Supplement of

Response of global evaporation to major climate modes in historical and future CMIP5 simulations

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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

LIST OF FIGURE CAPTIONS

Figure S1. Multi-model mean probability map for the absence of Granger causality between ENSO and annual mean evaporation for the period 1906-2000 of selected regions. (a) middle Asia (regions closed to Caspian Sea). (b) tropical Indian Oceans, Indochina Peninsula, Australia. (c) tropical Pacific. (d) Pacific coast of America. 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.

Figure S2. 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.

Figure S3. As in Figure S1 but for Granger causality from ENSO to seasonal evaporation for the period 2006-2100.

Figure S4. Multi-model mean probability map for the absence of Granger causality between IOD and annual mean evaporation for the period 1906-2000 of selected regions. (a) the western tropical Indian ocean close to the eastern coast of Africa. (b) the eastern tropical Pacific. 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.

Figure S5. As in Figure S1 but for Granger causality from IOD to seasonal evaporation for the period 1850-2005.

Figure S6. As in Figure S1 but for Granger causality from IOD to seasonal evaporation for the period 2006-2100.

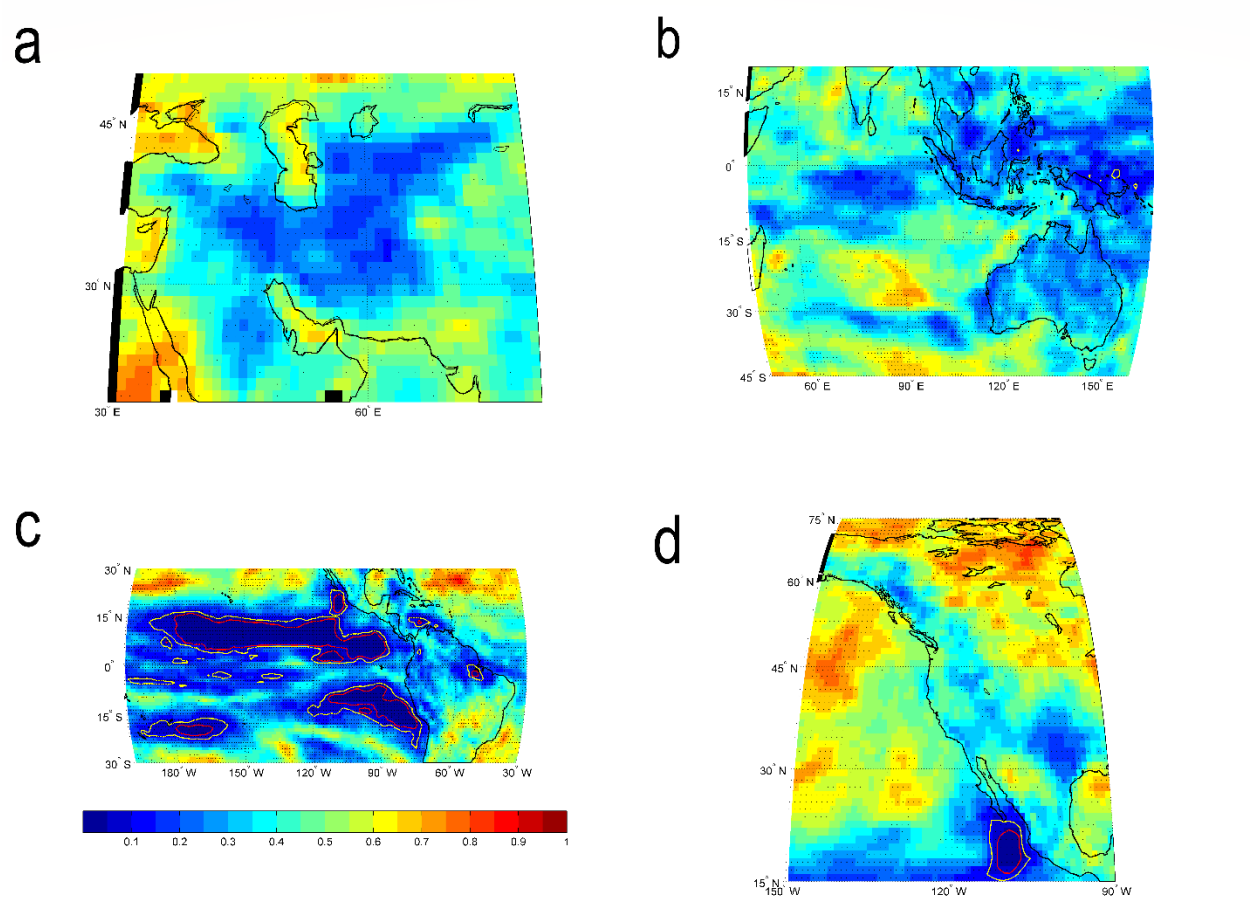
Figure S7. Multi-model mean probability map for the absence of Granger causality between NAO and annual mean evaporation for the period 1906-2000 of selected regions. Stippling

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 = 0.05 (0.1). Red shades indicate high probability of no Granger causality.

Figure S8. As in Figure S1 but for Granger causality from NAO to seasonal evaporation for the period 1850-2005.

Figure S9. As in Figure S1 but for Granger causality from NAO to seasonal evaporation for the period 2006-2100.

Figure S10. 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.



