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Geophysical Research Letters

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Supporting Information for

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Relating CMIP5 model biases to seasonal forecast skill in the tropical Pacific

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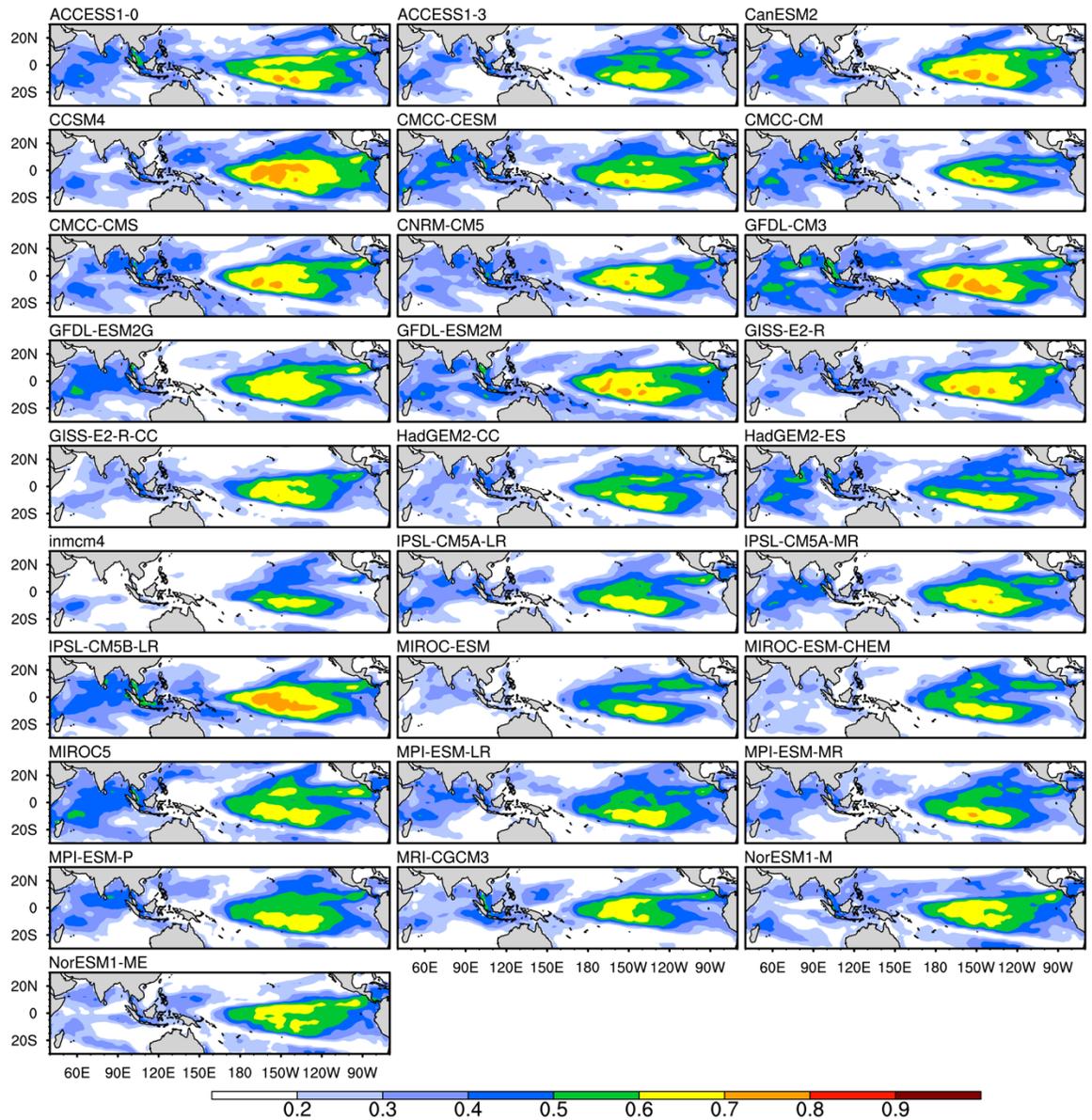
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Figures S1 to S6

