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*Supplement of*

**Response of global evaporation to major climate modes in  
historical and future Coupled Model Intercomparison  
Project Phase 5 simulations**

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**LIST OF TABLE CAPTIONS**

Table S1. List of CMIP5 models used in this study

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No.	Model name	Modelling center, country
1	ACCESS1-0	CSIRO–BOM, Australia
2	ACCESS1-3	CSIRO–BOM, Australia
3	CanESM2	CCCma, Canada
4	CMCC-CM	CMCC, Italy
5	CNRM-CM5	CNRM-CERFACS, France
6	CSIRO-Mk3-6-0	CSIRO–QCCCE, Australia
7	FGOALS-g2	LASG–CESS, China
8	IPSL-CM5A-LR	IPSL, France
9	IPSL-CM5A-MR	IPSL, France
10	IPSL-CM5B-LR	IPSL, France
11	MIROC-ESM	MIROC, Japan
12	MIROC5	MIROC, Japan
13	MPI-ESM-LR	MPI-M, Germany
14	MPI-ESM-MR	MPI-M, Germany
15	MRI-CGCM3	MRI, Japan

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25 model is determined when the difference between the multi-model mean probability and the selected model's probability is less than one standard deviation of multi-model mean probability. The red (yellow) contour line designates  $p$  value = 0.05 (0.1). Red shades indicate high probability of no Granger causality. ENSO = El Niño–Southern Oscillation.

Figure S2. Multi-model mean probability map for the absence of Granger causality between  
30 ENSO and annual mean SST (a), zonal winds (b) and precipitation (c) for the period 1906-2000. Stippling demonstrates that at least 70% of models show agreement on the mean probability of all models at given grid point. An individual model's agreement is determined when the difference between the multi-model mean probability and the selected model's probability is less than one standard deviation of multi-model mean probability. The green (red) contour line  
35 designates  $p$  value = 0.1 (0.05). Brown shades indicate low probability for the absence of Granger causality. ENSO = El Niño–Southern Oscillation. SST = sea surface temperature.

Figure S3. Multi-model mean probability of no Granger causality from ENSO to seasonal evaporation for the period 1850-2005. (a) boreal Winter (December-January-February). (b) boreal Spring (March-April-May). (c) boreal Summer (June-July-August). (d) boreal Fall  
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45 Granger causality. ENSO = El Niño–Southern Oscillation.

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55 deviation of multi-model mean probability. The red (yellow) contour line designates  $p$  value = 0.05 (0.1). Red shades indicate high probability of no Granger causality.

Figure S6. As in Figure S1 but for Granger causality from IOD to seasonal evaporation for the period 1906-2000.

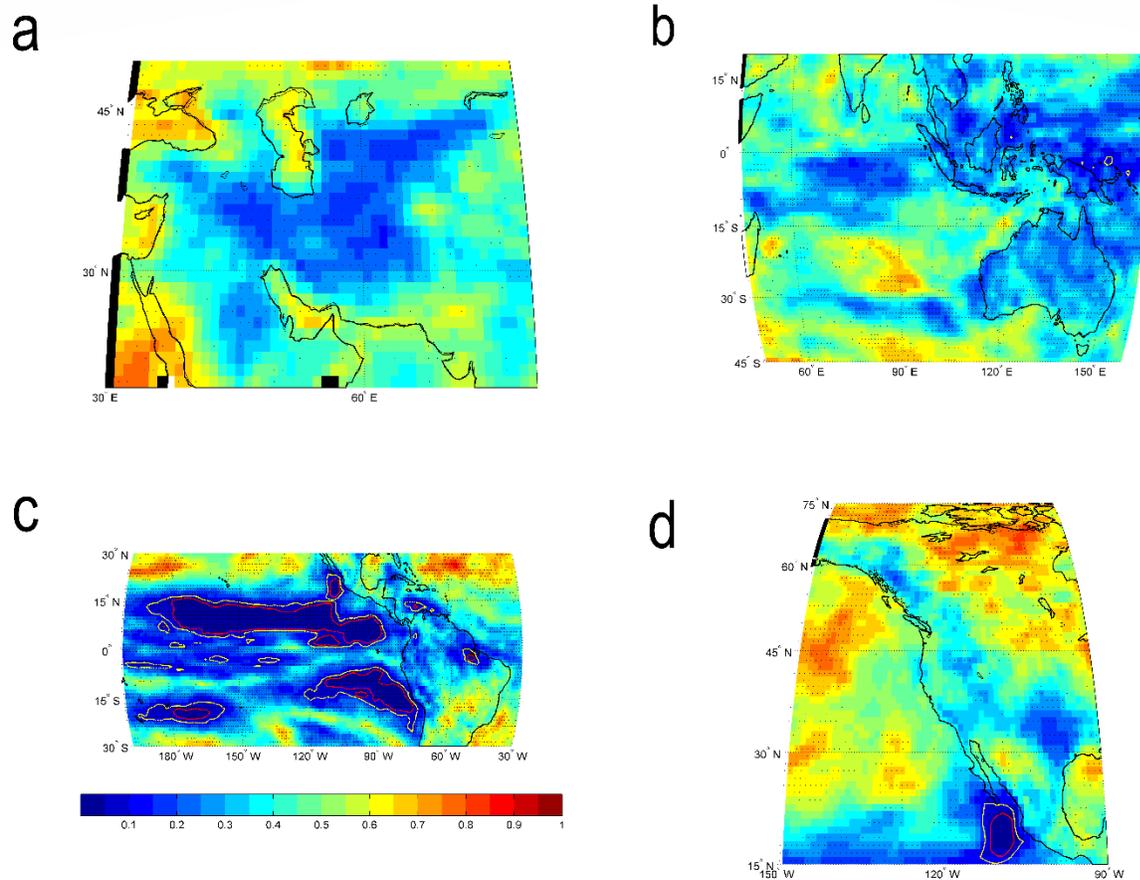
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60 Figure S8. Multi-model mean probability map for the absence of Granger causality between NAO and annual mean evaporation for the period 1906-2000 of selected regions. Stippling demonstrates that more than 70% of models show agreement on the multi-model mean probability. The agreement of an individual model is determined when the difference between the multi-model mean probability and the selected model's probability is less than one standard deviation of multi-model mean probability. The red (yellow) contour line designates  $p$  value = 65 0.05 (0.1). Red shades indicate high probability of no Granger causality.

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Figure S10. As in Figure S1 but for Granger causality from NAO to seasonal evaporation for the 70 period 2006-2100.

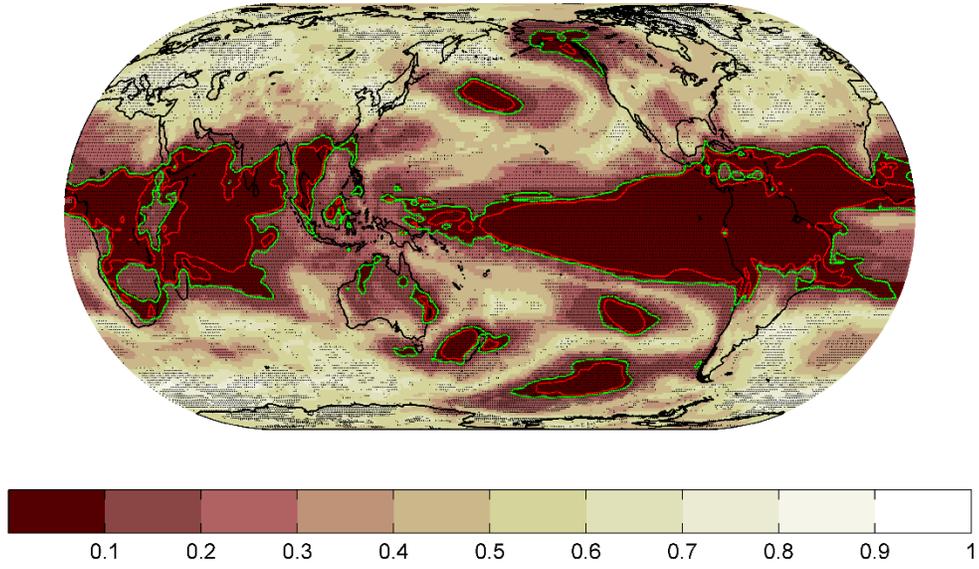
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 Red shades indicate high probability of no Granger causality. ENSO = El Niño–Southern Oscillation.