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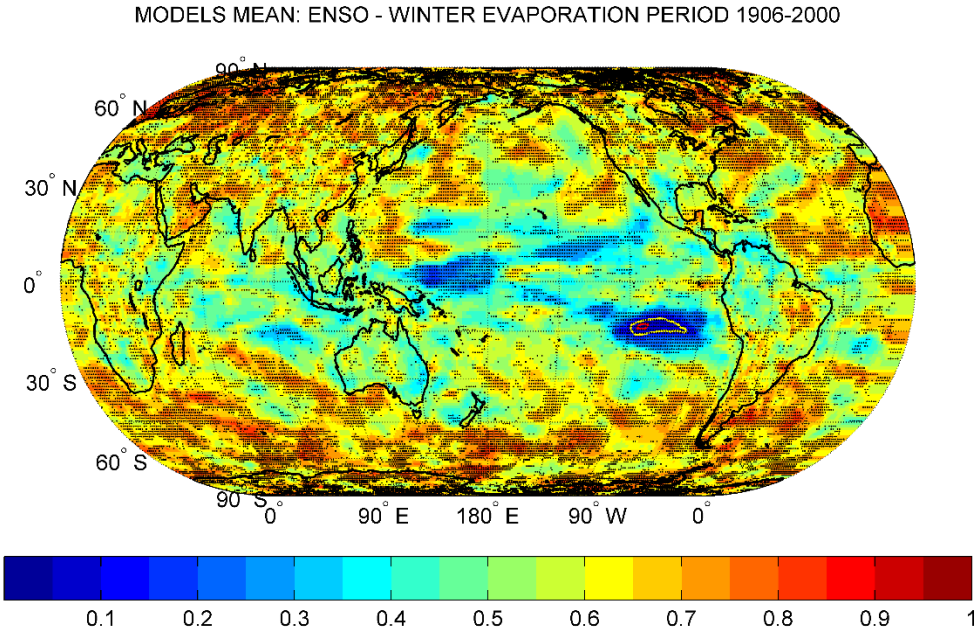
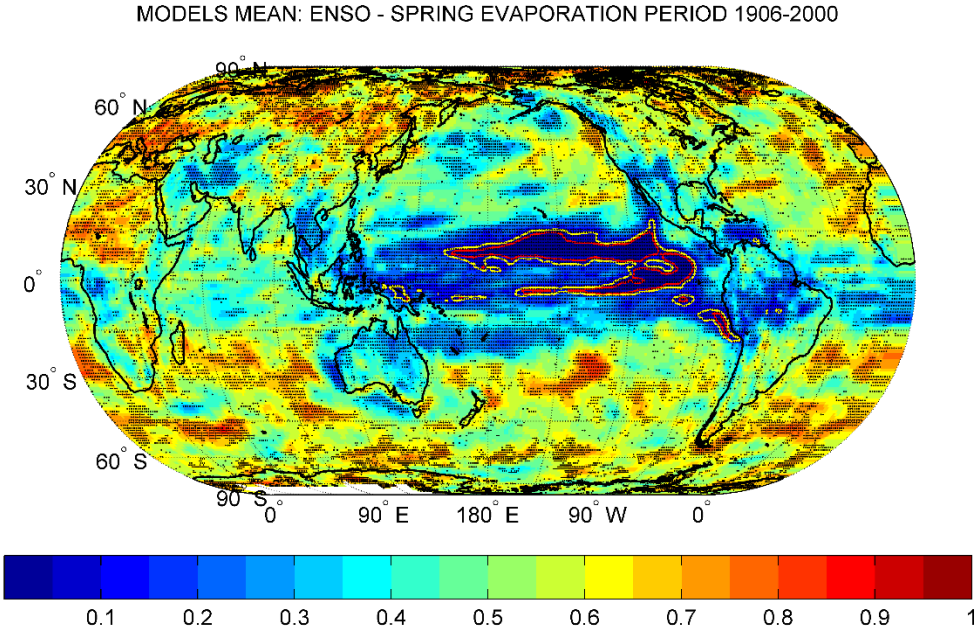
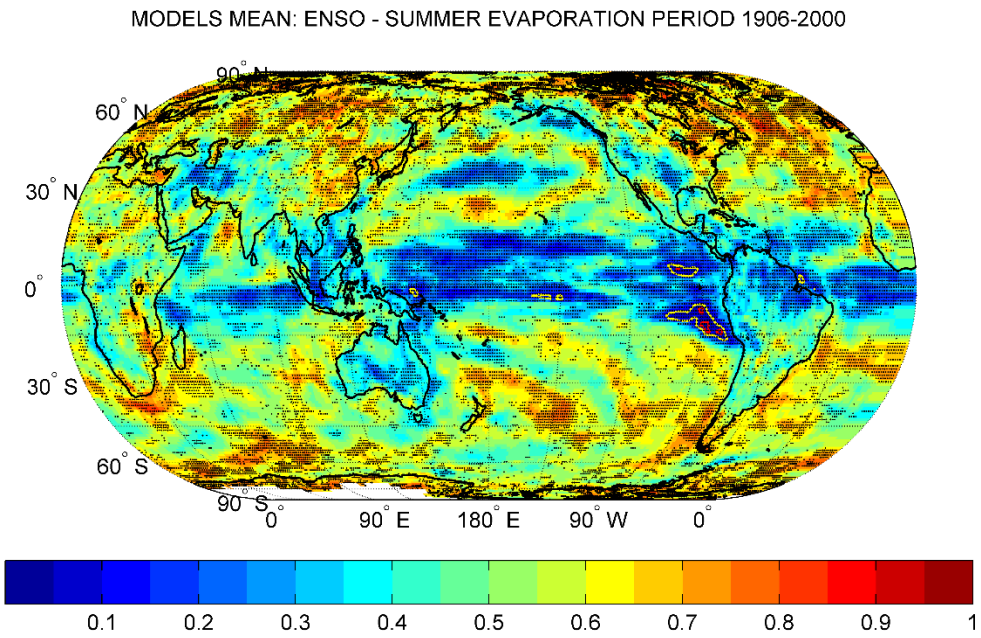
80 a)


MODELS MEAN: ENSO - WINTER EVAPORATION PERIOD 1906-2000
90° N
60° N
30° N
0°
30° S
60° S
90° S
0°
90° E
180° E
90° W
0°
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

b)


MODELS MEAN: ENSO - SPRING EVAPORATION PERIOD 1906-2000
90° N
60° N
30° N
0°
30° S
60° S
90° S
0°
90° E
180° E
90° W
0°
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

c)


MODELS MEAN: ENSO - SUMMER EVAPORATION PERIOD 1906-2000
90° N
60° N
30° N
0°
30° S
60° S
90° S
0°
90° E
180° E
90° W
0°
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

85

d)

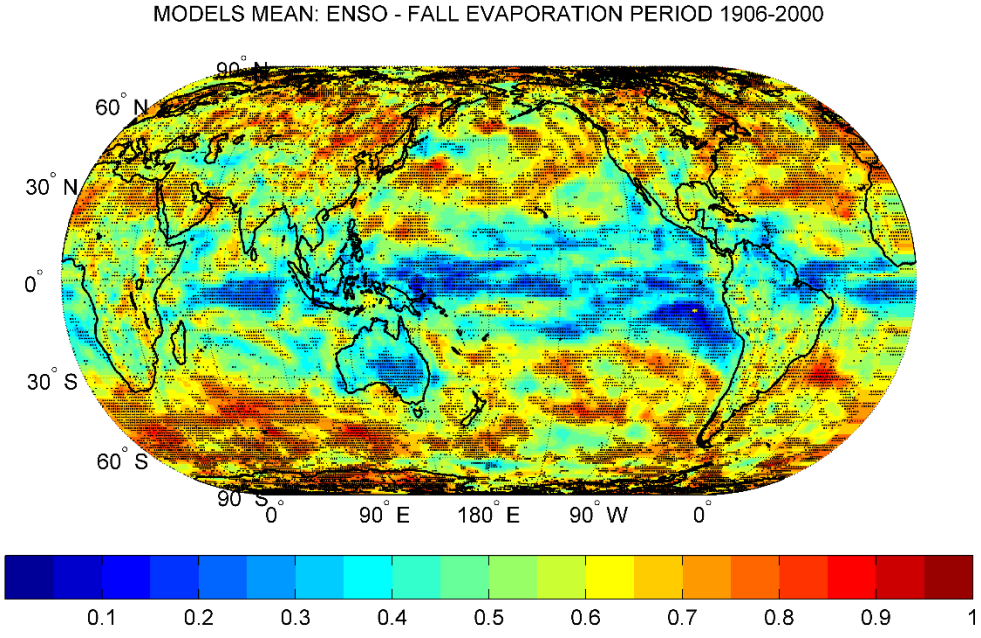
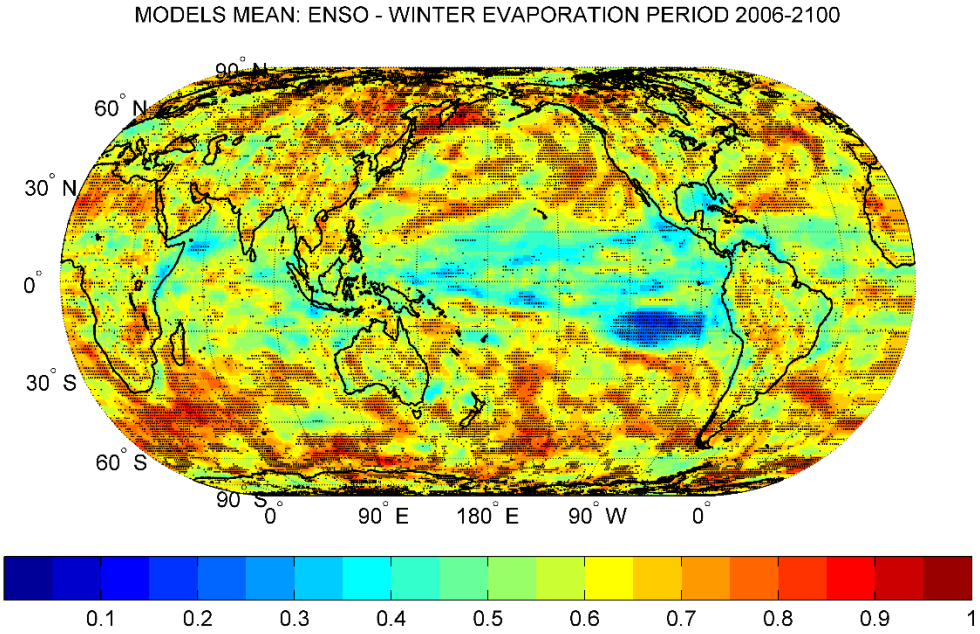
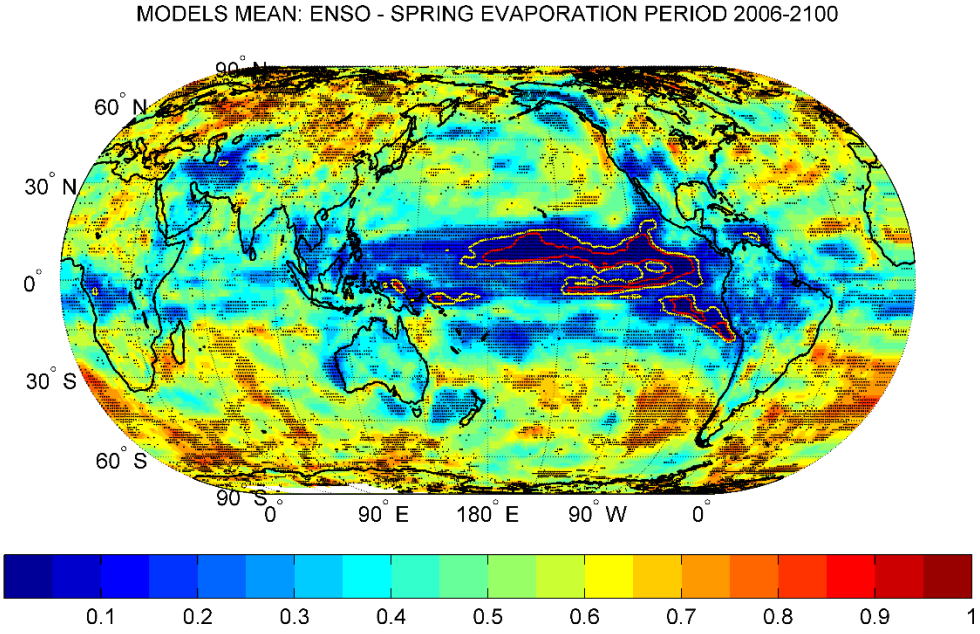