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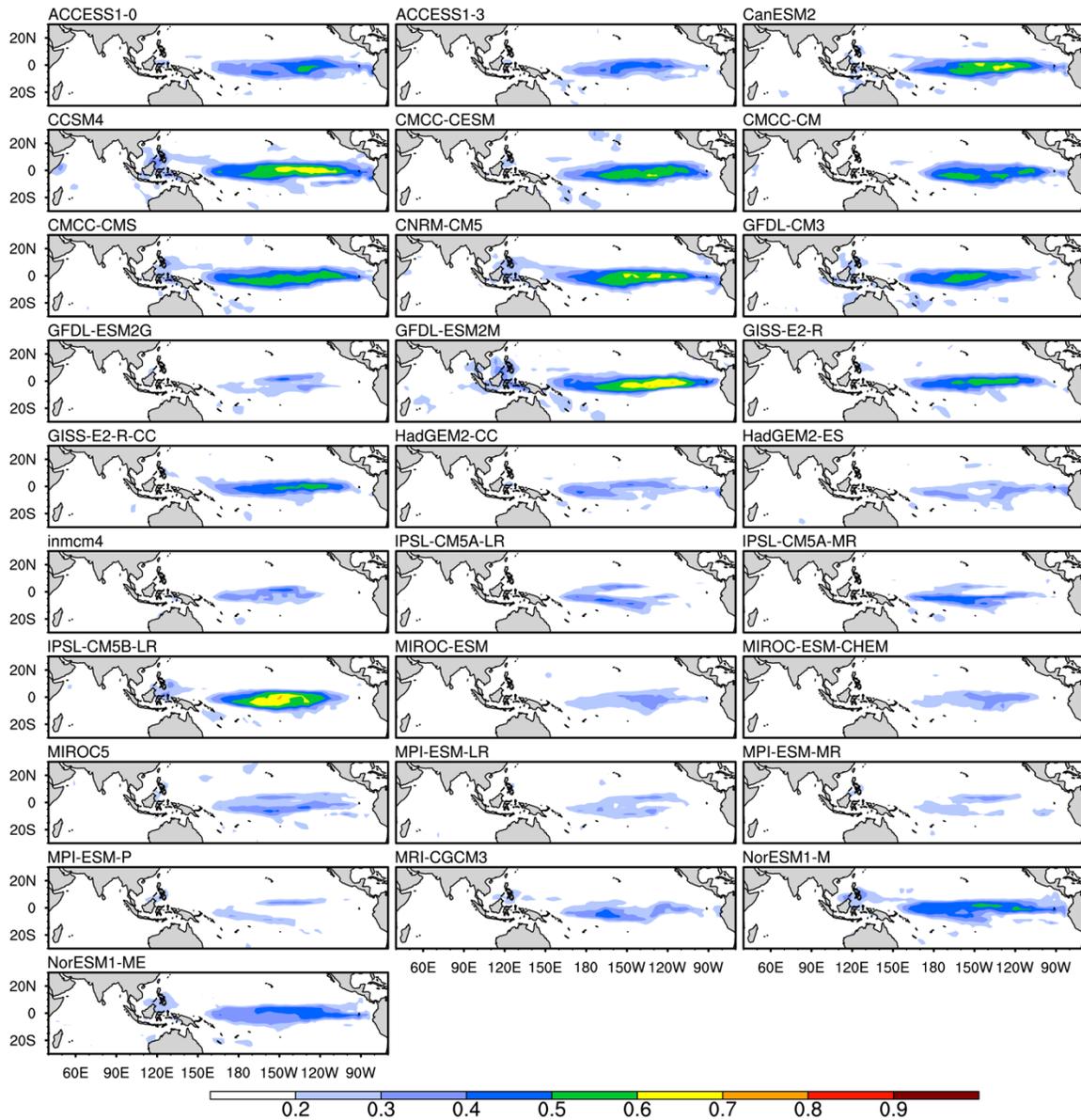
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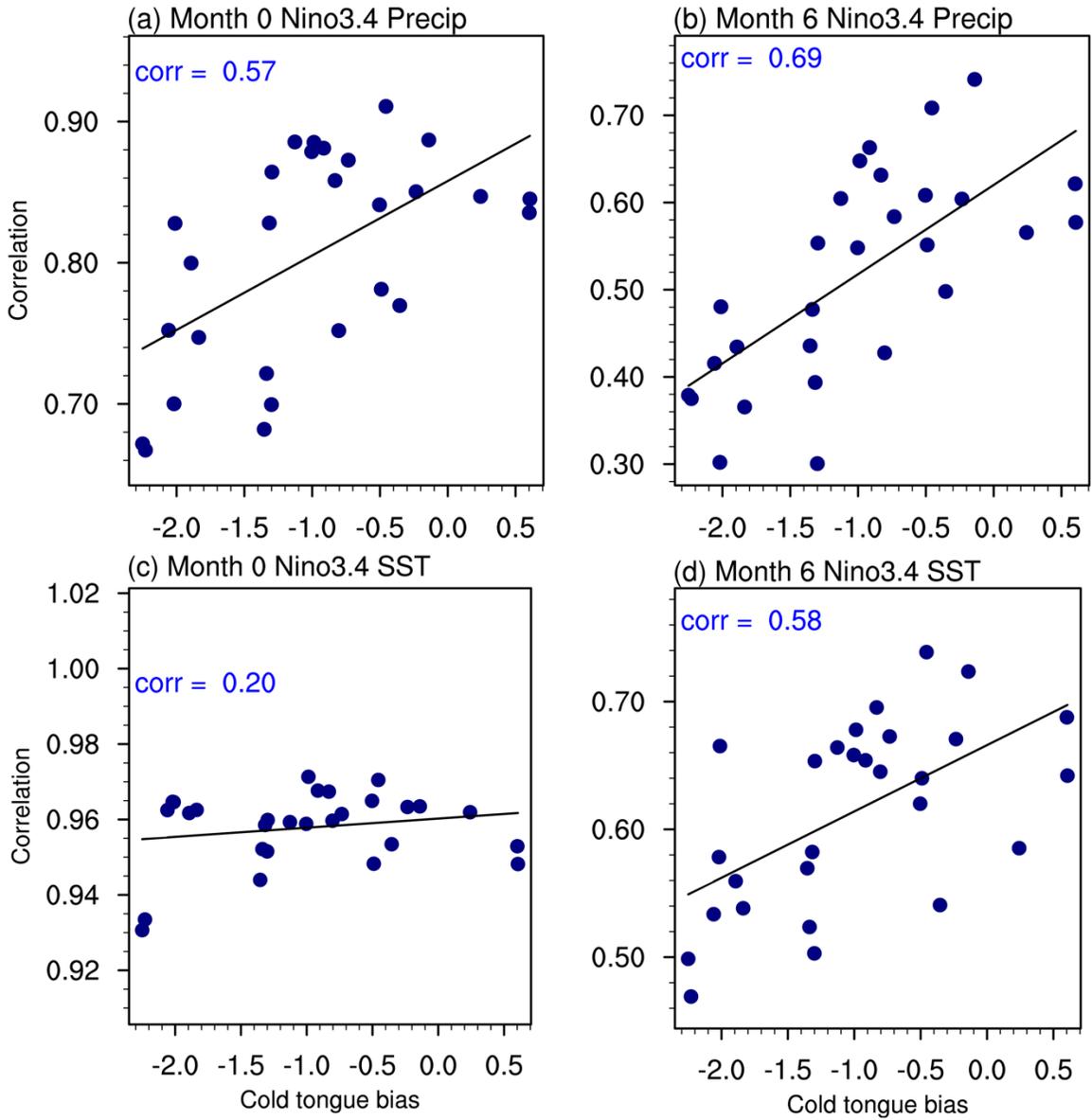
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Figure S1. Model-analog hindcast skill of observed SST variations (1961-2015) at 6-month lead, for each individual CMIP5 model, calculated as an anomaly correlation between observations and the hindcast ensemble mean.



