

Supplementary Information of ‘A potential collapse of the Atlantic Meridional Overturning Circulation may stabilise eastern Amazonian rainforests’

1 Supplementary Figures

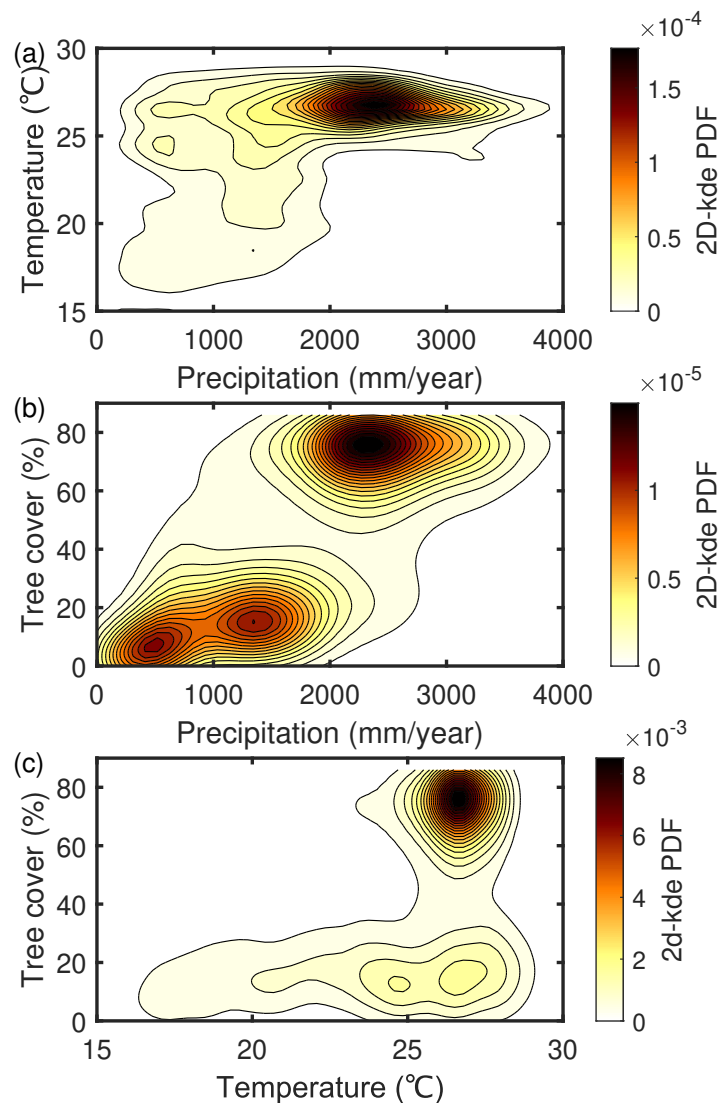
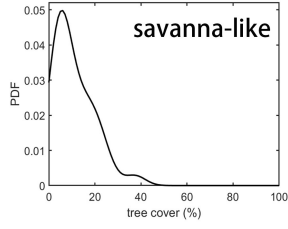


Figure S1: 2-Dimensional(2D) Probability Density Function Distribution Plot for three variables. The projected PDFs of Fig. 2: (a) the 2D PDF between MAT and MAP; (b) the 2D PDF between MAP and tree cover; (c) the 2D PDF between MAT and tree cover.

