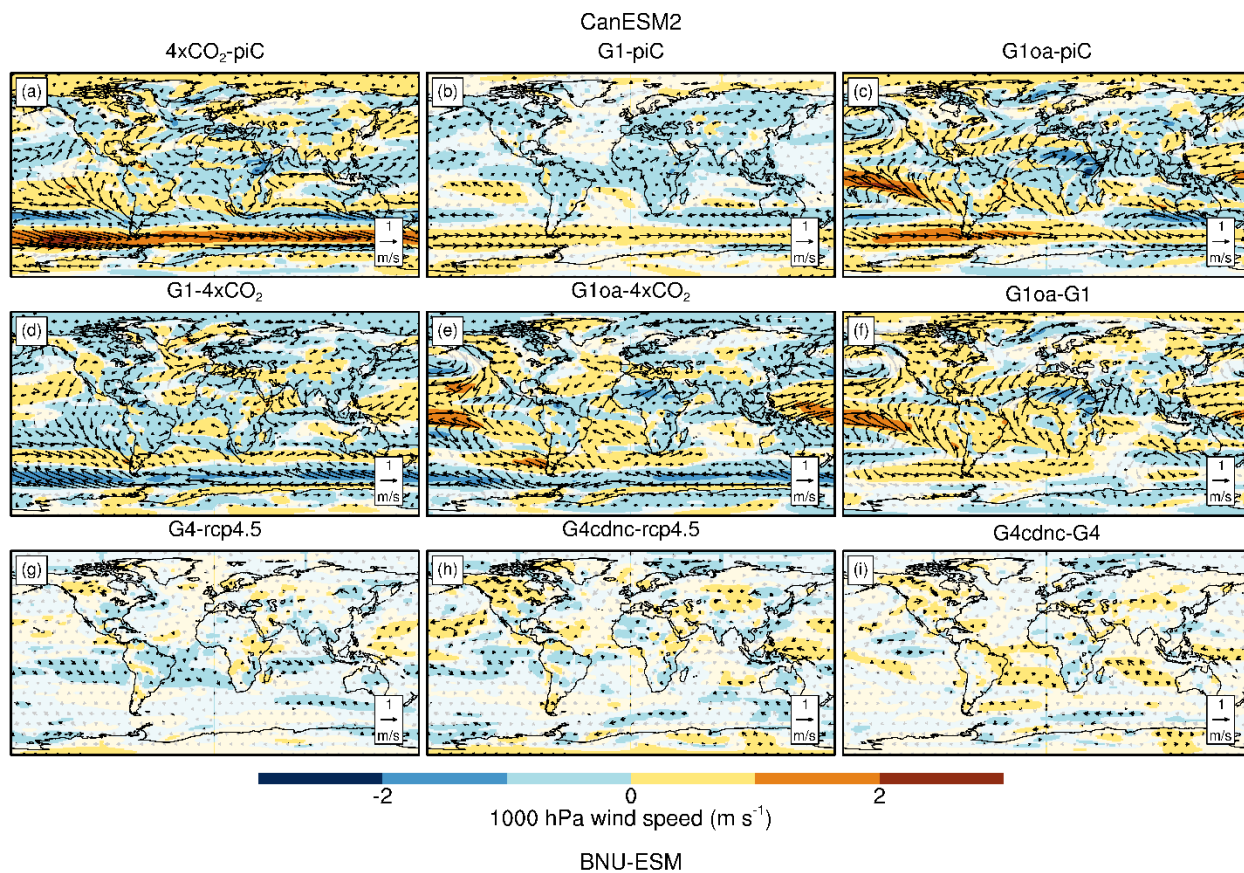
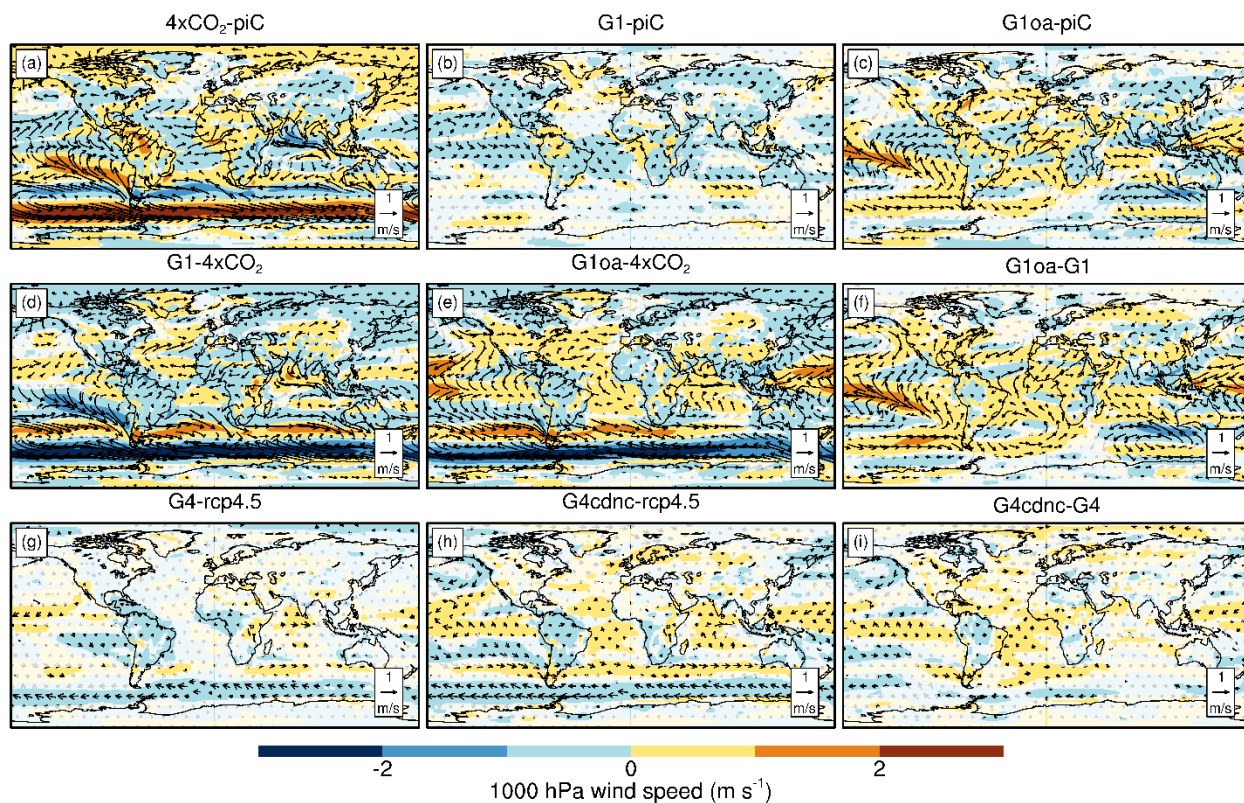
G4cdnc-piC	0.4	-2.4	-2.7	-0.8		-2.0	-1.5
G4-piC	-1.3	-2.3	-0.6		-5.1	-1.9	-2.2
G1oa-4xCO2	7.3	2.2	2.0	5.3		4.8	4.3
G1-4xCO2	8.7	3.1	3.5	6.5	5.4	6.3	5.6
G4cdnc-RCP4.5	1.9	0.6	0.3	3.5		0.5	1.4
G4-RCP4.5	0.3	0.7	2.4		0.9	0.5	1.0
G1oa-G1	-1.4	-0.8	-1.5	-1.2		-1.5	-1.3
G4cdnc-G4	1.6	-0.1	-2.1			-0.02	-0.2