MODELS MEAN: ENSO - FALL EVAPORATION PERIOD 1906-2000
90° N
60° N
30° N
0°
30° S
60° S
90° S
0°
90° E
180° E
90° W
0°
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

Figure S2. 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.

a)

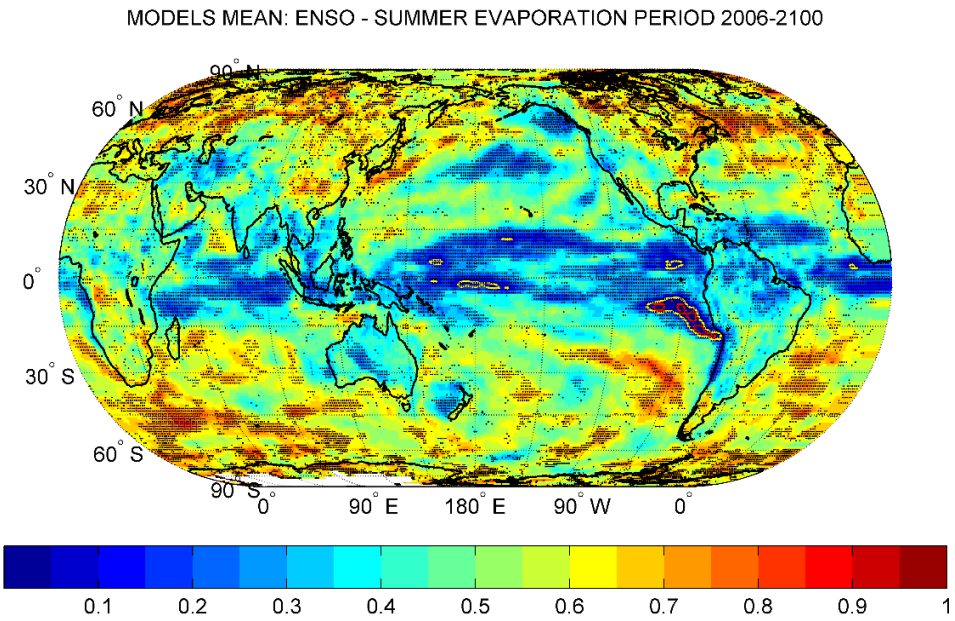

MODELS MEAN: ENSO - WINTER EVAPORATION PERIOD 2006-2100
90° N
60° N
30° N
0°
30° S
60° S
90° S
0°
90° E
180° E
90° W
0°
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

b)

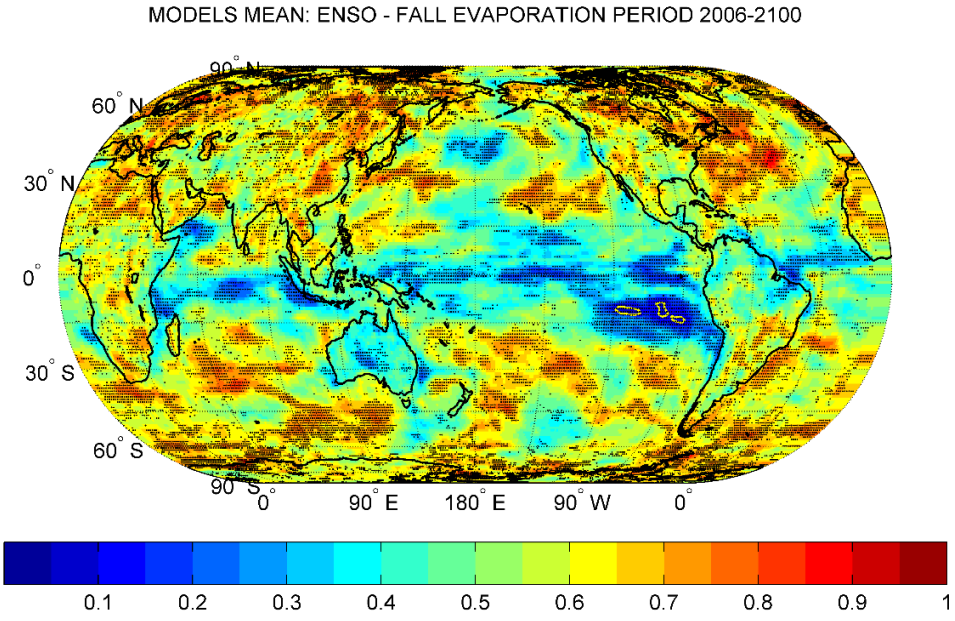

MODELS MEAN: ENSO - SPRING EVAPORATION PERIOD 2006-2100
90° N
60° N
30° N
0°
30° S
60° S
90° S
0°
90° E
180° E
90° W
0°
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

100

c)



d)



105 **Figure S3.** As in Figure S1 but for Granger causality from ENSO to seasonal evaporation for the period 2006-2100.