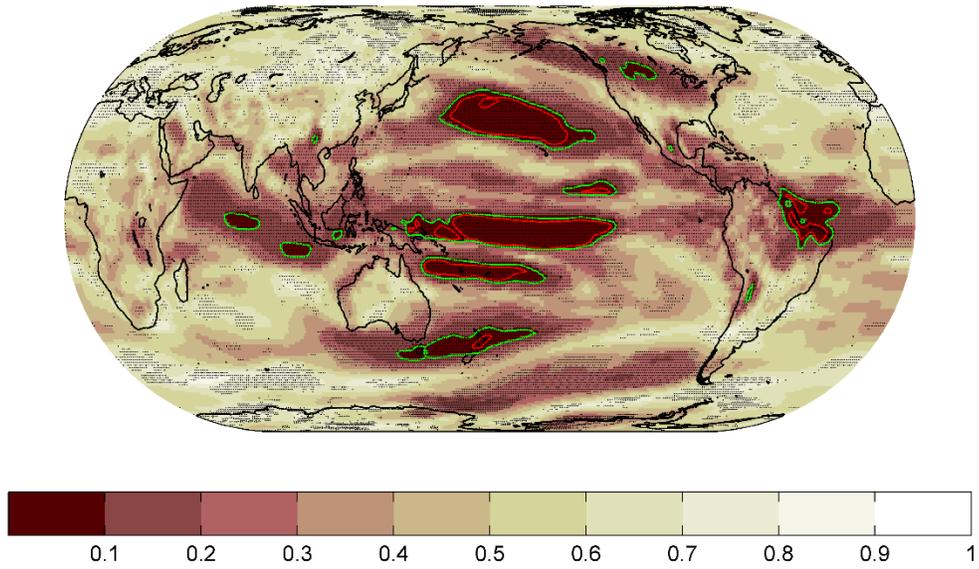
a)

MODELS MEAN: ENSO - SST PERIOD 1906-2000



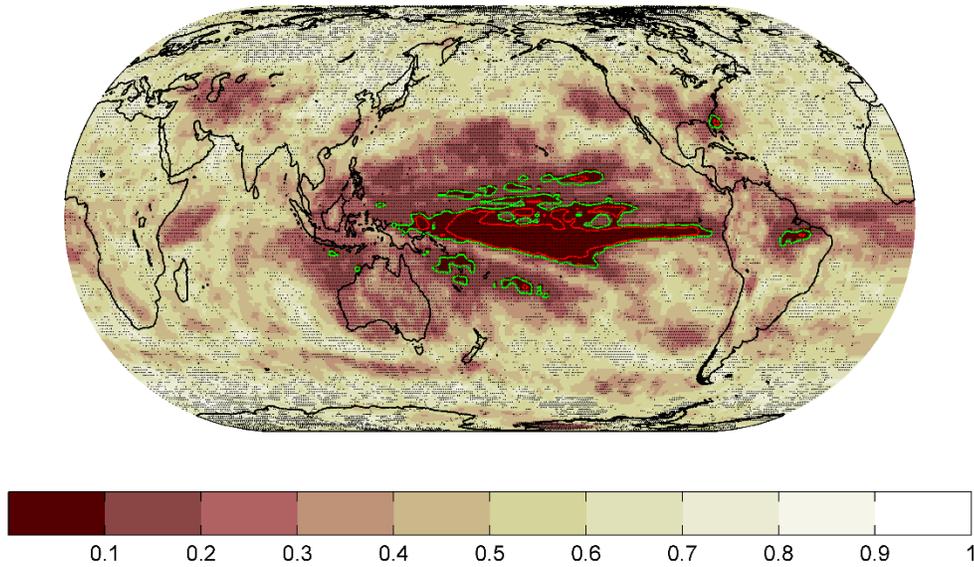
90 b)

MODELS MEAN: ENSO - ZONAL WINDS PERIOD 1906-2000



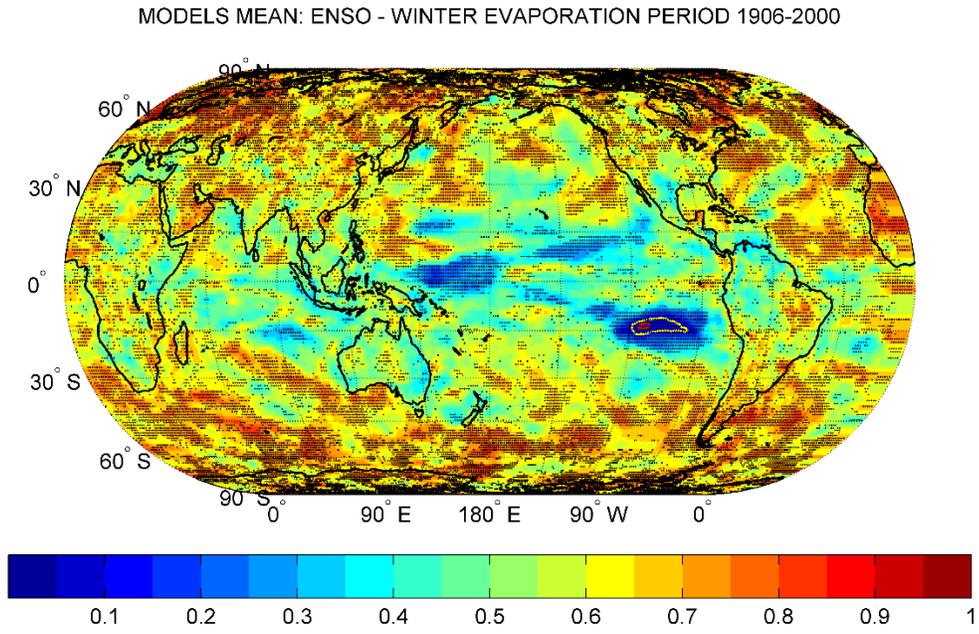
c)

MODELS MEAN: ENSO - PRECIPITATION PERIOD 1906-2000

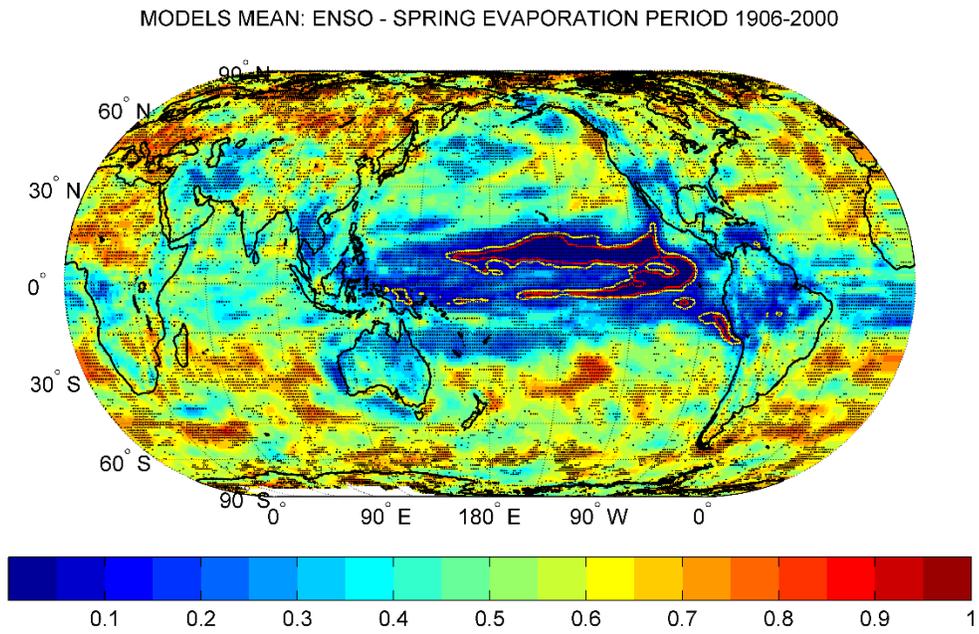


95 **Figure S2.** Multi-model mean probability map for the absence of Granger causality between ENSO and  
annual mean SST (a), zonal winds (b) and precipitation (c) for the period 1906-2000. Stippling  
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surface temperature.