e.g. MAT=14°C, MAP=400 mm/yr



e.g. MAT=27°C, MAP=1500 mm/yr

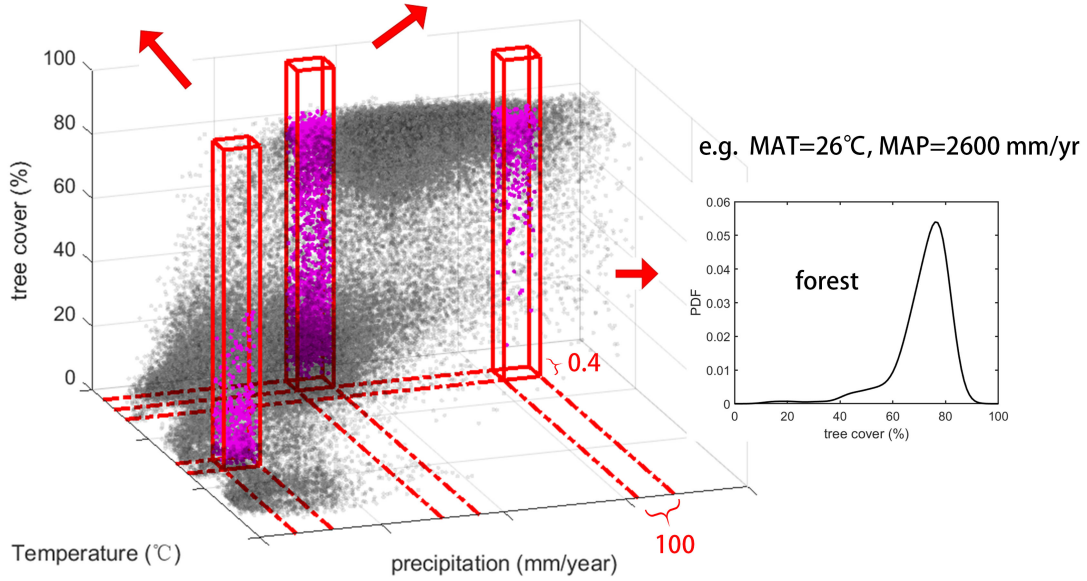
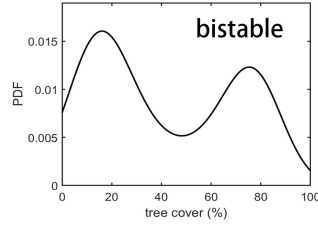


Figure S2: Schematic diagram of the method to determine the tree cover regime. Shown here are three cases with different MAT and MAP values and the corresponding tree cover PDF, which are determined as forest (MAT=26°C, MAP=2600 mm/yr), savanna-like (MAT=14°C, MAP=400 mm/yr), and bistable (MAT=27°C, MAP=1500 mm/yr), respectively. The cube is drawn by the target MAP and MAT with a temperature range of 0.2°C and a precipitation range of 50 mm/yr. The black dots are the samples from all observational datasets, and the pink dots are the samples selected within the cube.