$\frac{G4 - RCP4.5}{G1 - 4XC02}$	3%	23%	67%		17%	8%	24%
$\frac{G4cdnc - RCP4.5}{G1 - 4XC02}$	22%	19%	7%	54%		8%	22%
$\frac{G1 - 4XC02}{G4 - RCP4.5}$	15%	120%	944%			105%	296%
$\frac{G4cdnc - RCP4.5}{G4 - RCP4.5}$	4%	31%	119%			11%	41%
$\frac{G1oa - 4XC02}{G4cdnc - RCP4.5}$	26%	26%	13%	66%		11%	28%
$\frac{G1oa - 4XC02}{G1 - 4XC02}$							

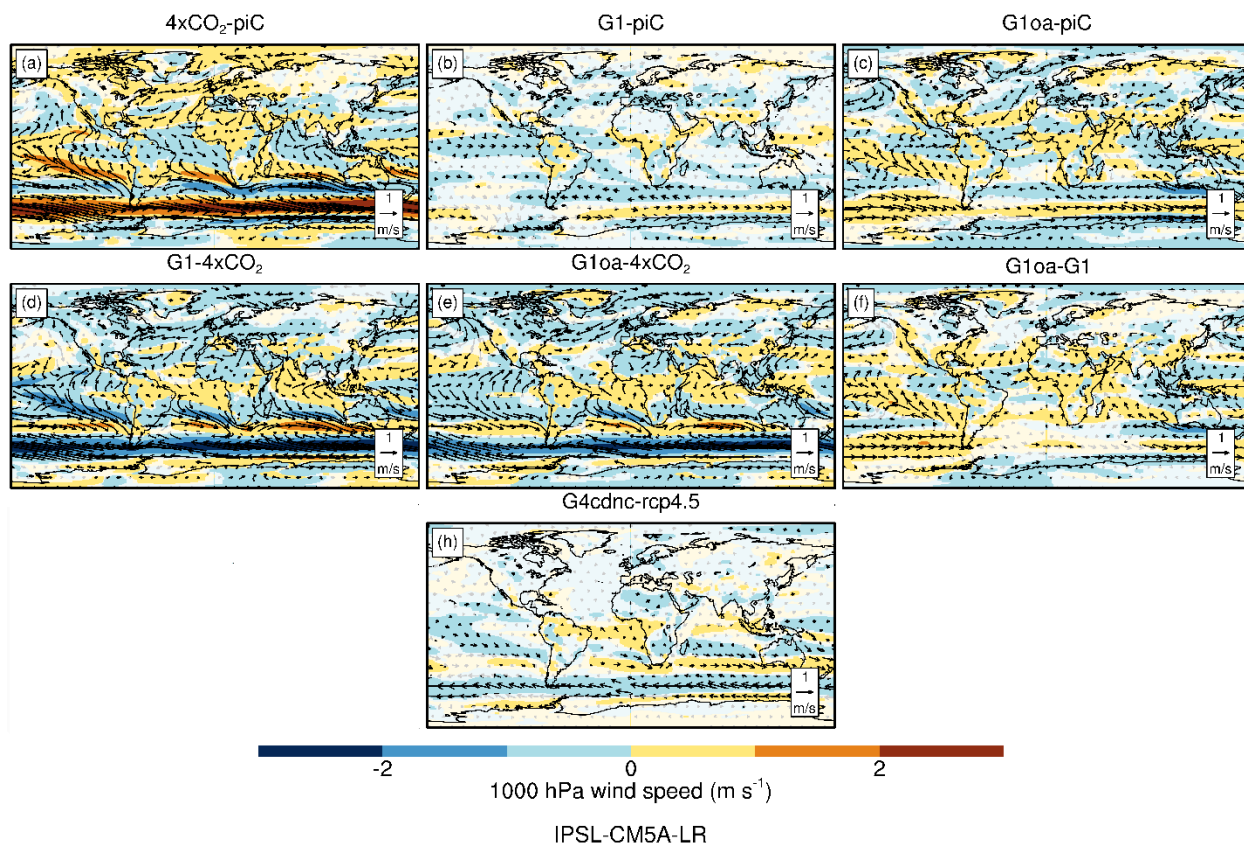
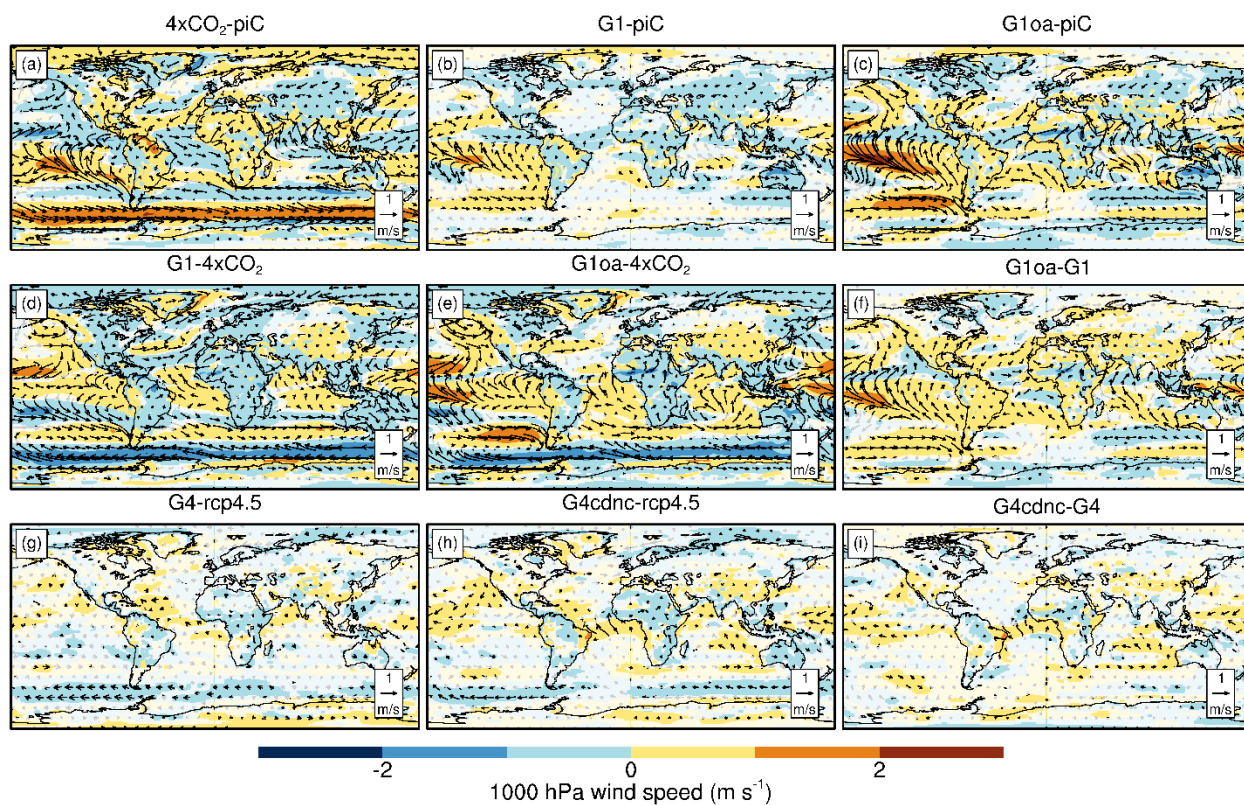