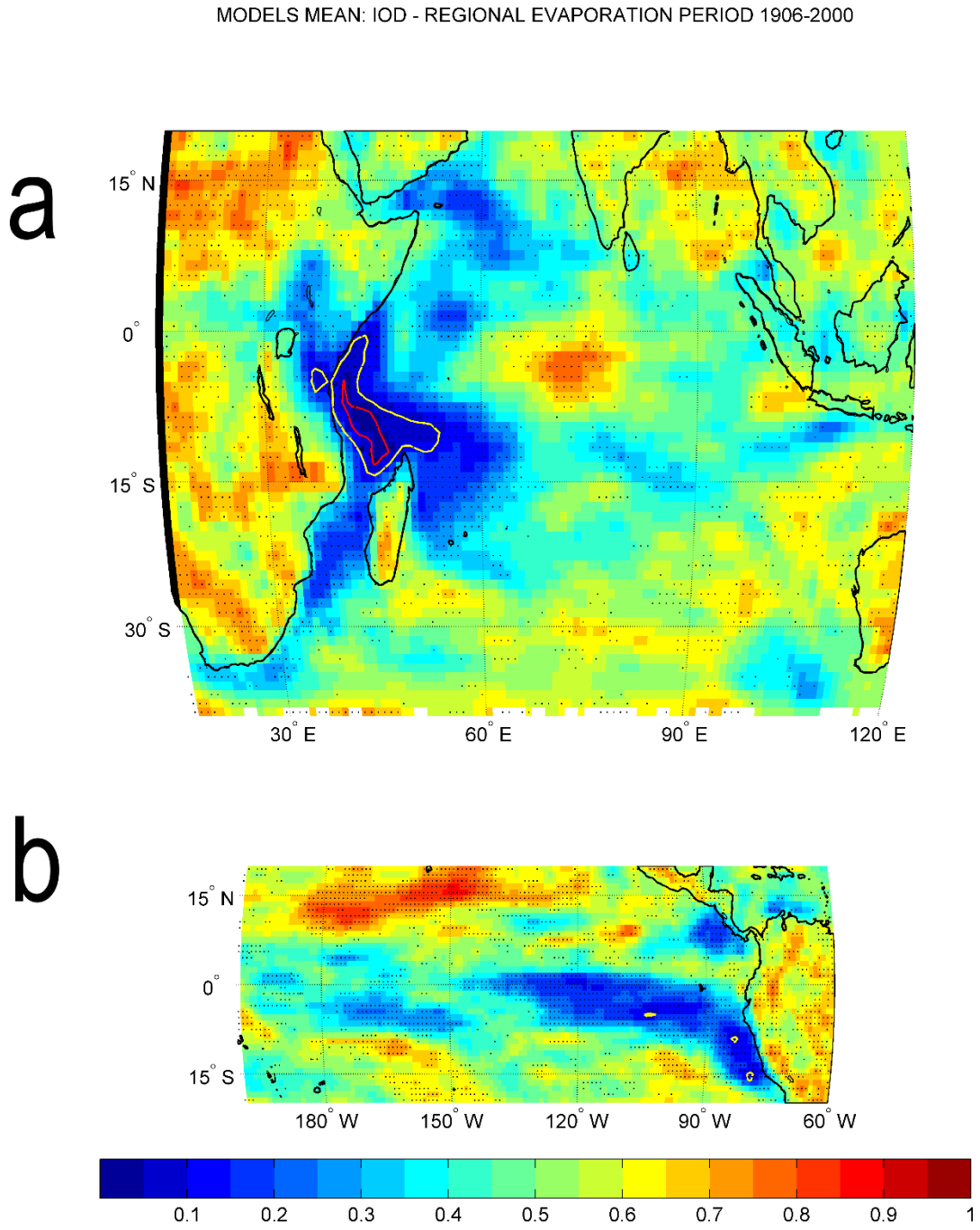
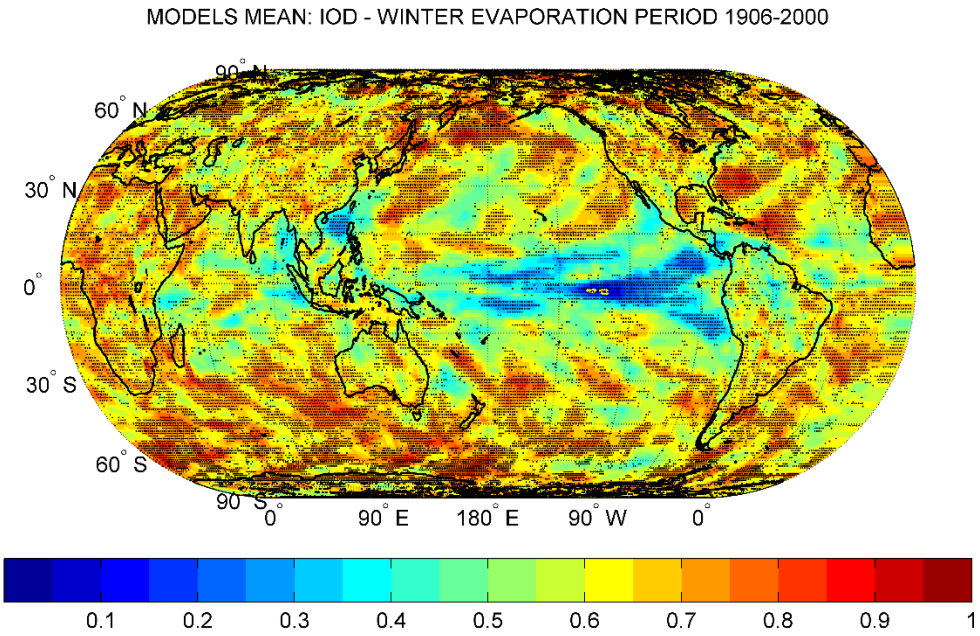
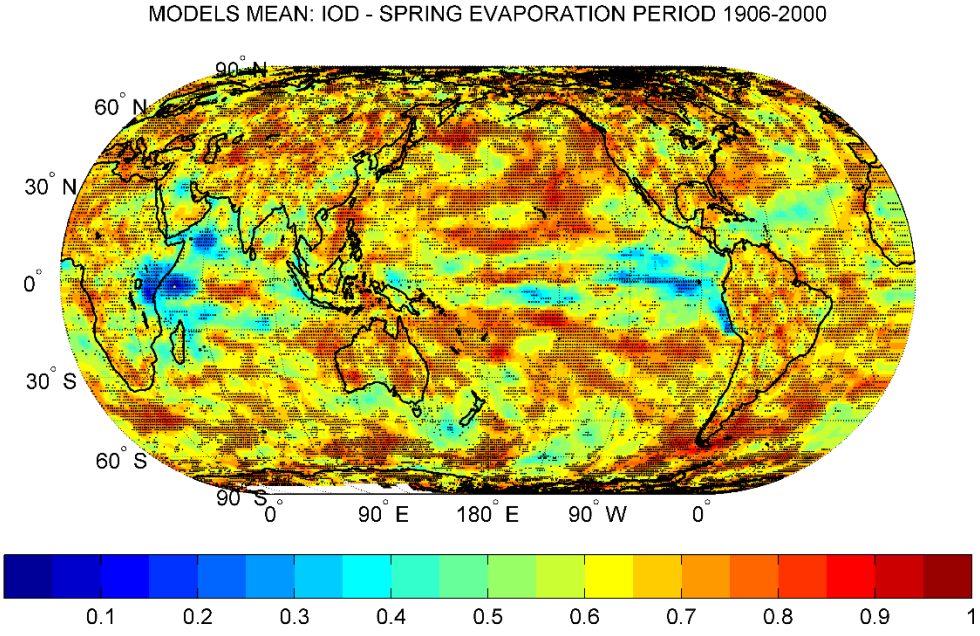


Figure S4. Multi-model mean probability map for the absence of Granger causality between IOD and annual mean evaporation for the period 1906-2000 of selected regions. (a) the western tropical Indian ocean close to the eastern coast of Africa. (b) the eastern tropical Pacific. Stippling demonstrates that 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.