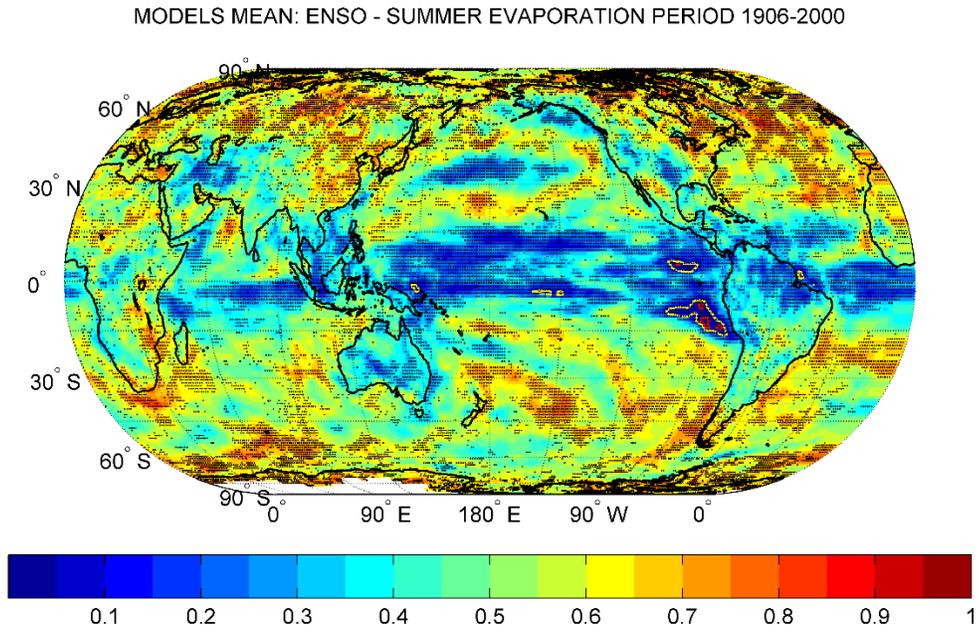
a)



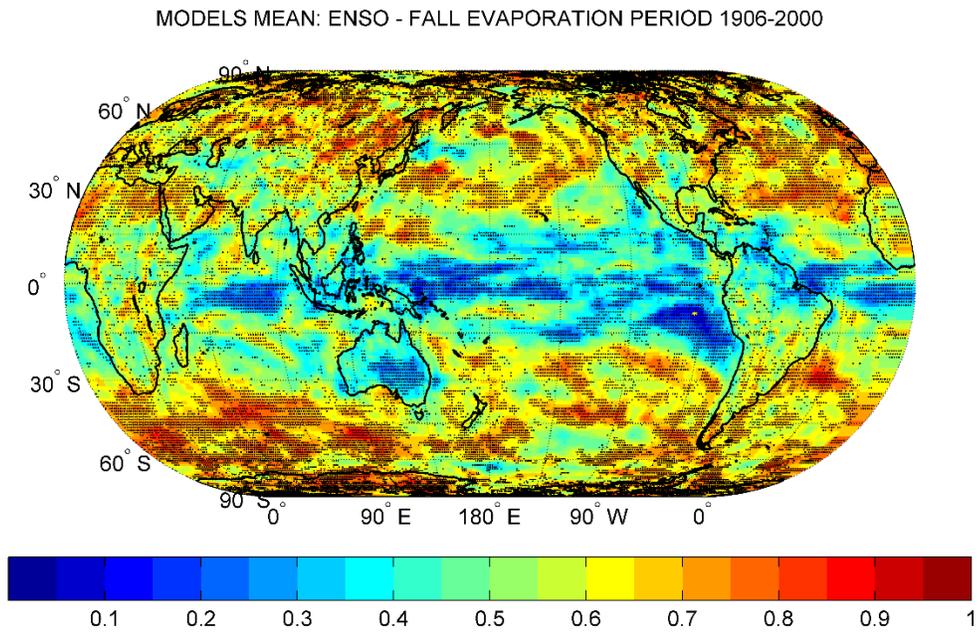
105 b)



c)

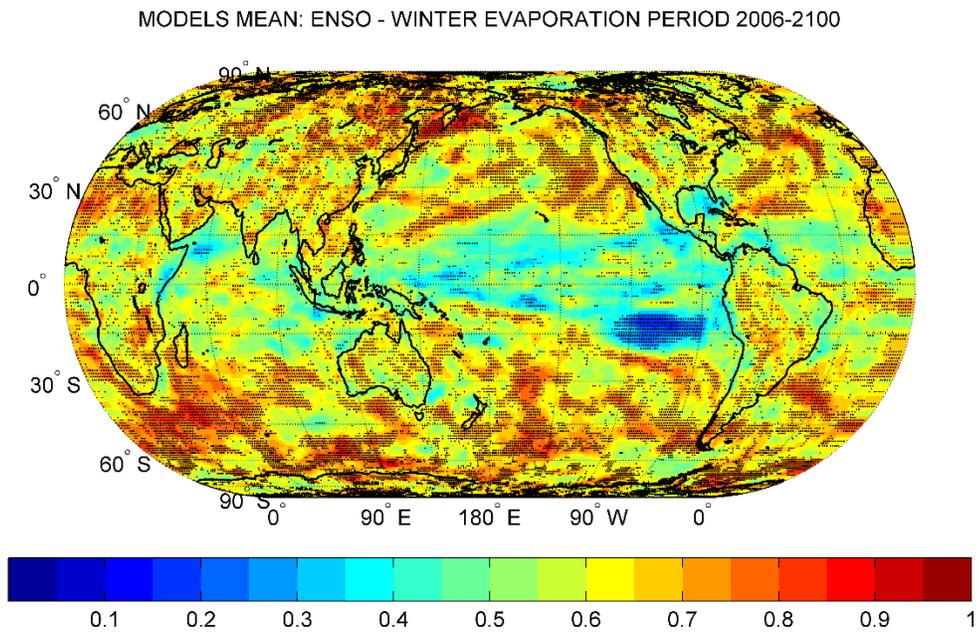


d)

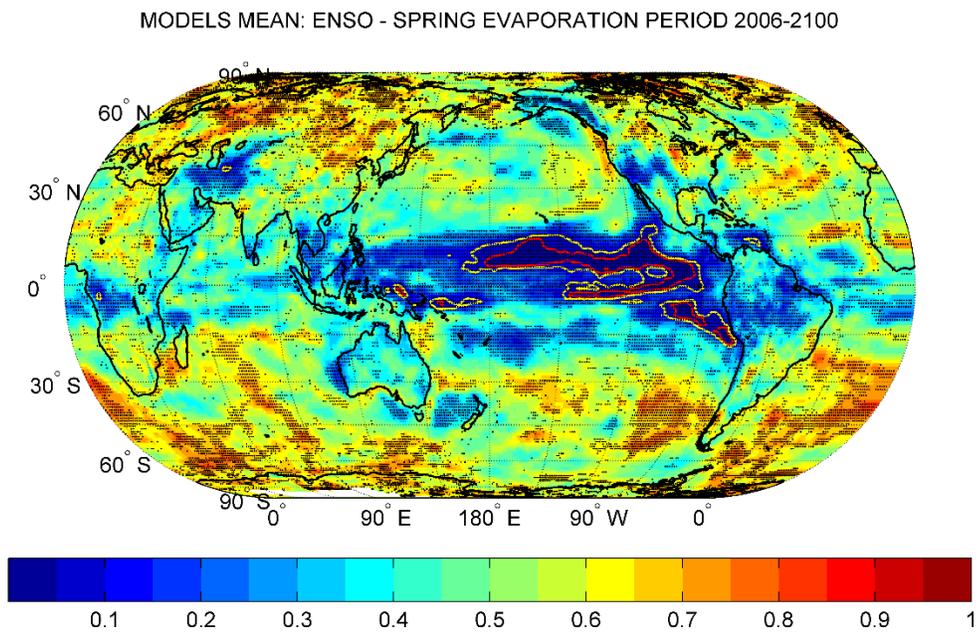


115 **Figure S3.** Multi-model mean probability of no Granger causality from ENSO to seasonal evaporation for the period 1850-2005. (a) boreal Winter (December-January-February). (b) boreal Spring (March-April-May). (c) boreal Summer (June-July-August). (d) boreal Fall (September-October-November). Stippling demonstrates that more than 70% of models show agreement on the multi-model mean probability. The agreement of an individual model is determined when the difference between the multi-model mean probability and the selected model's probability is less than one standard deviation of multi-model mean probability. The red (yellow) contour line designates  $p$  value = 0.05 (0.1). Red shades indicate high probability of no Granger causality. ENSO = El Niño–Southern Oscillation.