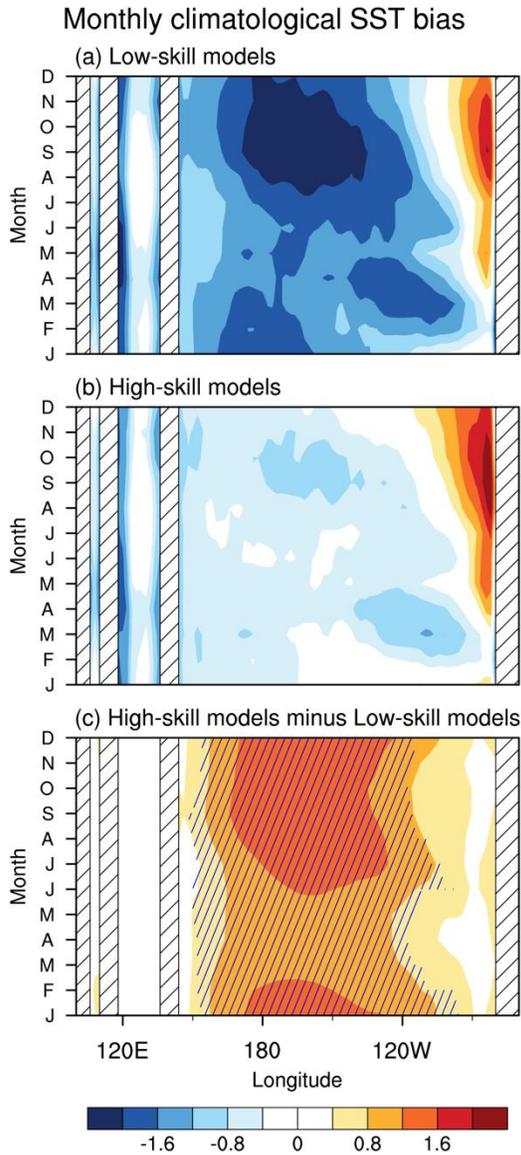
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Figure S2. As in Fig. S2, but for precipitation (1979-2015).