Table S5. TOA Net radiation flux global mean (W/m²) for each ESM having data available. Differences significant at the 95% are marked in bold according to the signed Wilcoxon rank test.

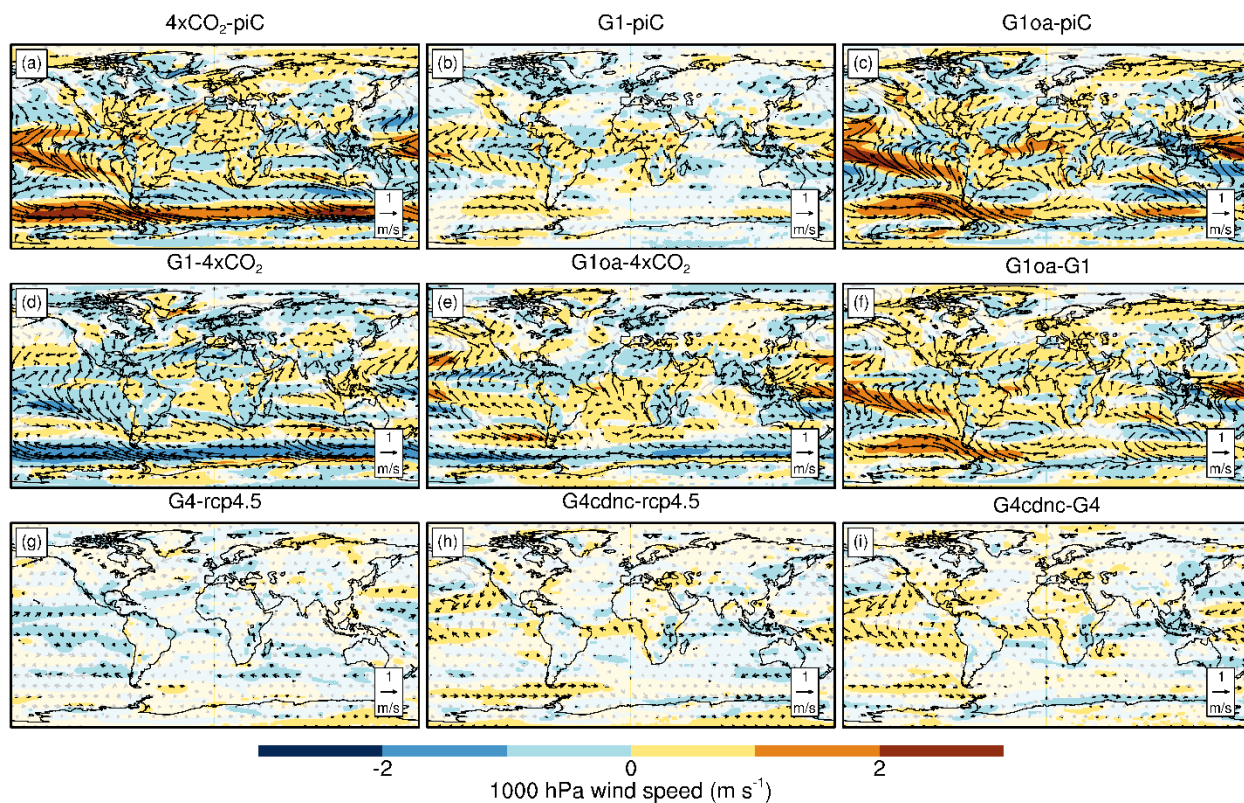
Experiments	BNU-ESM	CanESM2	HadGEM2-ES	IPSL-CM5A-LR	MIROC-ESM	NorESM1-M	Ensemble
4xCO2-piC	0.9	2.6	2.5	2.8	3.6	4.5	2.8
RCP4.5-piC	1.3	1.2	1.2	1.4	1.4	3.3	1.6
G1-piC	0.1	0.0	0.2	0.1	0.2	2.1	0.4