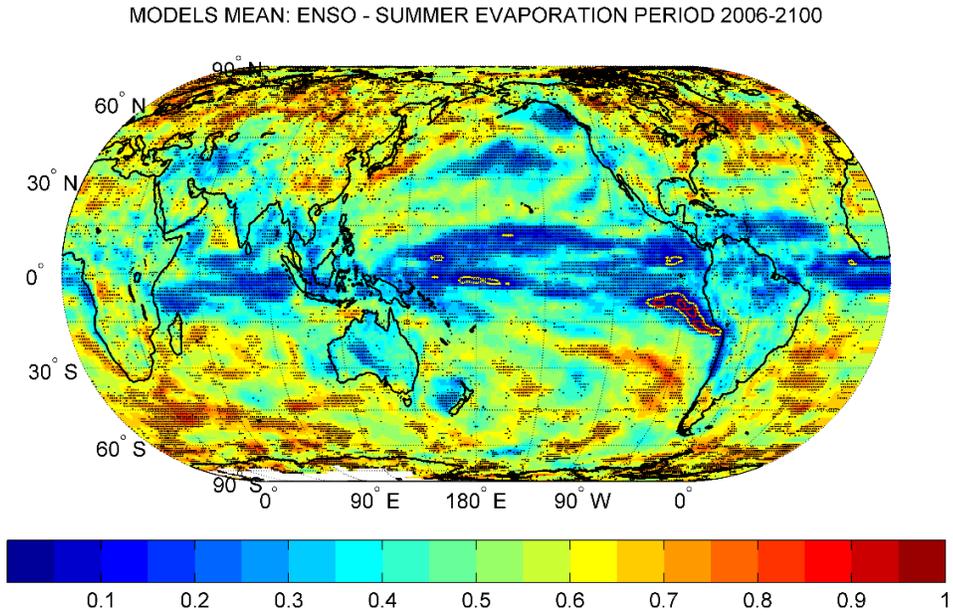
120 a)



b)

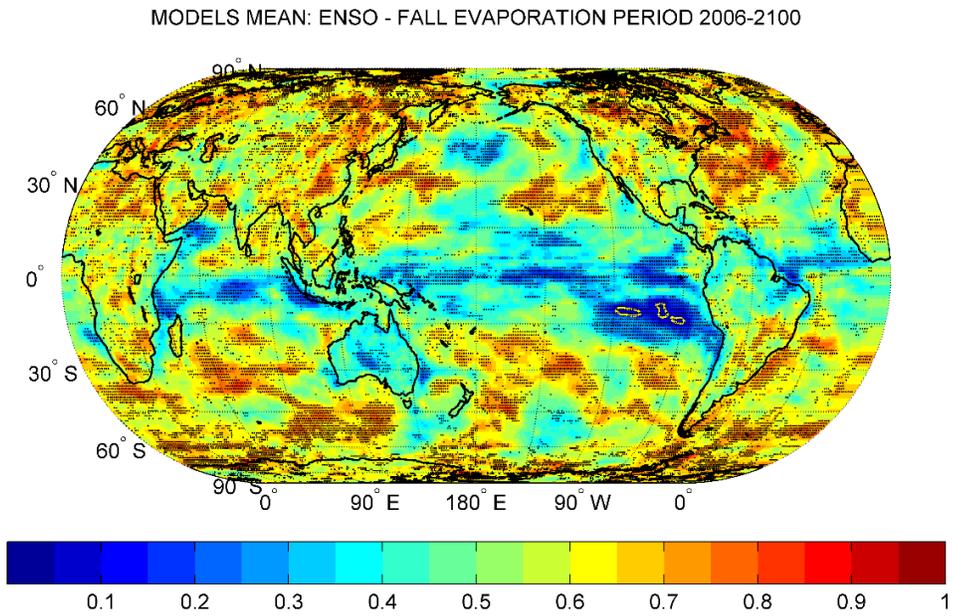


c)

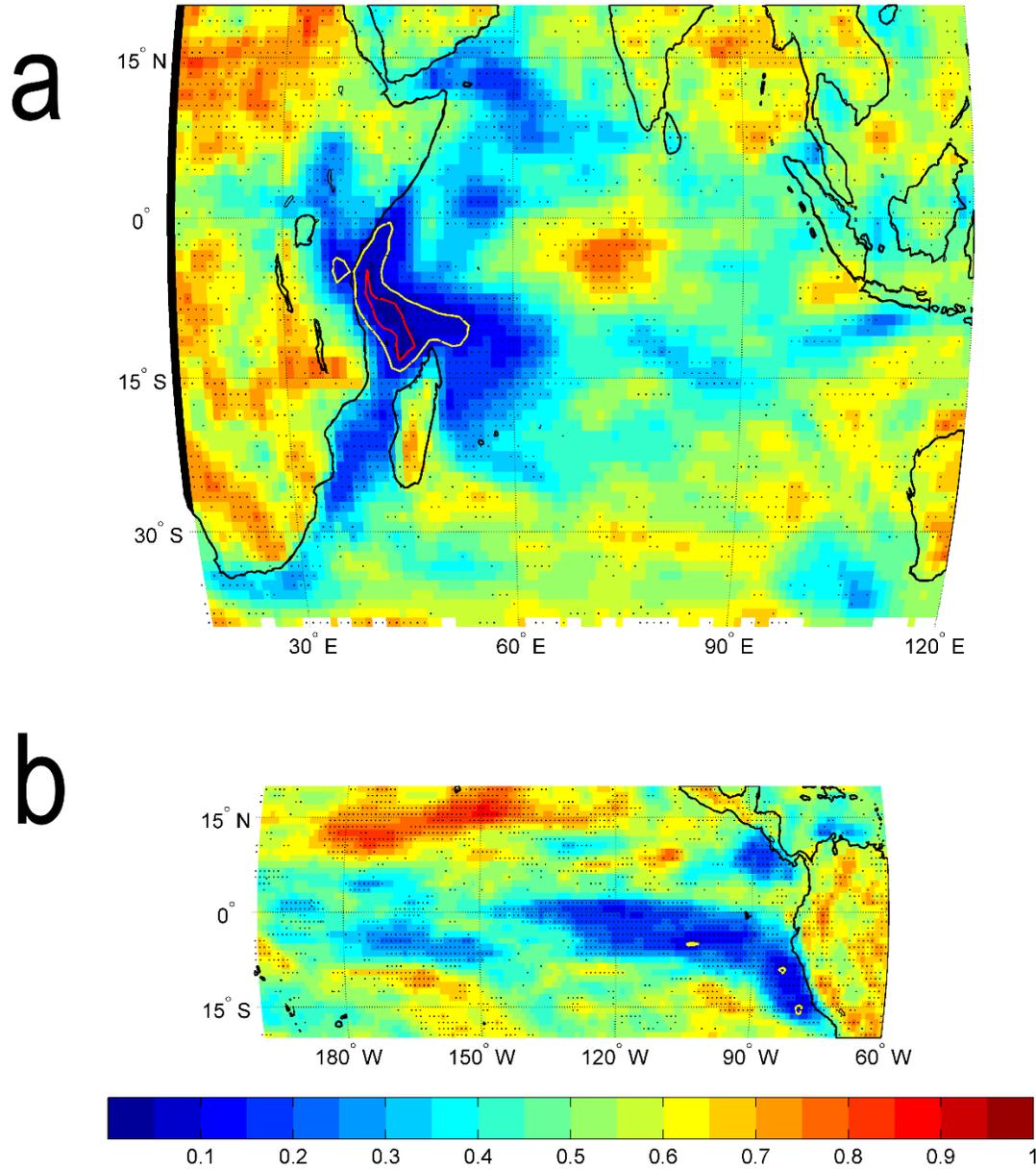


125

d)



