Supporting Information for Little change in apparent hydrological sensitivity at large CO_2 forcing

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Introduction

August 23, 2023, 3:35pm

Table S1. Values of Fig. 1 and Fig. S2

Model	experiment	η_a	η	A
CESM-LE fully coupled	2×CO_2	0.050±0.0015	0.086±0.0022	-0.101
	3×CO_2	0.050±0.0012	0.085±0.0015	-0.160
	4×CO_2	0.045±0.0011	0.089 ±0.0016	-0.221
	5×CO_2	0.046±0.0008	0.082 ±0.0013	-0.232
	6×CO_2	0.046±0.0008	0.081±0.0010	-0.261
	7×CO_2	0.046±0.0006	0.080±0.0009	-0.280
	8×CO_2	0.047±0.0004	0.081±0.0007	-0.308
CESM-LE slab ocean	2×CO_2	0.059±0.00058	0.076±0.002	-
	3×CO_2	0.057±0.00052	0.079±0.001	-
	4×CO_2	0.058±0.00042	0.078±0.0009	-
	5×CO_2	0.057±0.00037	0.79±0.0008	-
	6×CO_2	0.057±0.00035	0.078±0.0007	-
GISS E2.1-G fully coupled	2×CO_2	0.039±0.0025	0.077±0.0026	-0.079
	3×CO_2	0.031±0.0020	0.0079±0.0026	-0.135
	4×CO_2	0.033±0.0010	0.068±0.0020	-0.144
	5×CO_2	0.032±0.0008	0.064±0.0016	-0.160
	6×CO_2	0.033±0.0008	0.063±0.0012	-0.180
	7×CO_2	0.032±0.0005	0.061±0.0012	-0.185
	8×CO_2	0.032±0.0007	0.060±0.0010	-0.198
GISS E2.1-G slab ocean	2×CO_2	0.042±0.00082	0.072±0.0018	-
	3×CO_2	0.039±0.00075	0.069±0.0013	-
	4×CO_2	0.038±0.00063	0.066±0.0013	-

Table S2. List of CMIP5 models for the 1pctCO2 experiment

Model
ACCESS1-0
ACCESS1-3
bcc-csm1-1-m
bcc-csm1-1
BNU-ESM
CanESM2
CCSM4
CESM1-BGC
CESM1-CAM5
CMCC-CM
CNRM-CM5
CSIRO-Mk3-6-0
FGOALS-s2
GFDL-CM3
GFDL-ESM2G
GFDL-ESM2M
GISS-E2-H
GISS-E2-R
HadGEM2-ES
inmcm4
IPSL-CM5A-LR
IPSL-CM5A-MR
IPSL-CM5B-LR
MIROC5
MIROC-ESM
MPI-ESM-LR
MPI-ESM-MR
MPI-ESM-P
MRI-CGCM3
NorESM1-ME
NorESM1-M
For all models only r1i1p1 member was used

Table S3. List of CMIP6 models for the 1pctCO2 experiment

Model
AWI-CM-1-1-MR
BCC-CSM2-MR
BCC-ESM1
CAMS-CSM1-0
CIESM
EC-Earth3-Veg
FGOALS-f3-L
FGOALS-g3
GISS-E2-1-G
GISS-E2-1-H
GISS-E2-2-G
KIOST-ESM
MCM-UA-1-0
NESM3
NorCPM1

For all models only r1i1p1f1 member was used

Table S4. List of CMIP5 models for the RCP8.5 scenario

Model
ACCESS1-0
ACCESS1-3
bcc-csm1-1
bcc-csm1-1-m
BNU-ESM
CanESM2
CCSM4
CESM1-BGC
CESM1-CAM5
CMCC-CESM
CMCC-CM
CMCC-CMS
CNRM-CM5
CSIRO-Mk3-6-0”
FGOALS-s2
FIO-ESM
GFDL-CM3
GFDL-ESM2G
GFDL-ESM2M
GISS-E2-H
GISS-E2-H-CC
GISS-E2-R
GISS-E2-R-CC
HadGEM2-AO
HadGEM2-CC
HadGEM2-ES
inmcm4
IPSL-CM5A-LR
IPSL-CM5A-MR
IPSL-CM5B-LR
MIROC-ESM
MIROC-ESM-CHEM
MIROC5
MPI-ESM-LR
MRI-CGCM3
NorESM1-M
NorESM1-ME
For all models only r1i1p1 member was used