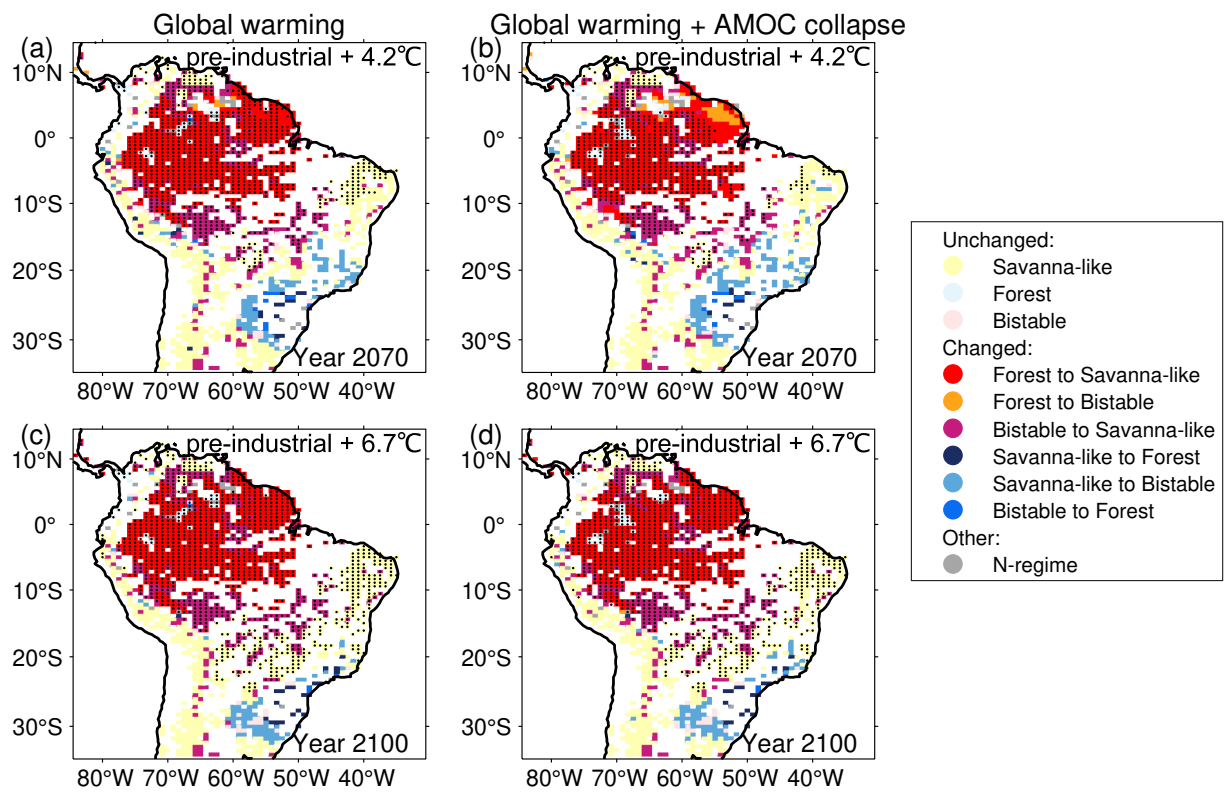


Figure S3: Same as Fig. 3 but for the years 2070 to 2100.