**Figure S4.** As in Figure S1 but for Granger causality from ENSO to seasonal evaporation for the period 2006-2100.

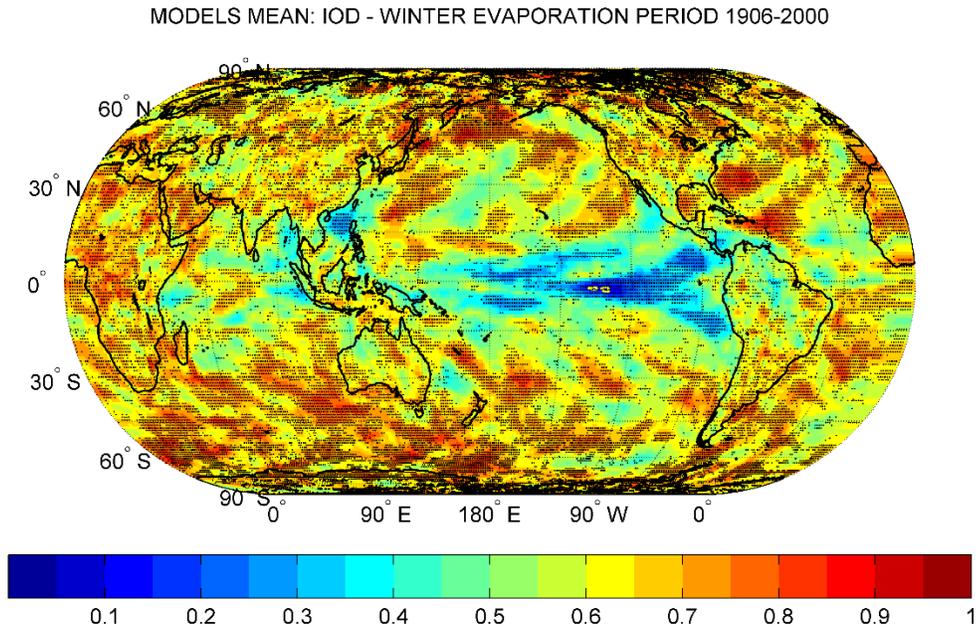


130

135

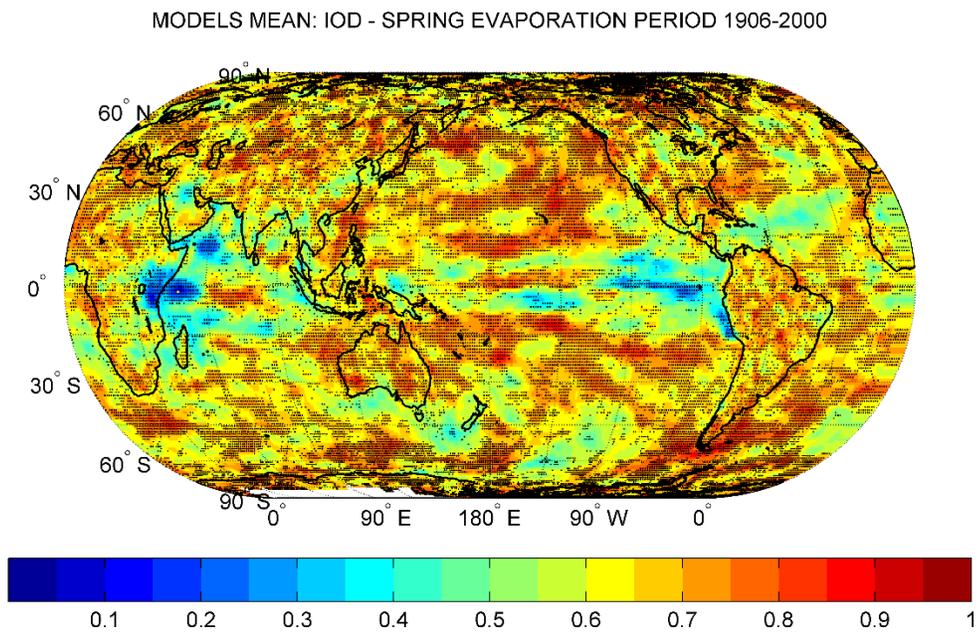
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a)

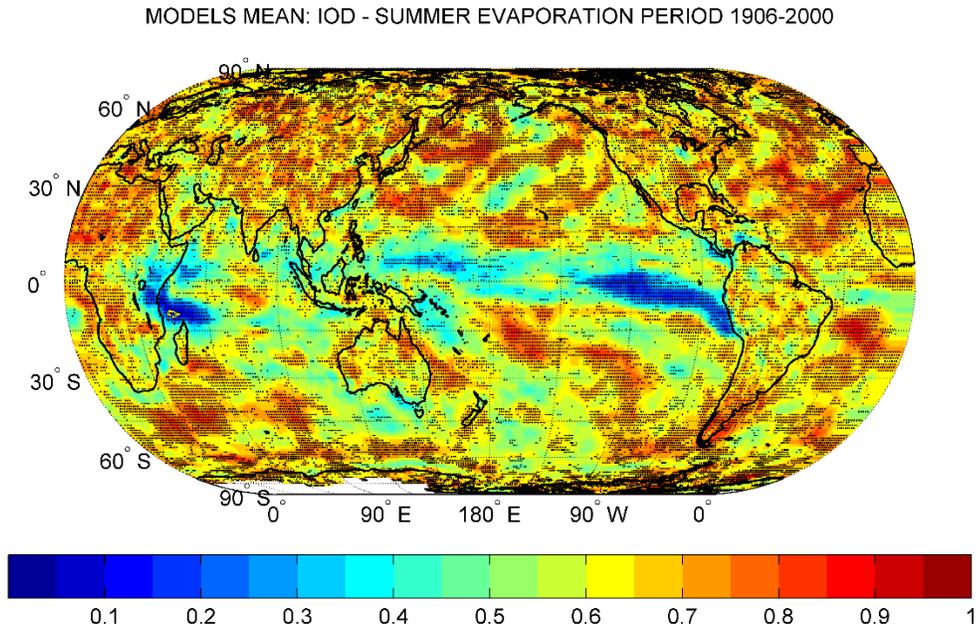


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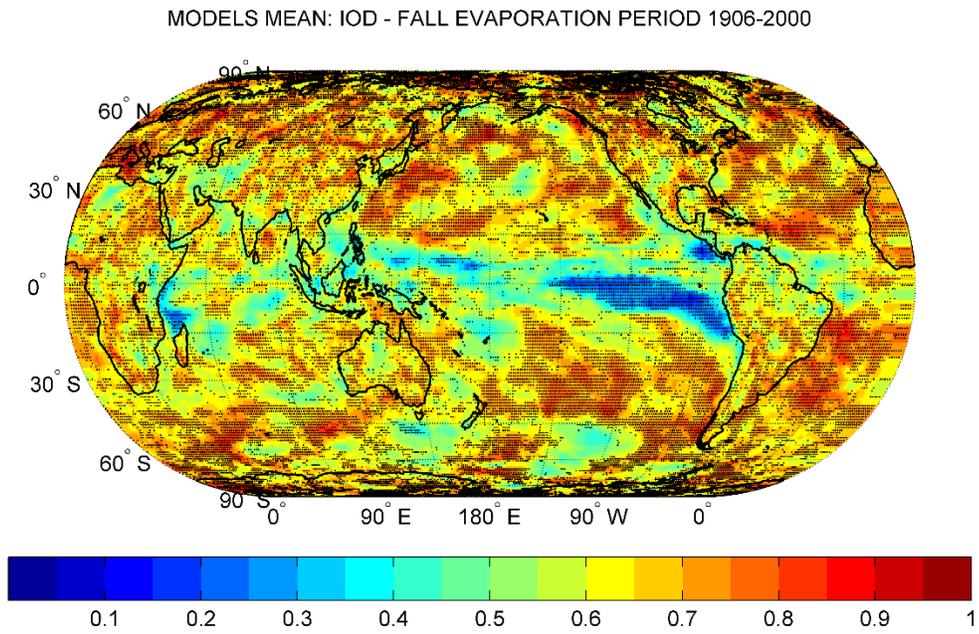
b)



c)