Table S5. List of CMIP6 models for the SSP5-8.5 scenario

Model
ACCESS-CM2
ACCESS-ESM1-5
AWI-CM-1-1-MR
BCC-CSM2-MR
CAMS-CSM1-0
CESM2-WACCM
CIESM
CMCC-CM2-SR5
CMCC-ESM2
CanESM5
E3SM-1-1
EC-Earth3
EC-Earth3-Veg
EC-Earth3-Veg-LR
FGOALS-f3-L
FGOALS-g3
GFDL-CM4
GFDL-ESM4
IITM-ESM
INM-CM4-8
INM-CM5-0
IPSL-CM6A-LR
KACE-1-0-G
KIOST-ESM
MIROC6
MPI-ESM1-2-HR
MPI-ESM1-2-LR
MRI-ESM2-0
NESM3
NorESM2-MM
TaiESM1

For all models only r1i1p1f1 member was used

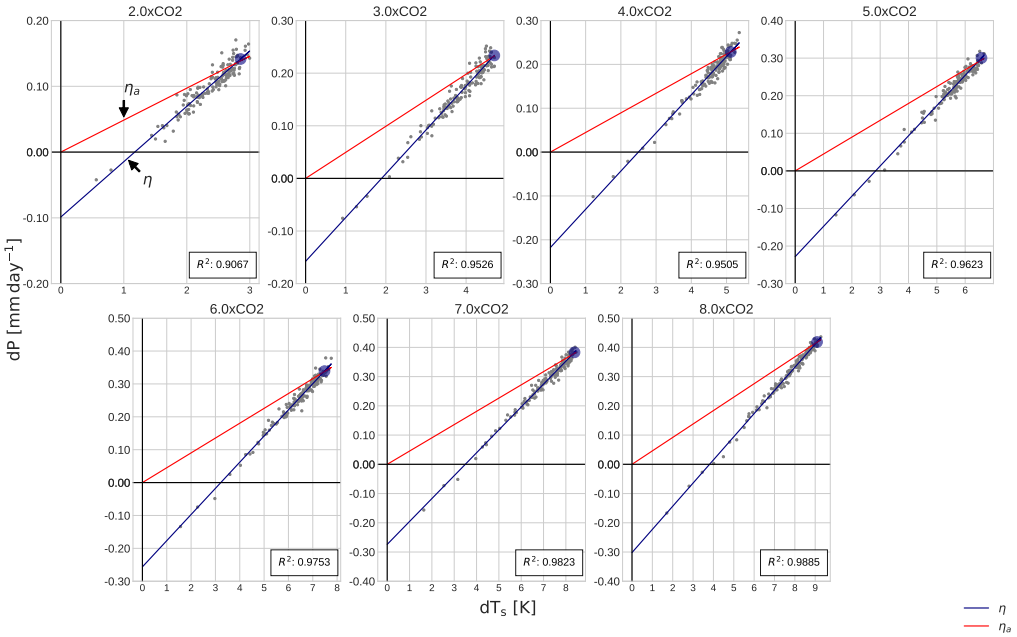

Figure S1. Hydrological sensitivity calculations for abrupt $2-8\times$ CO_2 CESM model run.

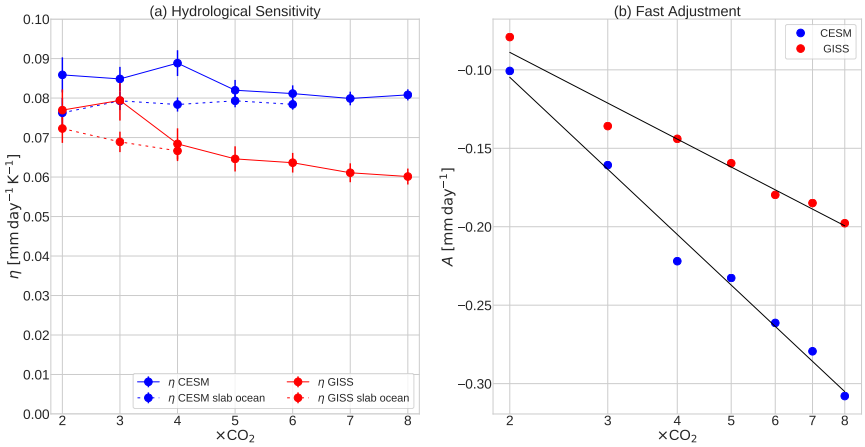

Figure S2. (a) Hydrological sensitivity, η, calculated from fully coupled (solid lines) and slab ocean (dashed lines) CESM-LE (blue) and GISS E2.1-G (red) abrupt 2× to 8×CO_2 runs. Data is globally and annually averaged. Error bars denote 95% confidence intervals. (b) Fast adjustment, A, calculated from the fully coupled runs in (a).