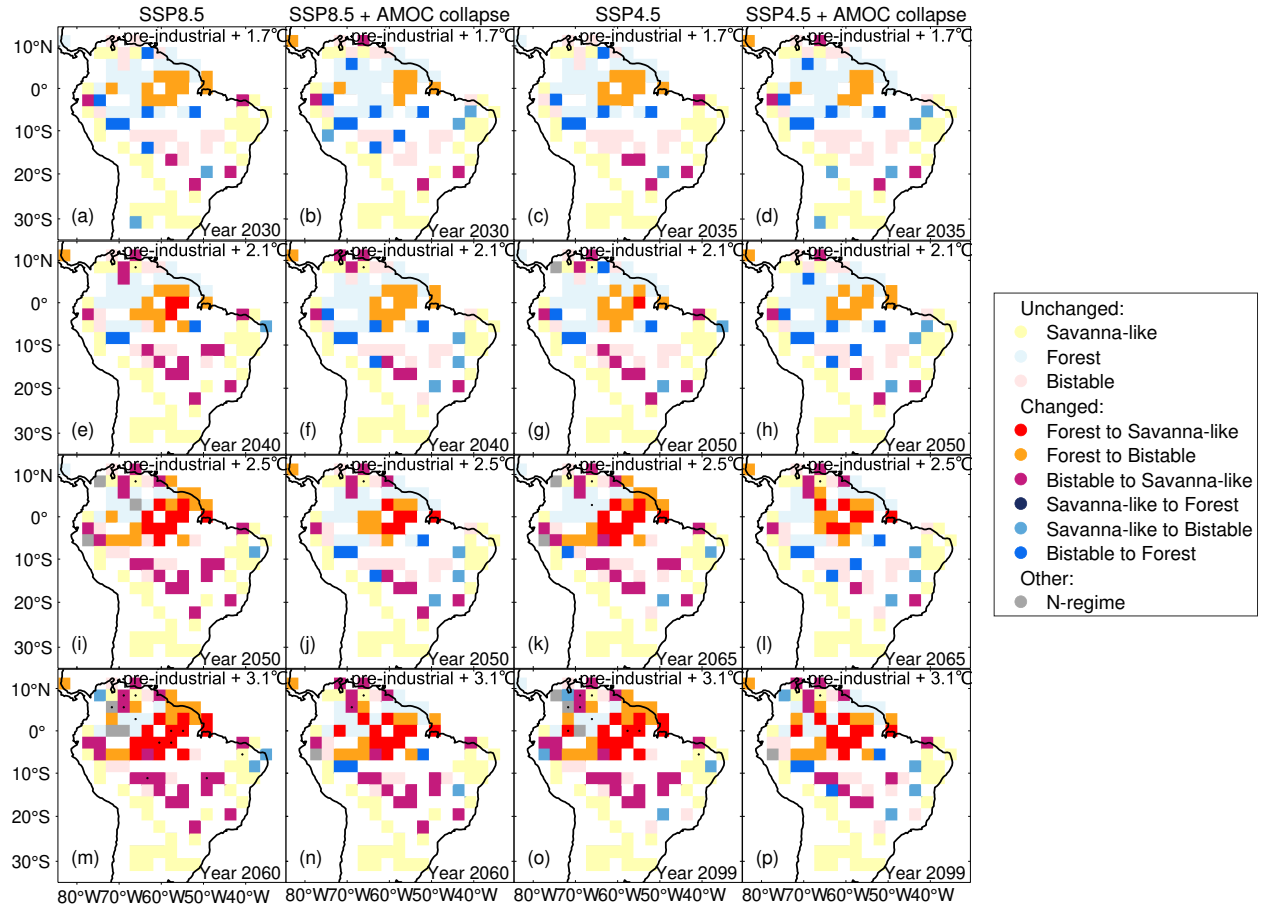


Figure S4: Vegetation regime shifts in future scenarios. (a),(e),(i),(m),(c),(g),(k),(o) show vegetation regime shifts in the global warming scenario, and (b),(f),(j),(n),(d),(h),(l),(p) show vegetation regime shifts in global warming combined with an AMOC collapse scenario. The MAP and MAT of AMOC collapse are the average of three hosing experiments from CanESM, CESM, and IPSL, the MAP and MAT of the SSP8.5 is the ensemble mean of 35 models in CMIP6, and the MAP and MAT of the SSP4.5 is the ensemble mean of 32 models in CMIP6 (same as SSP8.5 excluding three models without SSP4.5 experiments). The columns shown from left to right are SSP8.5-only, SSP8.5 combined with AMOC collapse, SSP4.5-only, and SSP4.5 combined with AMOC collapse, respectively. The selected years for SSP4.5-related scenarios are to align with the global warming level shown in SSP8.5-related scenarios. e.g. The result of the year 2060 under SSP8.5 closings resembles those results for the year 2099 under SSP4.5, with the same global warming level.