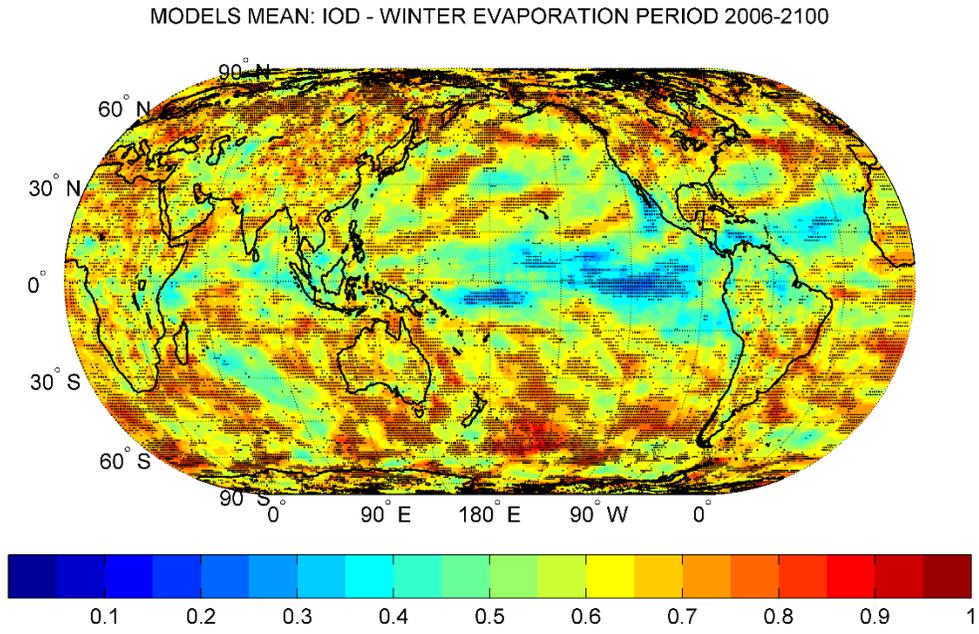


145 d)



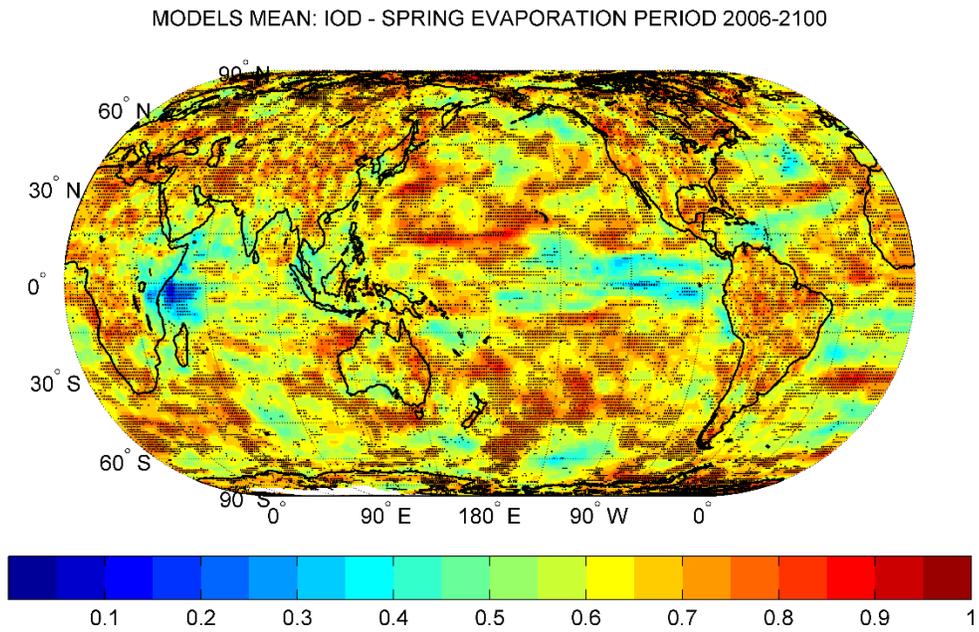
**Figure S6.** As in Figure S1 but for Granger causality from IOD to seasonal evaporation for the period 1906-2000.

a)

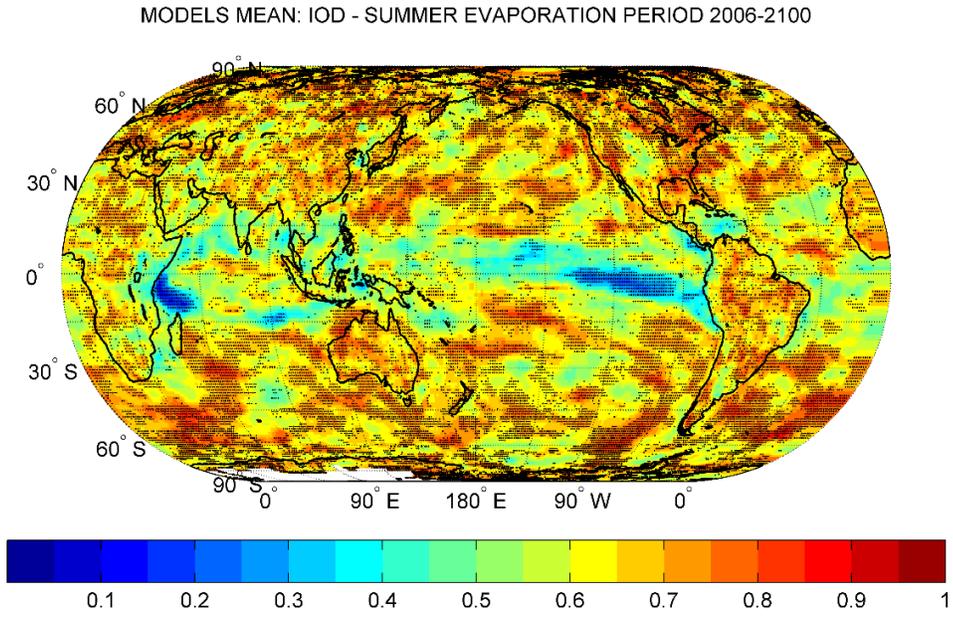


150

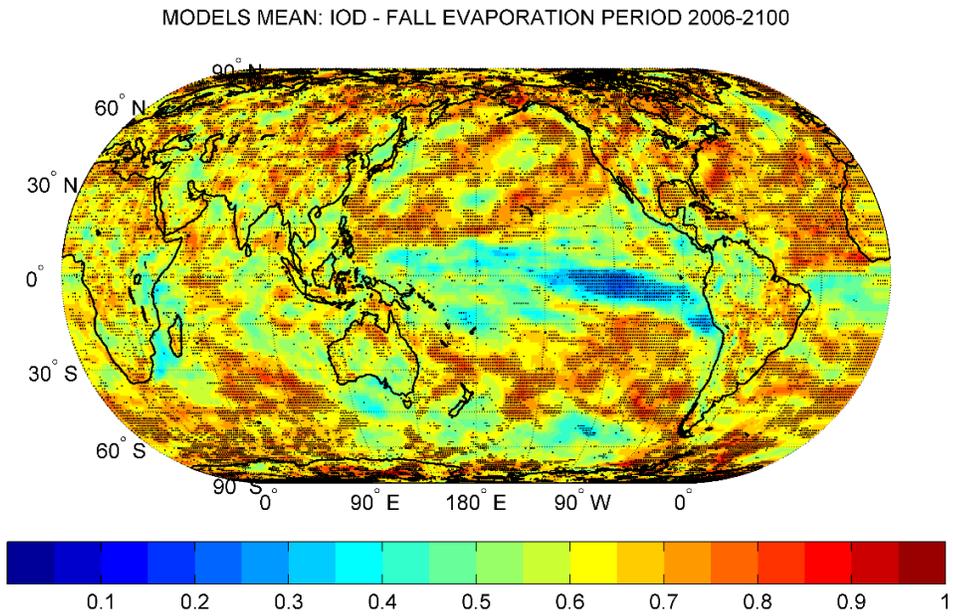
b)



c)