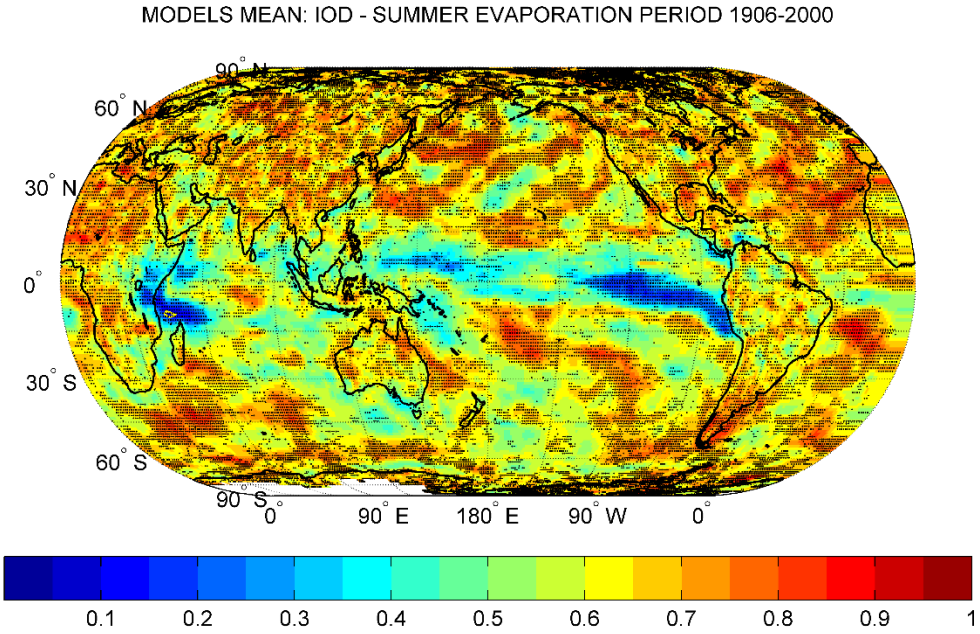
a)


MODELS MEAN: IOD - WINTER EVAPORATION PERIOD 1906-2000
90° N
60° N
30° N
0°
30° S
60° S
90° S
0°
90° E
180° E
90° W
0°
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

b)


MODELS MEAN: IOD - SPRING EVAPORATION PERIOD 1906-2000
90° N
60° N
30° N
0°
30° S
60° S
90° S
0°
90° E
180° E
90° W
0°
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

120 c)


MODELS MEAN: IOD - SUMMER EVAPORATION PERIOD 1906-2000
90° N
60° N
30° N
0°
30° S
60° S
90° S
0°
90° E
180° E
90° W
0°
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

d)

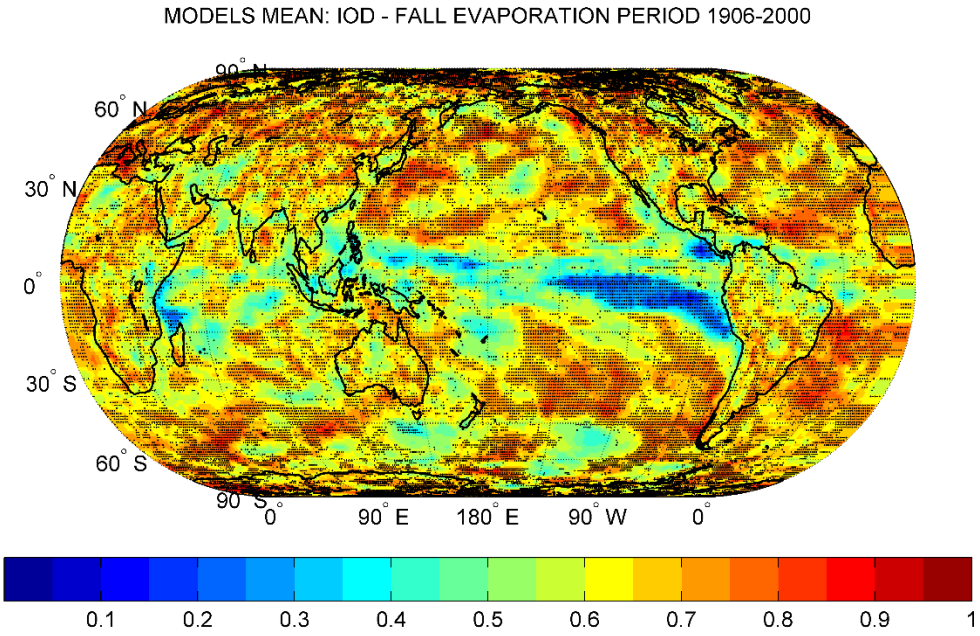
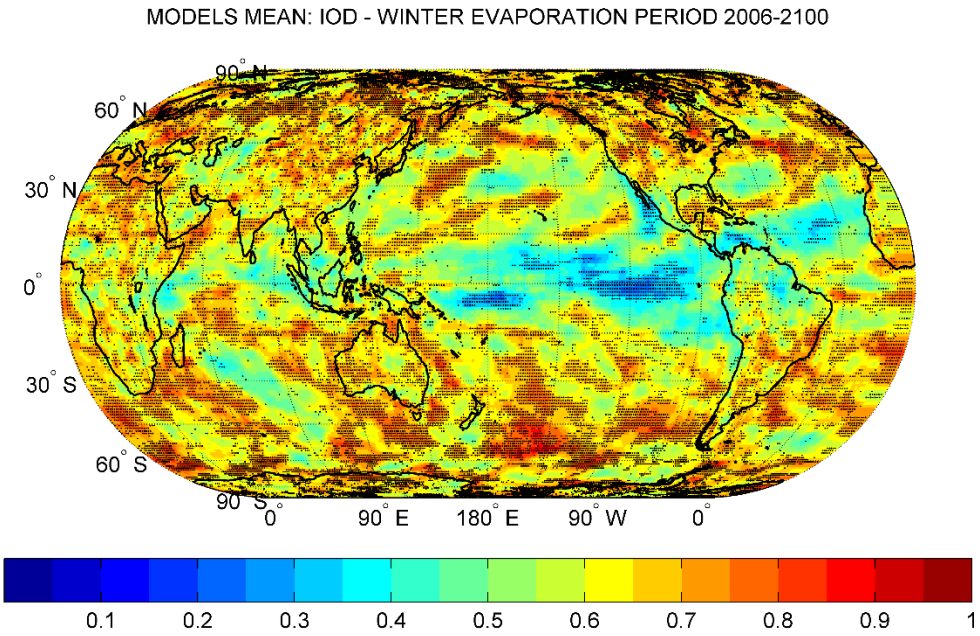
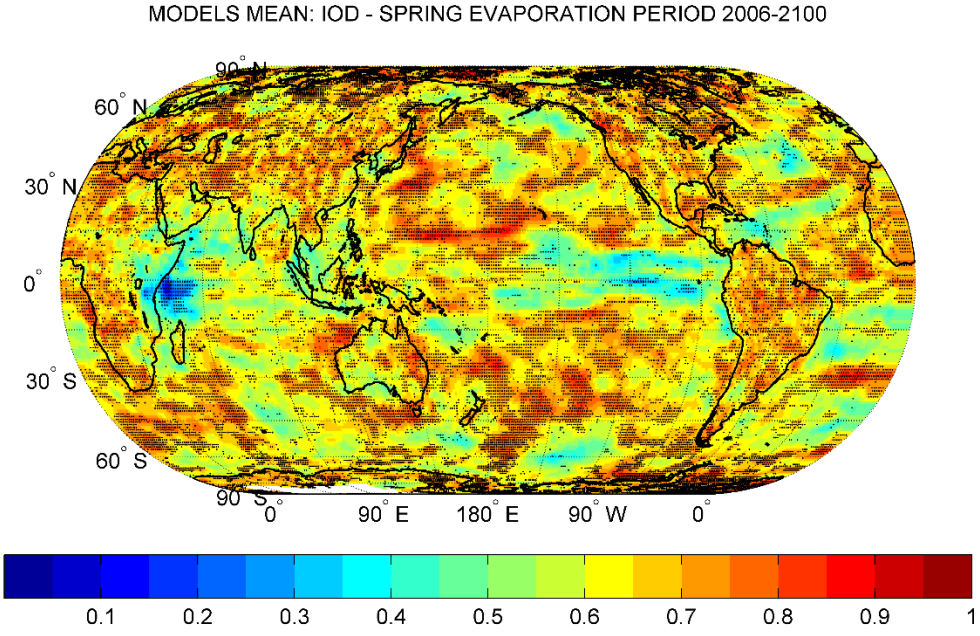

MODELS MEAN: IOD - FALL EVAPORATION PERIOD 1906-2000
90° N
60° N
30° N
0°
30° S
60° S
90° S
0°
90° E
180° E
90° W
0°
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

Figure S5. As in Figure S1 but for Granger causality from IOD to seasonal evaporation for the period 1850-2005.