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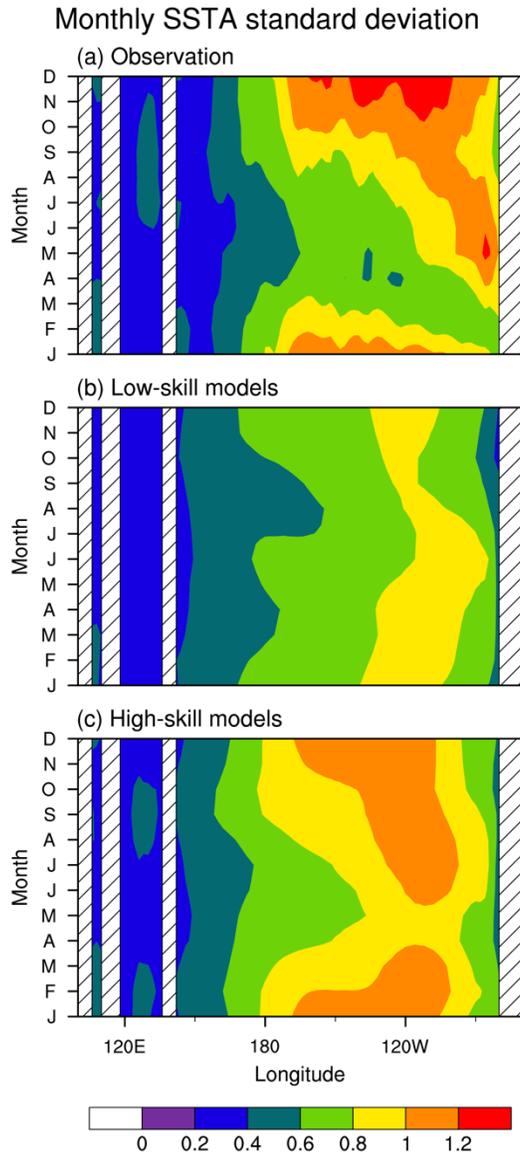
Figure S3. As in Fig. 2, but for model-analog anomaly correlation on the ordinate.



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Figure S4. Multi-model monthly climatological equatorial (5°S - 5°N) SST biases,

54 calculated from the pre-industrial control simulations of the 12 models with the (a) worst
55 and (b) best initial model-analog reconstruction error (SRMSE) for Niño3.4 precipitation
56 and (c) the difference between the two groups of models. Differences in SST are hatched
57 when they exceed 95% significance. The unit is Celsius.



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Figure S5. Monthly equatorial (5°S - 5°N) SSTA standard deviation, calculated

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from (a) observations and the pre-industrial control simulations of the 12 models with the

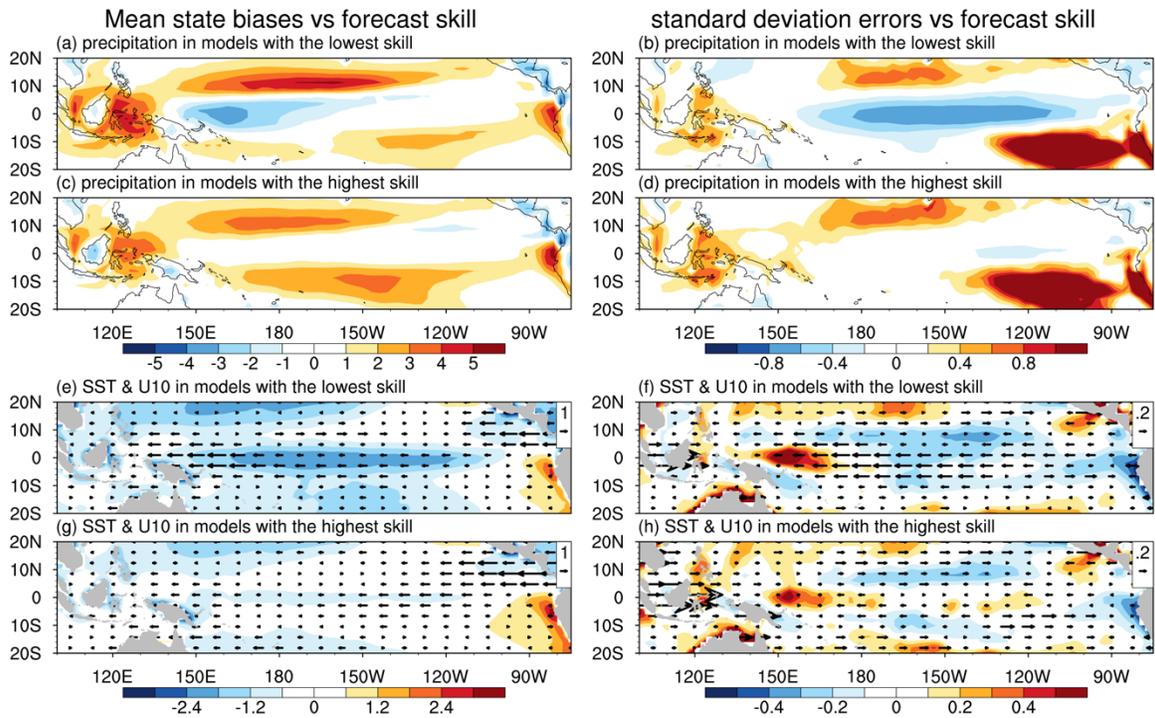
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(b) worst and (c) best initial model-analog reconstruction error (SRMSE) for Niño3.4