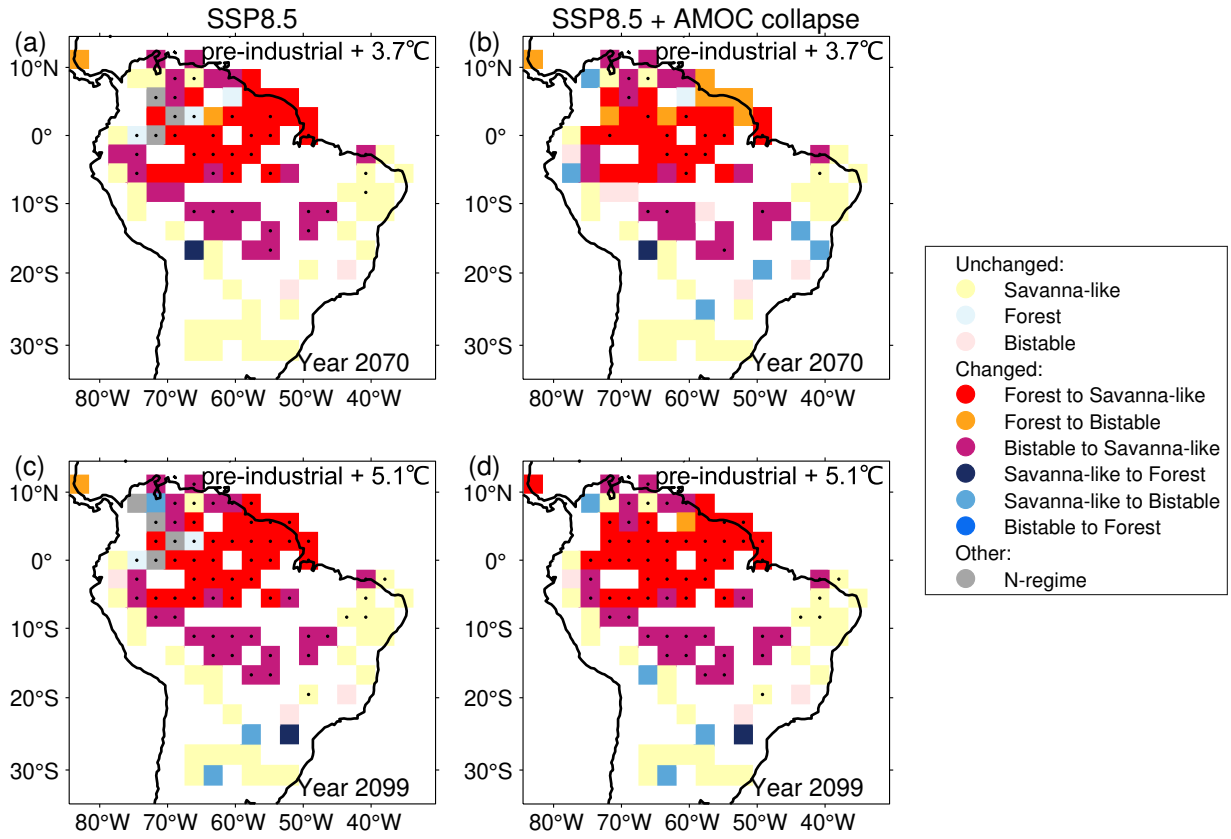


Figure S5: Same as Supplementary Fig. S4 but only for SSP8.5-related scenarios from years 2070 to 2099.