G1oa-piC	-1.4	-0.2	-0.1		0.0	2.0	0.0
G4cdnc-piC	0.3	0.6	0.5		0.6	3.0	1.0
G4-piC	0.7	0.9	0.6		1.2	3.1	1.3
G1oa-4xCO2	-2.3	-2.8	-2.6		-3.6	-2.5	-2.8
G1-4xCO2	-0.8	-2.6	-2.3	-2.7	-3.4	-2.4	-2.4
G4cdnc-RCP4.5	-1.0	-0.6	-0.6		-0.8	-0.3	-0.7
G4-RCP4.5	-0.5	-0.3	-0.5		-0.2	-0.2	-0.4
G1oa-G1	-1.5	-0.2	-0.3		-0.2	-0.1	-0.5
G4cdnc-G4	-0.5	-0.3	-0.1		-0.6	-0.1	-0.3
$\frac{G4 - RCP4.5}{G1 - 4XC02}$	64%	10%	23%		6%	10%	23%
$\frac{G4cdnc - RCP4.5}{G1 - 4XC02}$	121%	22%	27%		24%	14%	42%
$\frac{G1 - 4XC02}{G4 - RCP4.5}$	53%	45%	85%		27%	70%	56%
$\frac{G4cdnc - RCP4.5}{G4 - RCP4.5}$	22%	9%	21%		6%	10%	14%
$\frac{G1oa - 4XC02}{G4cdnc - RCP4.5}$	42%	21%	24%		22%	14%	25%
$\frac{G1oa - 4XC02}{G1 - 4XC02}$							

Table S6. Ratios of SRMs for AMOC/TOA. Where individual ESM have no data, the ensemble mean was used.