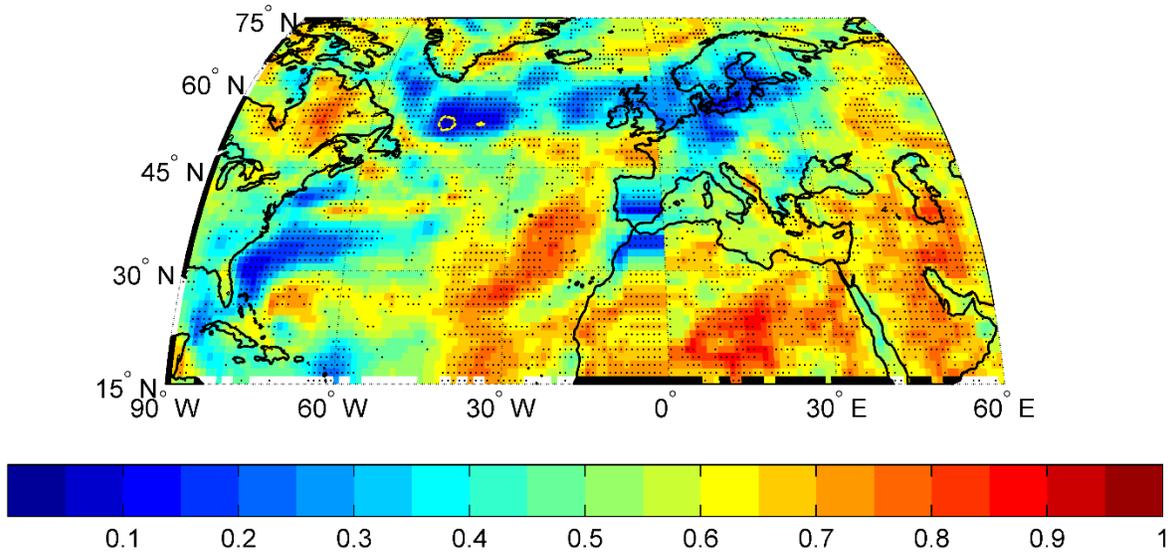


155 d)



**Figure S7.** As in Figure S1 but for Granger causality from IOD to seasonal evaporation for the period 2006-2100.

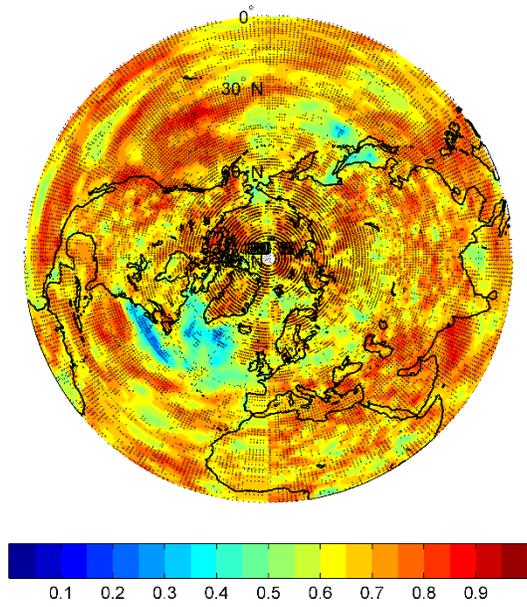
MODELS MEAN: NAO - EVAPORATION PERIOD 1906-2000



160 **Figure S8.** Multi-model mean probability map for the absence of Granger causality between NAO and  
annual mean evaporation for the period 1906-2000 of selected regions. Stippling demonstrates that more  
than 70% of models show agreement on the multi-model mean probability. The agreement of an  
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selected model's probability is less than one standard deviation of multi-model mean probability. The red  
165 (yellow) contour line designates  $p$  value = 0.05 (0.1). Red shades indicate high probability of no Granger  
causality.

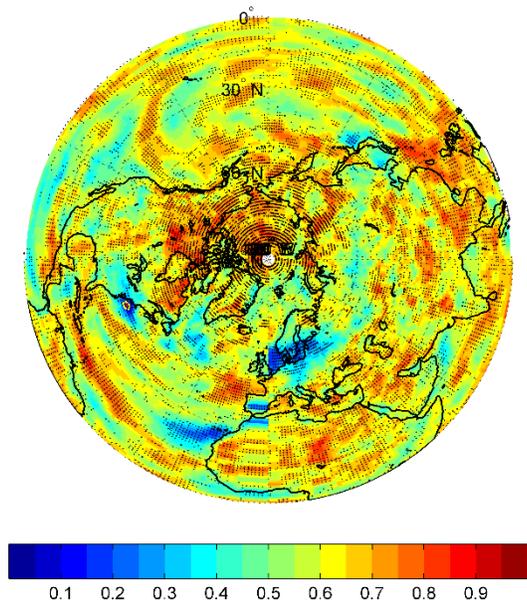
a)

MODELS MEAN: NAO - WINTER EVAPORATION PERIOD 1906-2000



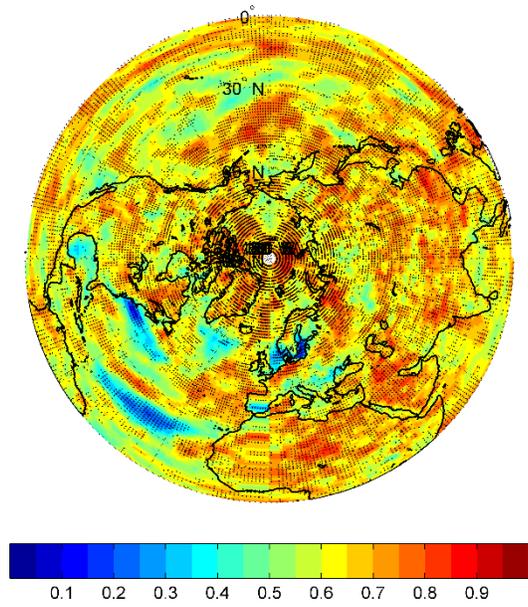
b)

MODELS MEAN: NAO - SPRING EVAPORATION PERIOD 1906-2000



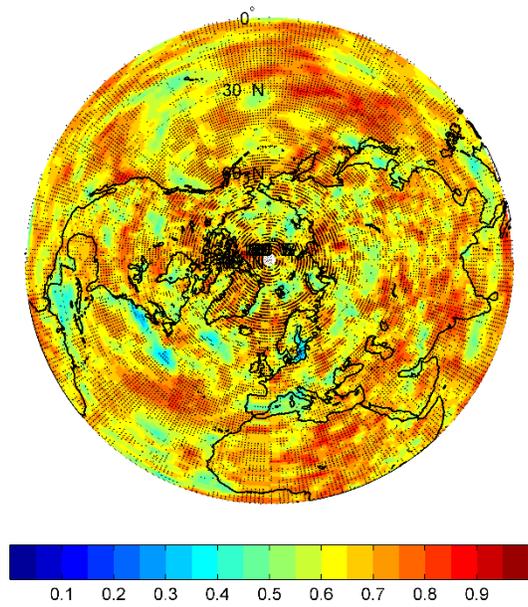
c)

MODELS MEAN: NAO - SUMMER EVAPORATION PERIOD 1906-2000



d)

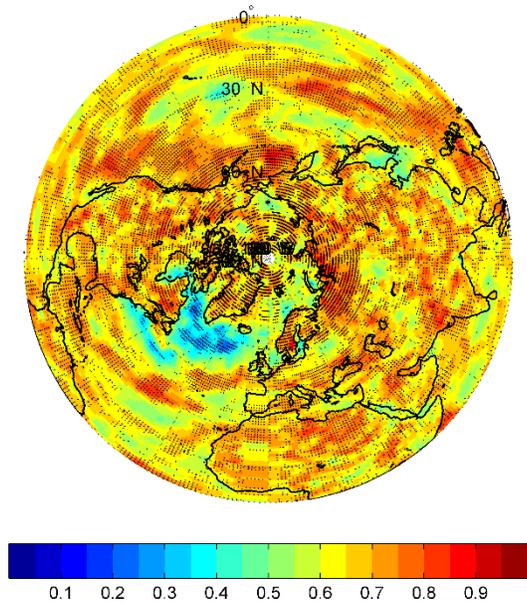
MODELS MEAN: NAO - FALL EVAPORATION PERIOD 1906-2000



175 **Figure S9.** As in Figure S1 but for Granger causality from NAO to seasonal evaporation for the period 1906-2000.