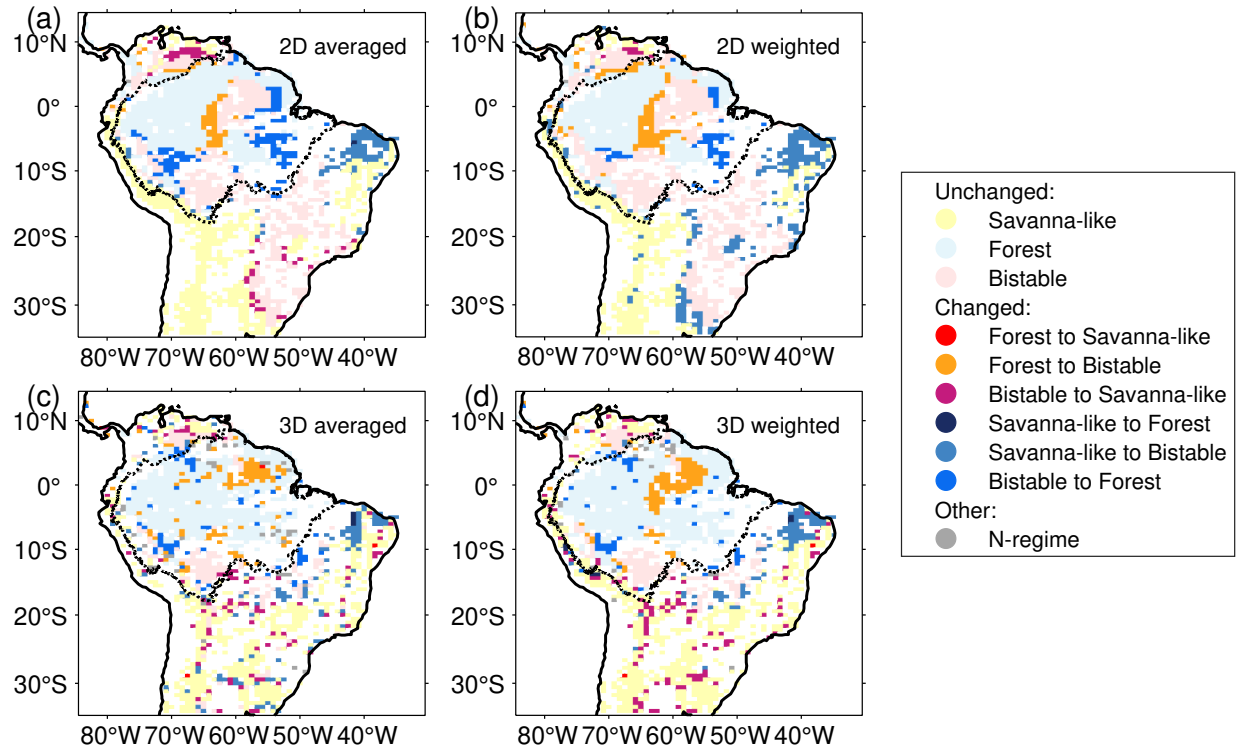


Figure S6: The regime shift due to AMOC collapse compared with the current climatology. (a) estimated by the averaged method and only considering the change of precipitation due to the AMOC collapse; (b) using the weighted average method, only considering changes in precipitation; (c) using the averaged method, considering both changes in precipitation and temperature; (d) using the weighted average method, considering both changes in precipitation and temperature. The black dashed line shows the Amazon forest basin area.