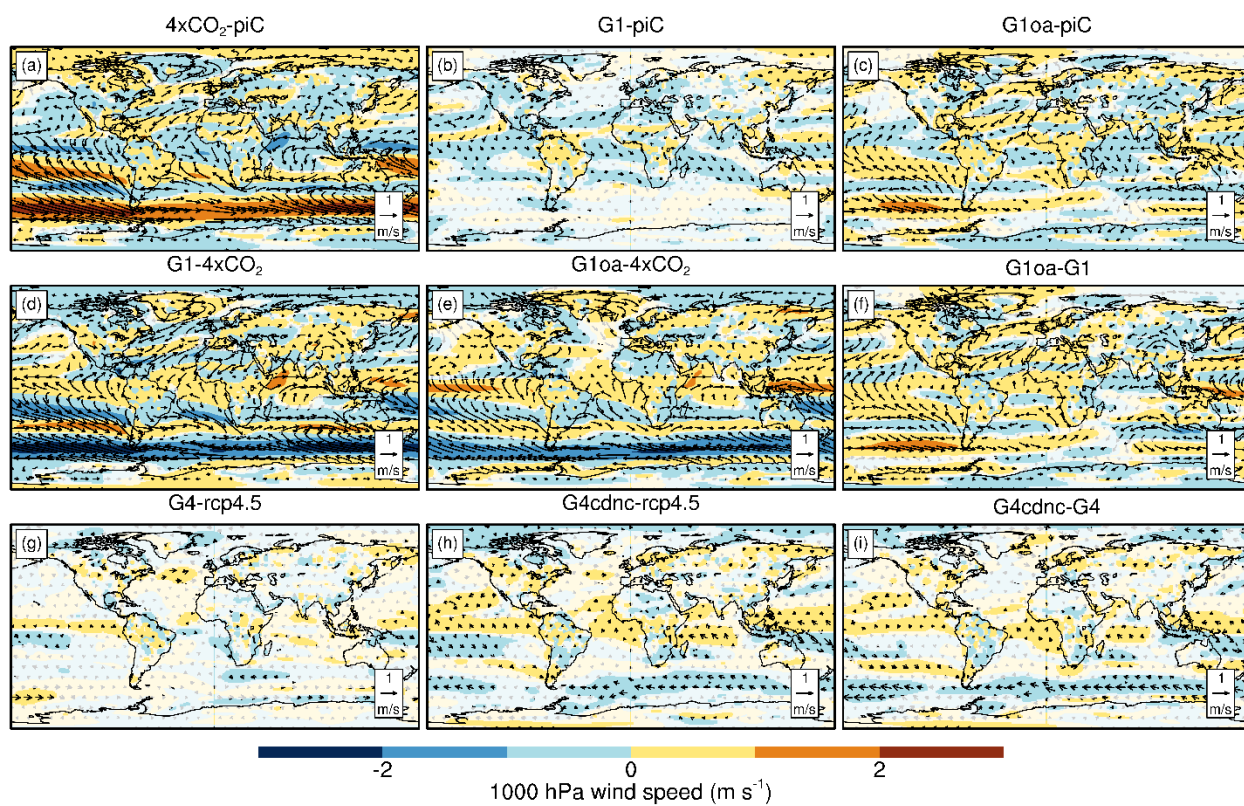
Type	Ratios	BNU-ESM	CanESM2	HadGEM2-ES	IPSL-CM5A-LR	MIROC-ESM	NorESM1-M	Ensemble
SAI/G1 Solar	$\frac{G4 - RCP4.5}{G1 - 4XC02}$	0.3	1.2	0.7	0.6	1.4	1.4	0.6
MCB/G1 Solar	$\frac{G4cdnc - RCP4.5}{G1 - 4XC02}$	0.3	1.1	1.2	0.4	1.2	0.5	0.6
SAI/MCB	$\frac{G4 - RCP4.5}{G4cdnc - RCP4.5}$	1.1	1.2	0.6	1.3	1.1	2.6	1.3
	$\frac{G4 - RCP4.5}{G1oa - 4XC02}$	1.0	1.4	1.6	1.3	1.4	1.6	1.3







NorESM1-M



MIROC-ESM

Figure S1 (Multi-page figure): As for Fig. 4 but for the 6 ESM as marked below each color bar, showing the spatial distribution of 1000 hPa wind speed and wind direction (arrows) changes under different scenarios (11-50 yr). Blue colors indicate decreased wind speed, the length of arrow in each panel's bottom right represents speeds of 1 m s^{-1} . Translucent white overlay indicates regions where differences are not significant at the 95% level according to the Wilcoxon signed-rank test. IPSL-CM5A-LR lacks some data.