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precipitation. The unit is Celsius.

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Figure S6. As in Fig. 3, but for the 12 models selected according to model-analog forecast accuracy of Niño3.4 precipitation at 6-month lead.

Model name	Expanded model name	Length of run (yr)
ACCESS1-0	Australian Community Climate and Earth System Simulator Coupled Model	500
ACCESS1-3	Australian Community Climate and Earth System Simulator Coupled Model	500
CanESM2	Second Generation Canadian Earth System Model	995
CCSM4	Community Climate System Model, version 4	1050
CMCC-CESM	CMCC Carbon Earth System Model	277
CMCC-CM	CMCC Climate Model	330
CMCC-CMS	CMCC Climate Model with a resolved Stratosphere	500
CNRM-CM5	Centre National de Recherches Meteorologiques Coupled Global Climate Model, version 5	850
GFDL-CM3	Geophysical Fluid Dynamics Laboratory, Climate Model versions 3.0	500
GFDL-ESM2G	Geophysical Fluid Dynamics Laboratory Earth System Model with Generalized Ocean Layer Dynamics (GOLD) component	500
GFDL-ESM2M	Geophysical Fluid Dynamics Laboratory Earth System Model with Modular Ocean Model 4 (MOM4) component	500
GISS-E2-R	Goddard Institute for Space Studies Model E2, coupled with the Russell ocean model	550
GISS-E2-R-CC	Goddard Institute for Space Studies Model E2, coupled with the Russell ocean model, Interactive Carbon Cycle	251
HadGEM2-CC	Hadley Centre Global Environment Model, version 2–Carbon Cycle	240
HadGEM2-ES	Hadley Centre Global Environment Model, version 2-Earth System	575
INMCM4	Institute of Numerical Mathematics Coupled Model, version 4.0	500
IPSL-CM5A-LR	L’Institut Pierre-Simon Laplace Coupled Model, version 5, coupled with Nucleus for European Modelling of the Ocean (NEMO), low resolution	1000
IPSL-CM5A-MR	L’Institut Pierre-Simon Laplace Coupled Model, version 5, coupled with NEMO, mid resolution	300
IPSL-CM5B-LR	L’Institut Pierre-Simon Laplace Coupled Model, version 5, coupled with NEMO, new atmospheric physics low resolution	300

MIROC-ESM	Model for Interdisciplinary Research on Climate, Earth System Model	630
MIROC-ESM-CHEM	Model for Interdisciplinary Research on Climate, Earth System Model, an atmospheric chemistry coupled version	255
MIROC5	Model for Interdisciplinary Research on Climate, version 5	670
MPI-ESM-LR	Max Planck Institute Earth System Model, low resolution	1000
MPI-ESM-MR	Max Planck Institute Earth System Model, medium resolution	1000
MPI-ESM-P	Max Planck Institute Earth System Model, low resolution, and paleo mode	1155
MRI-CGCM3	Meteorological Research Institute Coupled Atmosphere–Ocean General Circulation Model, version 3	500
NorESM1-M	Norwegian Earth System Model 1, medium resolution	500
NorESM1-ME	Norwegian Earth System Model 1, medium resolution with capability to be fully emission driven	252

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90 **Table S1.** The 28 CMIP5 models whose preindustrial control simulations served as the data
91 library for selection of model-analogs.

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