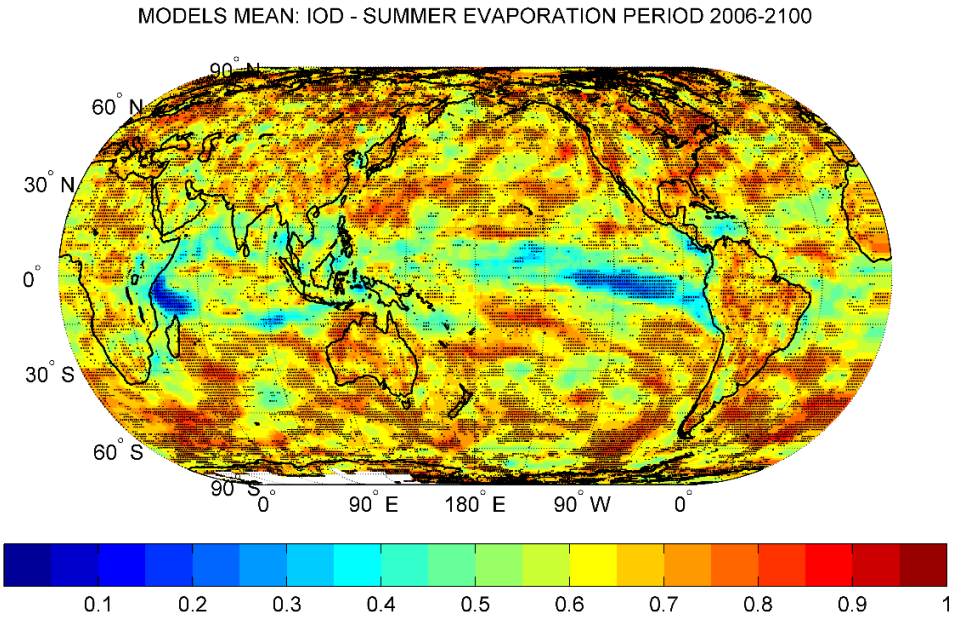
a)


MODELS MEAN: IOD - WINTER EVAPORATION PERIOD 2006-2100
90° N
60° N
30° N
0°
30° S
60° S
90° S
0°
90° E
180° E
90° W
0°
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

b)


MODELS MEAN: IOD - SPRING EVAPORATION PERIOD 2006-2100
90° N
60° N
30° N
0°
30° S
60° S
90° S
0°
90° E
180° E
90° W
0°
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

c)



d)

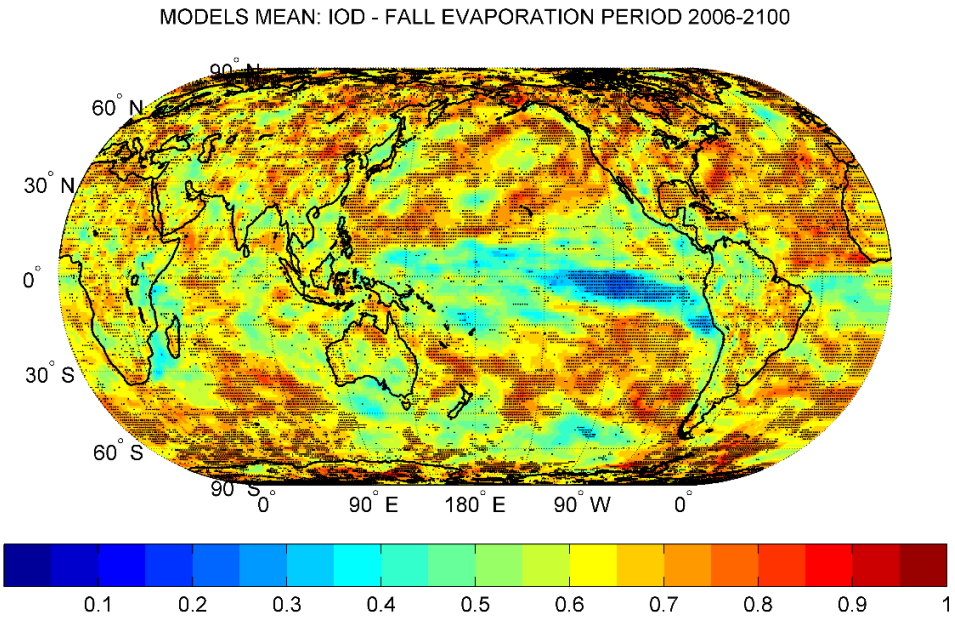


Figure S6. As in Figure S1 but for Granger causality from IOD to seasonal evaporation for the period 2006-2100.

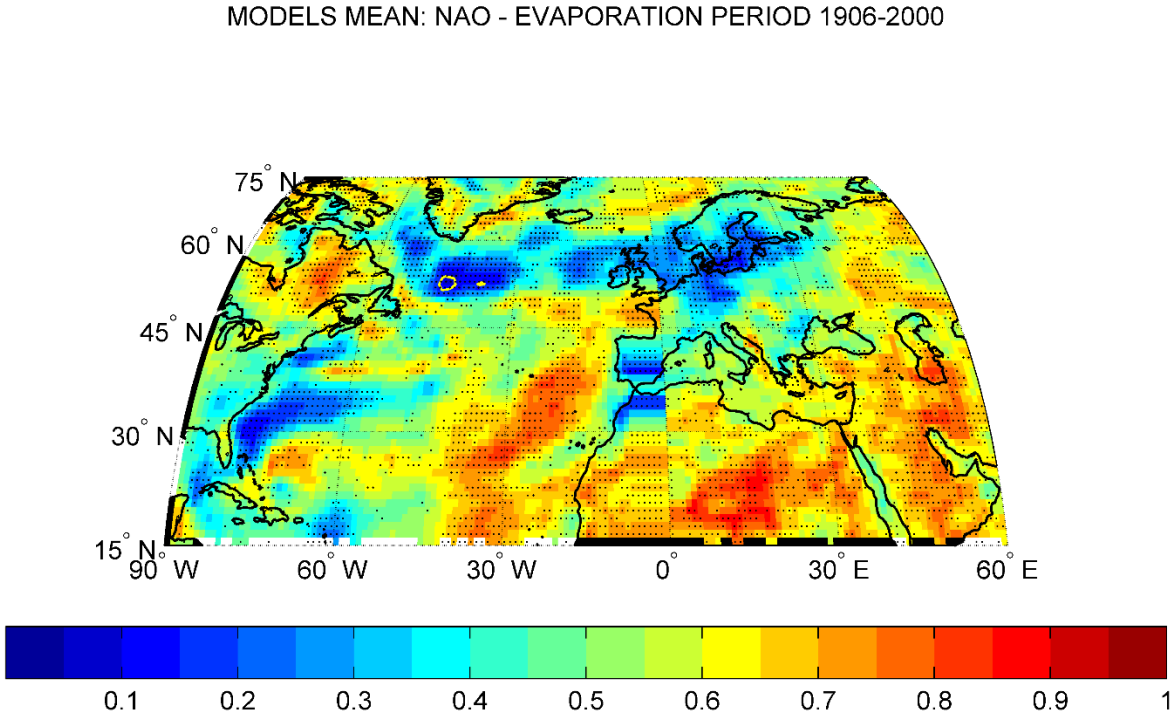
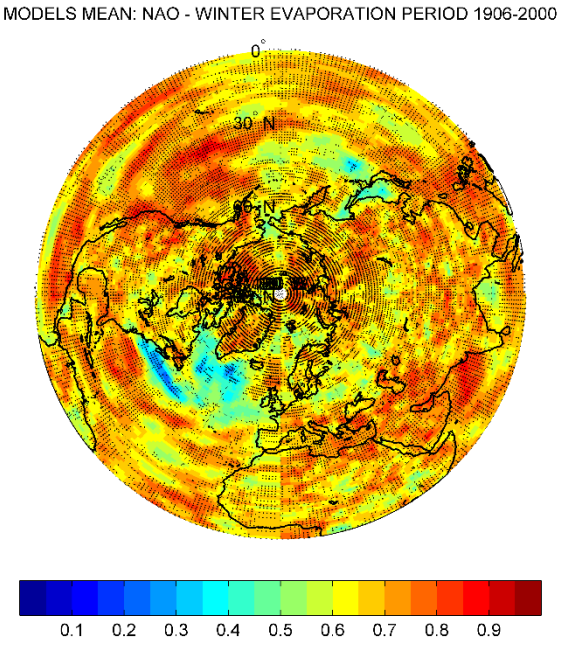


