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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| 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

20 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.

25 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 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 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.

30 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.

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

40 Figure S5. 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 S6. As in Figure S1 but for Granger causality from IOD to seasonal evaporation for the period 1906-2000.

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

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

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

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

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.
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