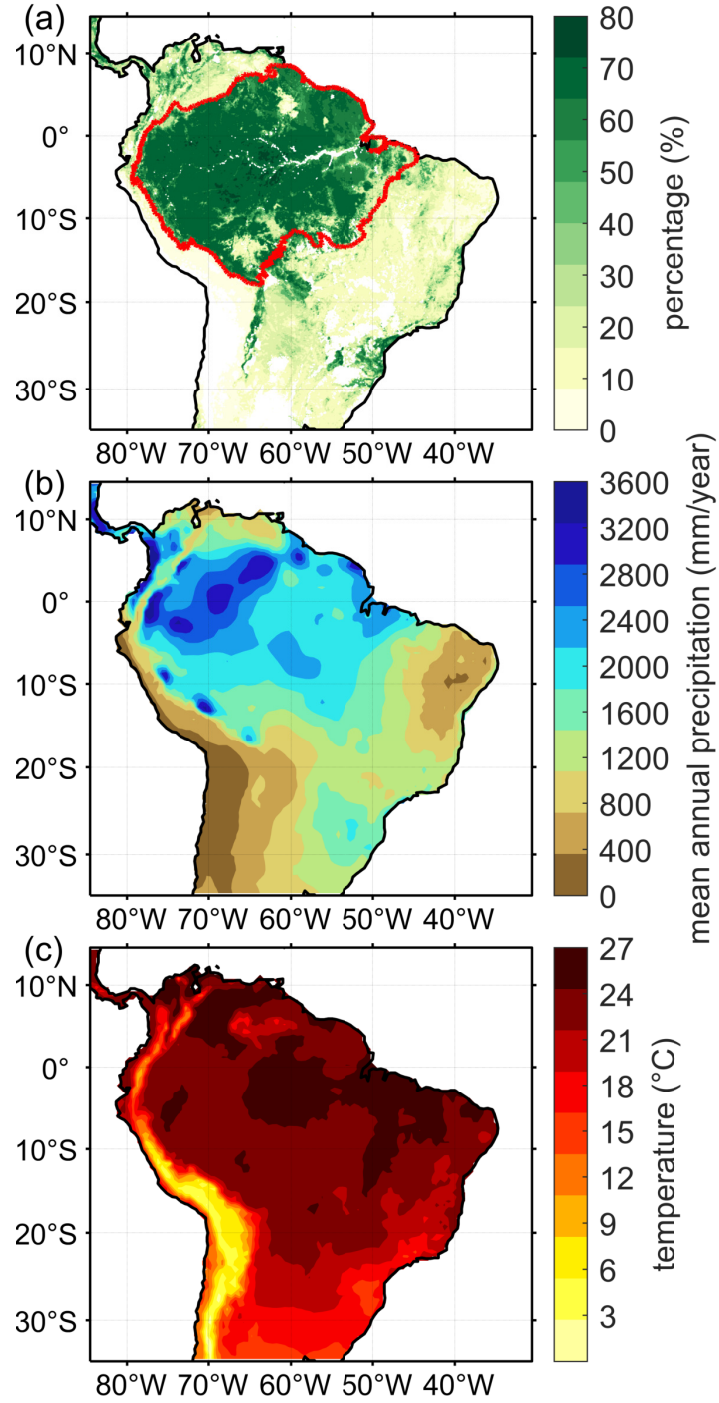


Figure S7: The climatology of South America by averaging the observations during 2000-2020. (a) shows tree cover; (b) shows mean annual precipitation; (c) shows mean annual temperature.

2 Supplementary Table

Table S1: The models in CMIP6 listed here are used to calculate the ensemble mean of SSP8.5 scenarios and ensemble mean of SSP4.5, which is used in Supplementary Fig. S4 and Fig. S5. (* means the corresponding model does not have the SSP4.5 experiment, which is not included in the calculation of the ensemble mean of SSP4.5.)

number	model name	experiment id
1	ACCESS-CM2	r1i1p1f1
2	ACCESS-ESM1-5	r1i1p1f1
3	AWI-CM-1-1-MR	r1i1p1f1
4	BCC-CSM2-MR	r1i1p1f1
5	CAMS-CSM1-0	r1i1p1f1
6	CanESM5	r1i1p1f1
7	CAS-ESM2-0	r1i1p1f1
8	CESM2	r4i1p1f1
9	CESM2-WACCM	r1i1p1f1
10	CIesm	r1i1p1f1
11	CMCC-CM2-SR5	r1i1p1f1
12	CMCC-ESM2	r1i1p1f1
13	EC-Earth3-CC	r1i1p1f1
14	EC-Earth3-Veg	r1i1p1f1
15	EC-Earth3-Veg-LR	r1i1p1f1
16	FGOALS-f3-L	r1i1p1f1
17	FGOALS-g3	r1i1p1f1
18	GFDL-CM4	r1i1p1f1
19	GFDL-ESM4	r1i1p1f1
20	HadGEM3-GC31-LL	r1i1p1f3
21	HadGEM3-GC31-MM*	r1i1p1f3
22	IITM-ESM	r1i1p1f1
23	INM-CM4-8	r1i1p1f1
24	INM-CM5-0	r1i1p1f1
25	IPSL-CM6A-LR	r1i1p1f1
26	KACE-1-0-G	r1i1p1f1
27	KIOST-ESM	r1i1p1f1
28	MIROC6	r1i1p1f1
29	MPI-ESM1-2-HR	r1i1p1f1
30	MPI-ESM1-2-LR	r1i1p1f1
31	MRI-ESM2-0	r1i1p1f1
32	NESM3	r1i1p1f1
33	NorESM2-LM*	r1i1p1f1
34	NorESM2-MM*	r1i1p1f1
35	TaiESM1	r1i1p1f1