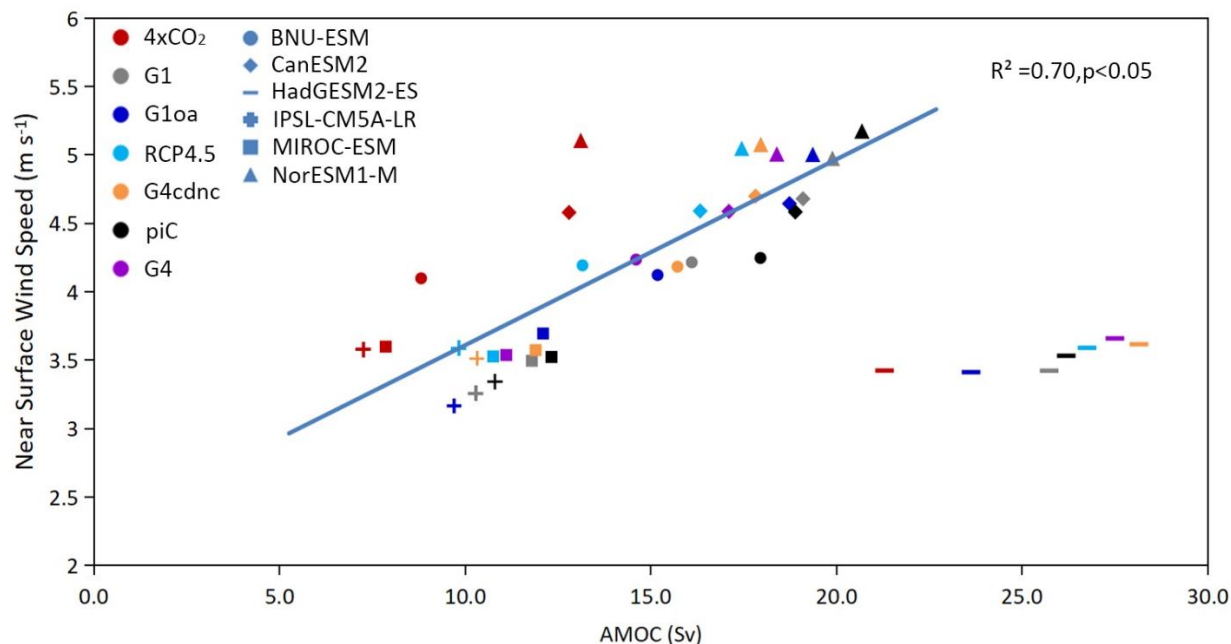


Figure S2: ESM mean of Wind speed (m s^{-1}) over the 40-year analysis period in the subpolar North Atlantic (North of 45°N). All ESMs except HadGESM2-ES show a high correlation between near surface wind speed and AMOC intensity. The dotted line is the linear regression line of AMOC intensity and wind speed (area average of the subpolar North Atlantic) over the 40-year analysis period in the 5 ESMs excluding HadGESM2-ES.

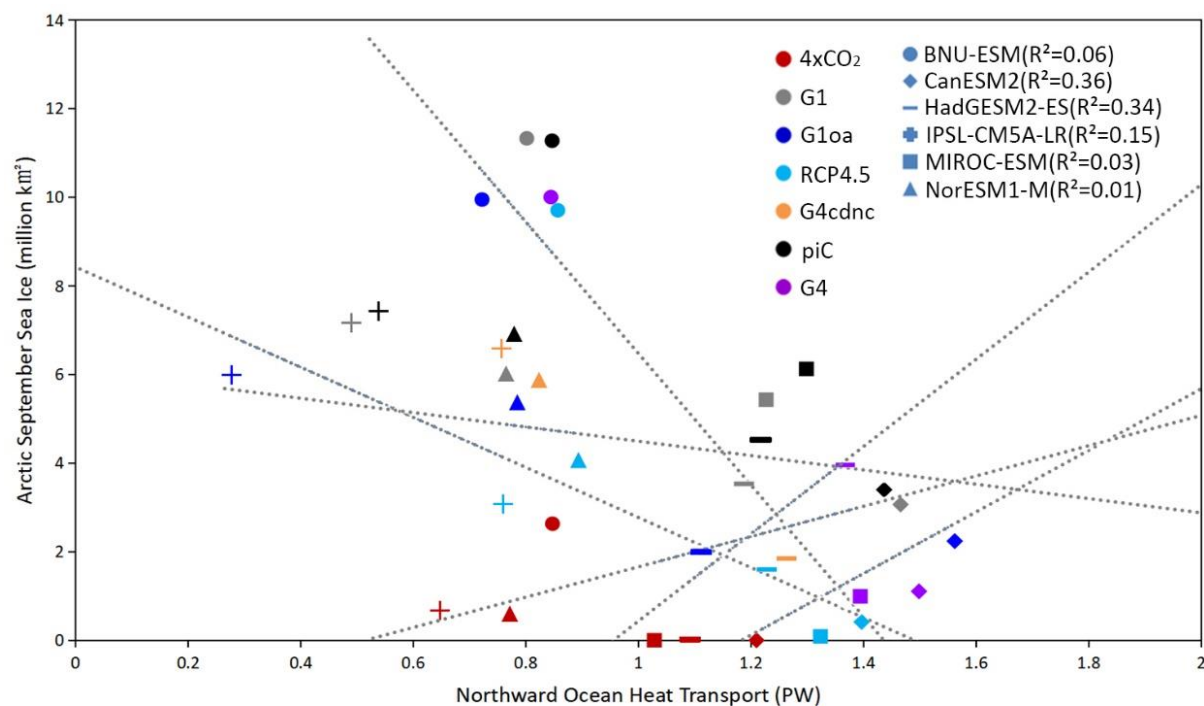


Figure S3. Model mean Arctic September sea ice area (million km^2) over the 40-year analysis period (defined as the limit of 15% ice concentration region). The dotted lines are the linear regression trendline of Northward Ocean Heat Transport (0-700m, 60°N) and Arctic September Sea ice area over the 40-year analysis period. The R^2 for all data points is an insignificant 0.26.