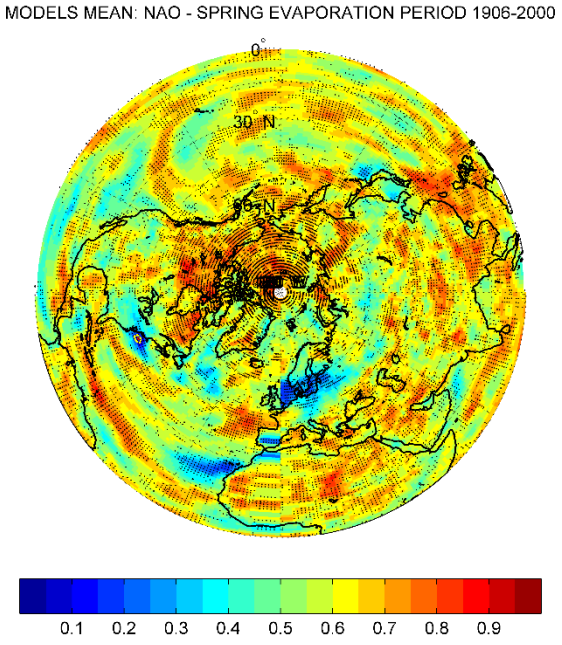
Figure S7. Multi-model mean probability map for the absence of Granger causality between NAO and annual mean evaporation for the period 1906-2000 of selected regions. Stippling demonstrates that more than 70% of models show agreement on the multi-model mean probability. The agreement of an individual 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 = 0.05 (0.1). Red shades indicate high probability of no Granger causality.

a)

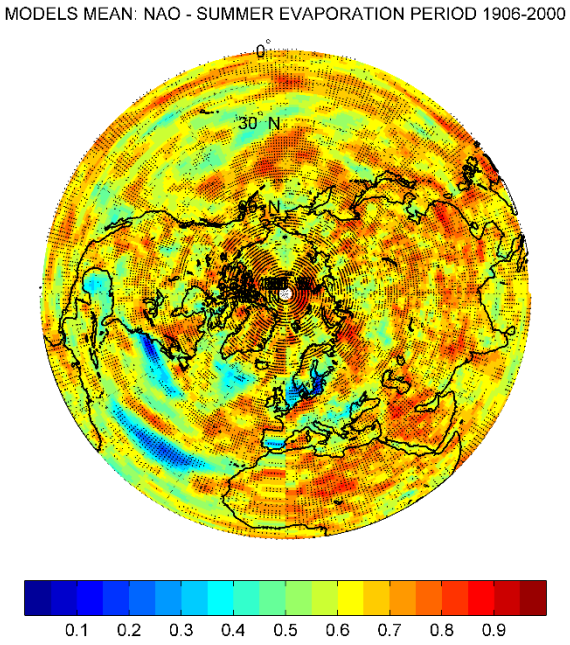

MODELS MEAN: NAO - WINTER EVAPORATION PERIOD 1906-2000
0°
30° N
60° N
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9

145

b)


MODELS MEAN: NAO - SPRING EVAPORATION PERIOD 1906-2000
0°
30° N
60° N
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9

c)


MODELS MEAN: NAO - SUMMER EVAPORATION PERIOD 1906-2000
0°
30° N
60° N
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9

d)

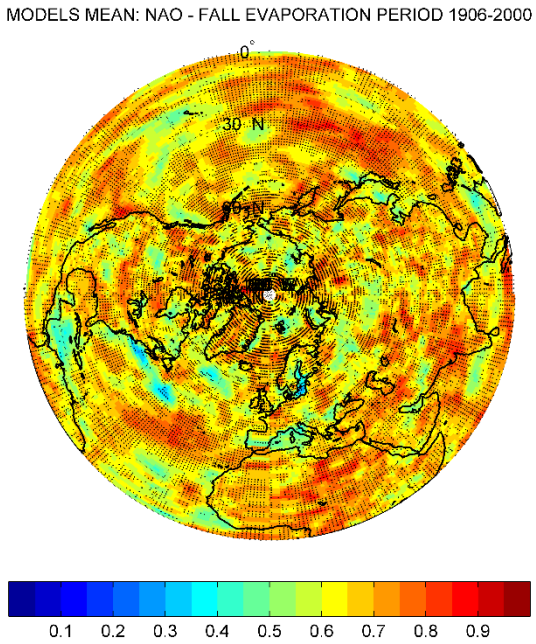
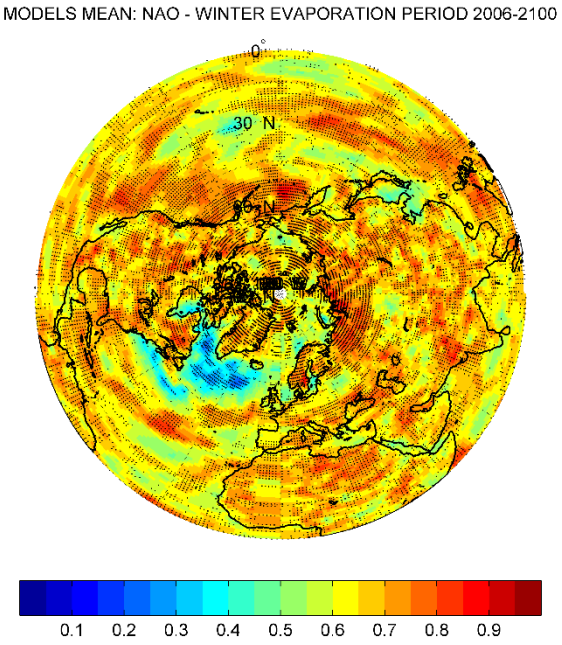

MODELS MEAN: NAO - FALL EVAPORATION PERIOD 1906-2000
0°
30° N
60° N
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9