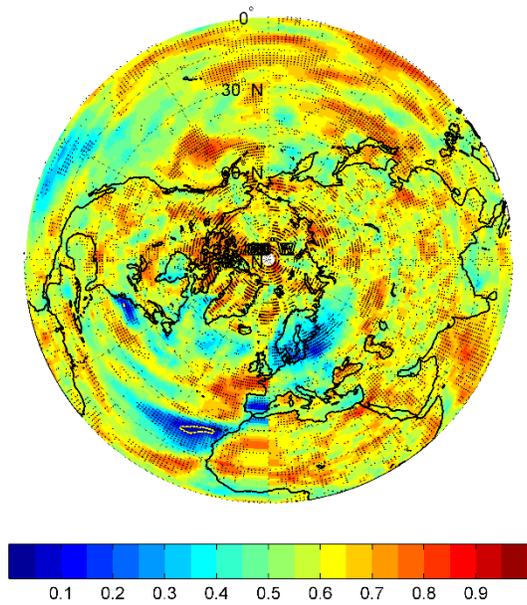
a)

MODELS MEAN: NAO - WINTER EVAPORATION PERIOD 2006-2100



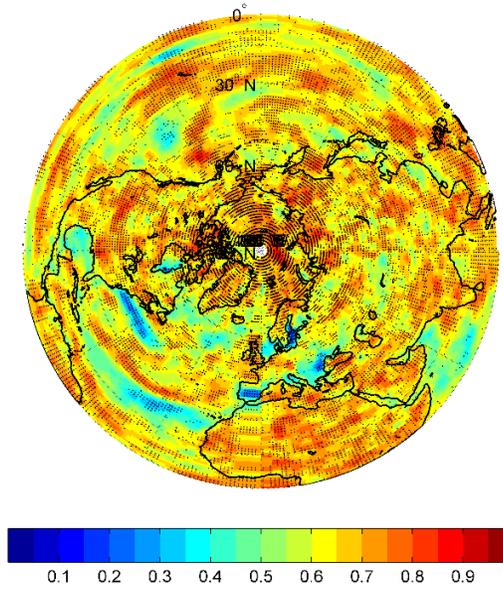
b)

MODELS MEAN: NAO - SPRING EVAPORATION PERIOD 2006-2100



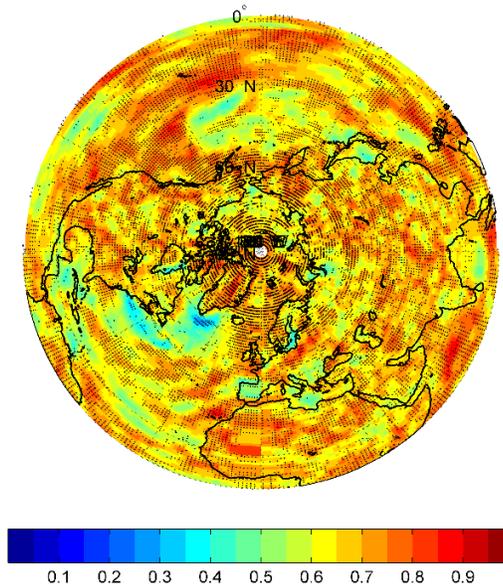
c)

MODELS MEAN: NAO - SUMMER EVAPORATION PERIOD 2006-2100

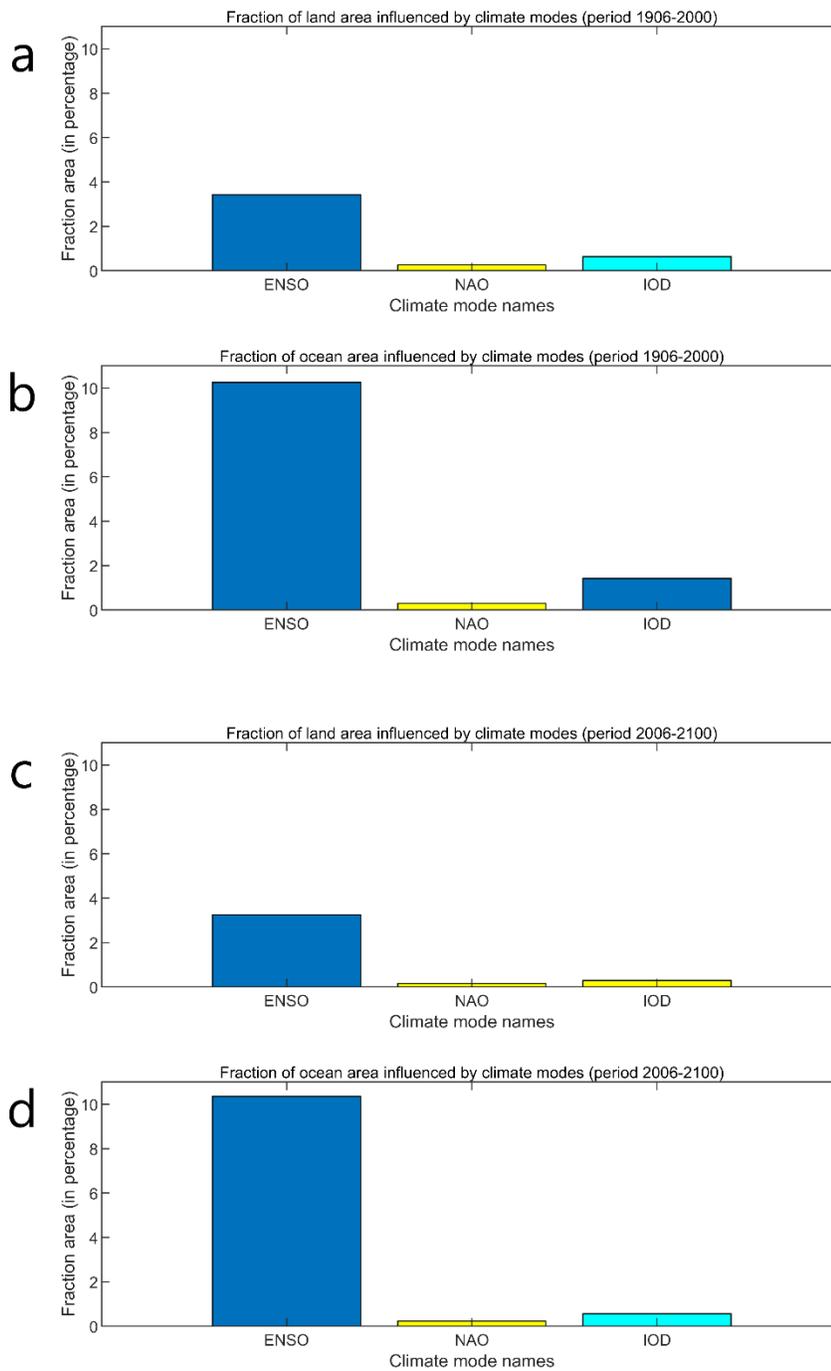


d)

MODELS MEAN: NAO - FALL EVAPORATION PERIOD 2006-2100



185 **Figure S10.** As in Figure S1 but for Granger causality from NAO to seasonal evaporation for the period 2006-2100.



190

**Figure S11.** Fraction of Earth surface for land (a, c) and ocean (b, d) with probability for the absence of Granger causality between climate modes and evaporation less than 0.25 (i.e.,  $p$  value  $< 0.25$  and climate modes are unlikely to have no causal effects on evaporation). The results are shown for the influence of individual climate mode on annual mean evaporation for periods 1906-2000 (a, b) and 2006-2100 (c, d). Fraction area lower than 0.5% is plotted in yellow bar. Fraction area higher than 0.5% and lower than 1% is plotted in cyan bar. ENSO = El Niño–Southern Oscillation. NAO = North Atlantic Oscillation. IOD = Indian Ocean Dipole.