Fig.

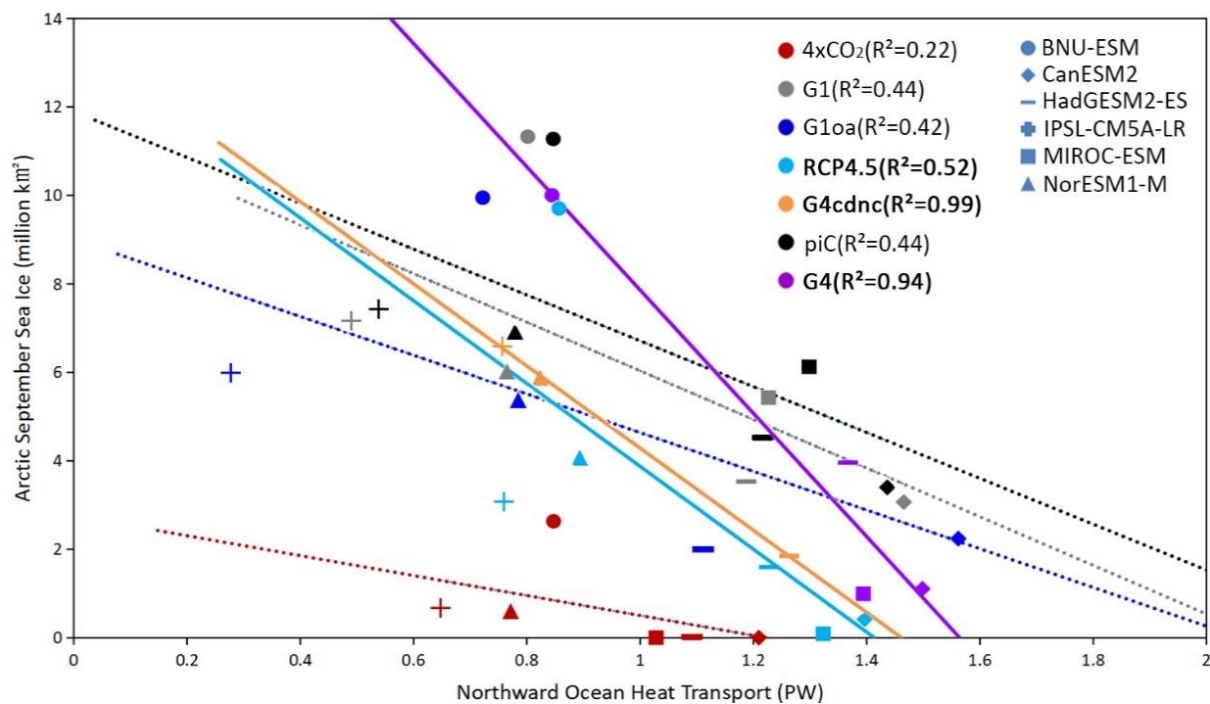


Figure S4. Model mean Arctic September sea ice area (million km²) over the 40-year analysis period (defined as the limit of 15% ice concentration region). The lines are the linear regression trendlines of Northward Ocean Heat Transport (0-700m, 60°N) and Arctic September Sea ice area over the 40-year analysis period for each scenario. Those significant at the 95% level are shown as heavier lines in bold in the legend.