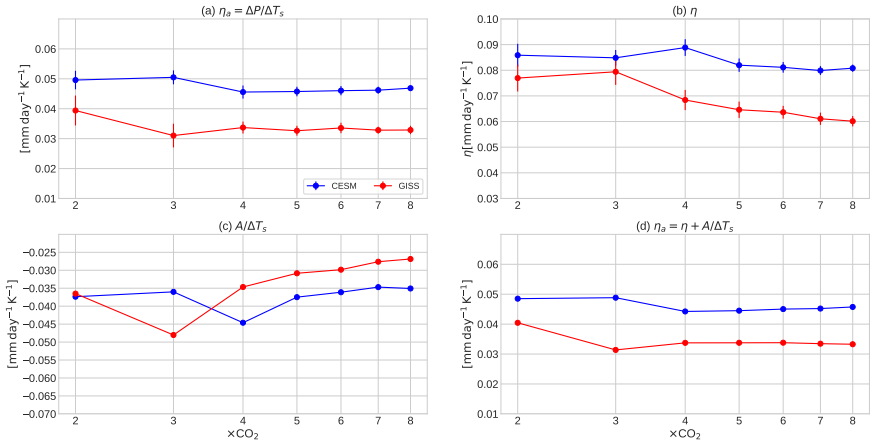

Figure S3. (a) Apparent hydrological sensitivity, η_a, (b) Hydrological sensitivity, η,(c) Ratio between the Fast adjustment, A, and change in surface temperature, ΔT and (d) η_a calculated using equation (2) in the main text. All calculated using the fully coupled CESM-LE (blue) and GISS E2.1-G (red) abrupt 2× to 8×CO_2 runs. Data is globally and annually averaged. Error bars denote 95% confidence intervals.

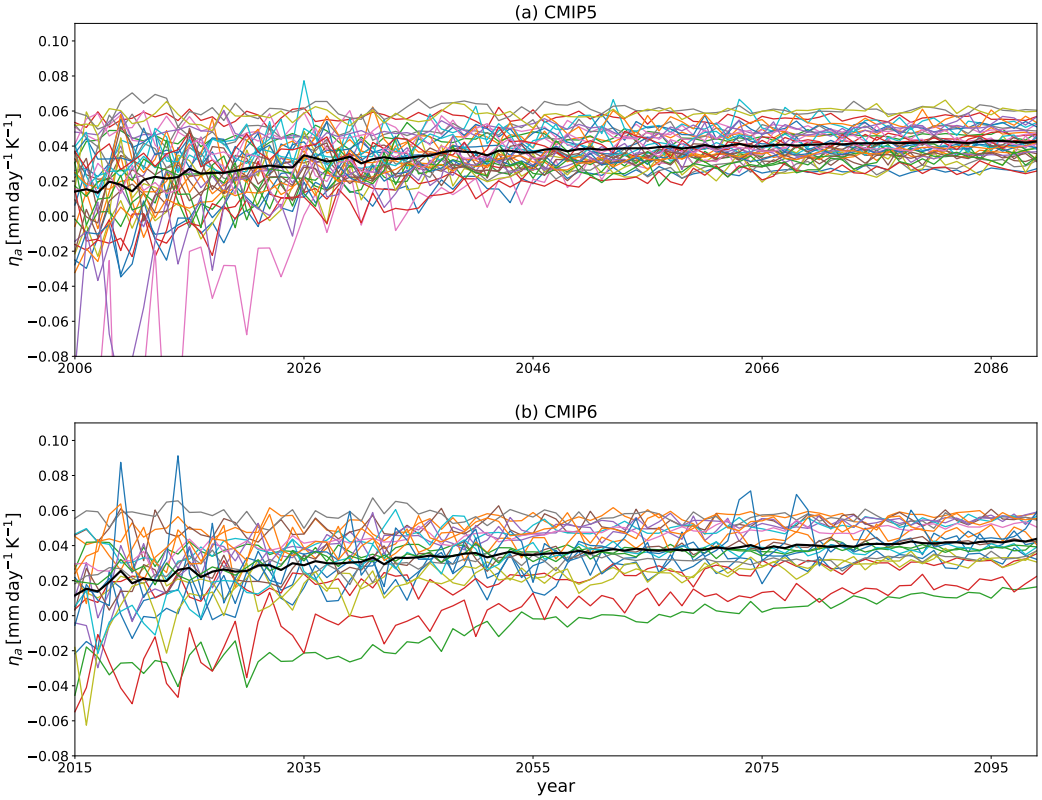

Figure S4. Time series of η_a for CMIP5 data, RCP8.5 scenario (a, colored lines) and CMIP6 data, SSP5-8.5 scenario (b, colored lines). Black line is the model mean.