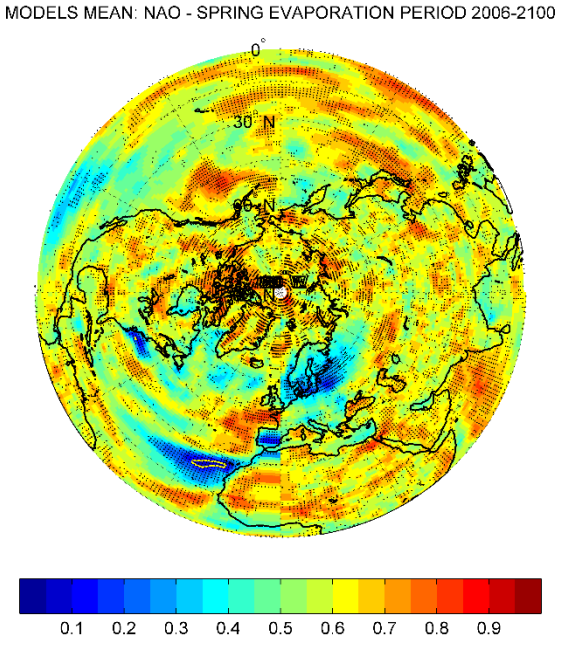
Figure S8. As in Figure S1 but for Granger causality from NAO to seasonal evaporation for the period 1850-2005.

a)

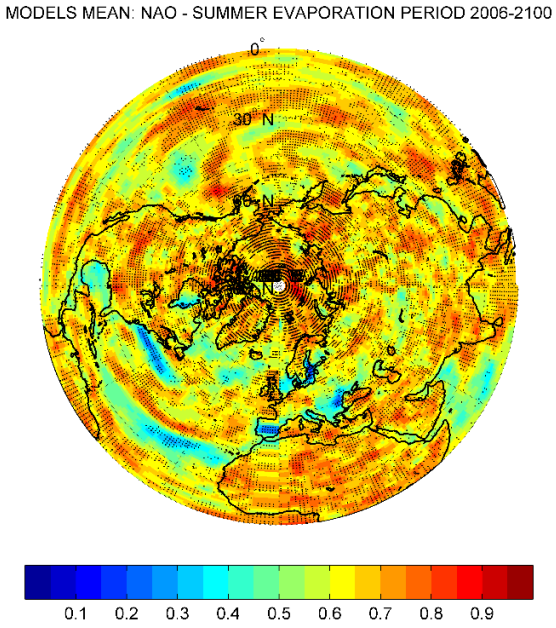

MODELS MEAN: NAO - WINTER EVAPORATION PERIOD 2006-2100
0°
30° N
60° N
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9

155

b)


MODELS MEAN: NAO - SPRING EVAPORATION PERIOD 2006-2100
0°
30° N
60° N
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9

c)



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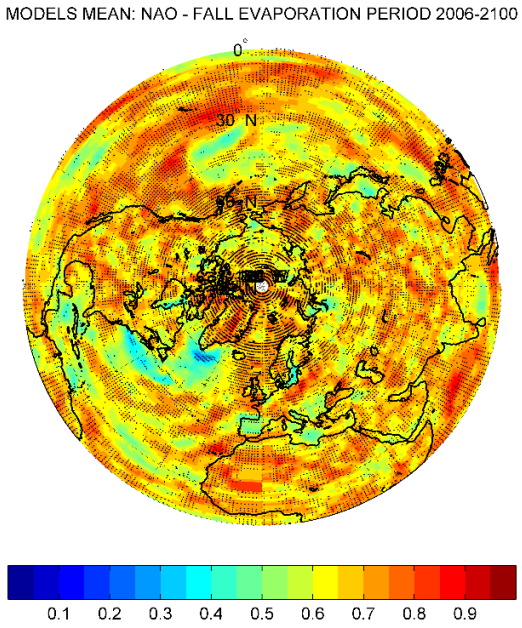
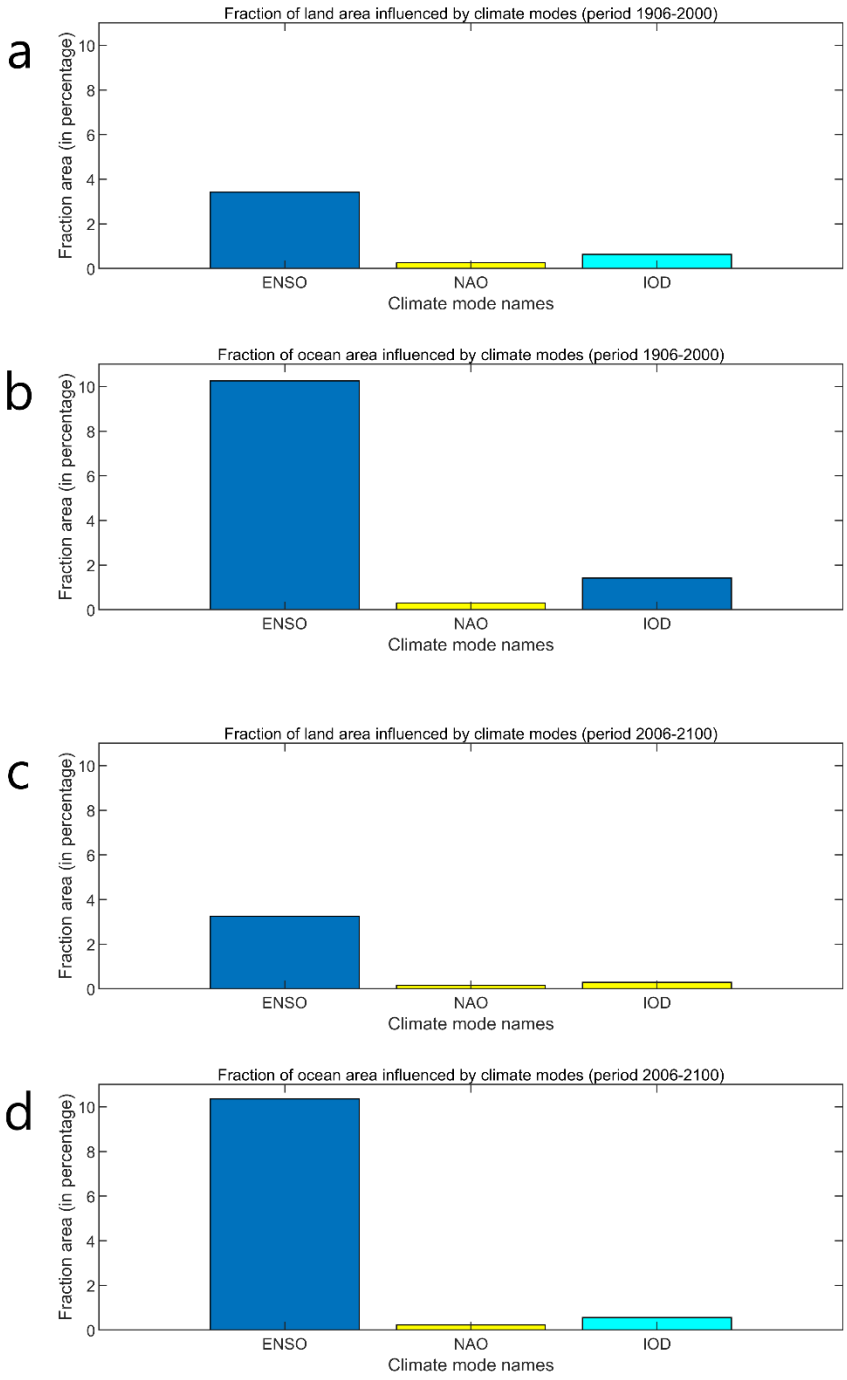


Figure S9. As in Figure S1 but for Granger causality from NAO to seasonal evaporation for the period 2006-2100.



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