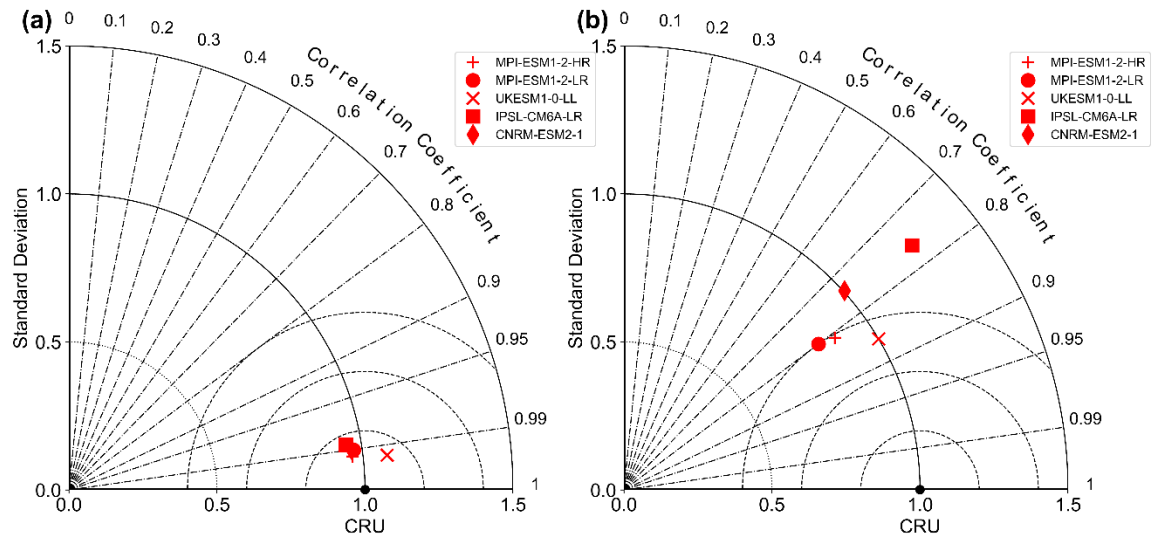*Supplement of*

Unequal socioeconomic exposure to drought extremes induced by stratospheric aerosol geoengineering
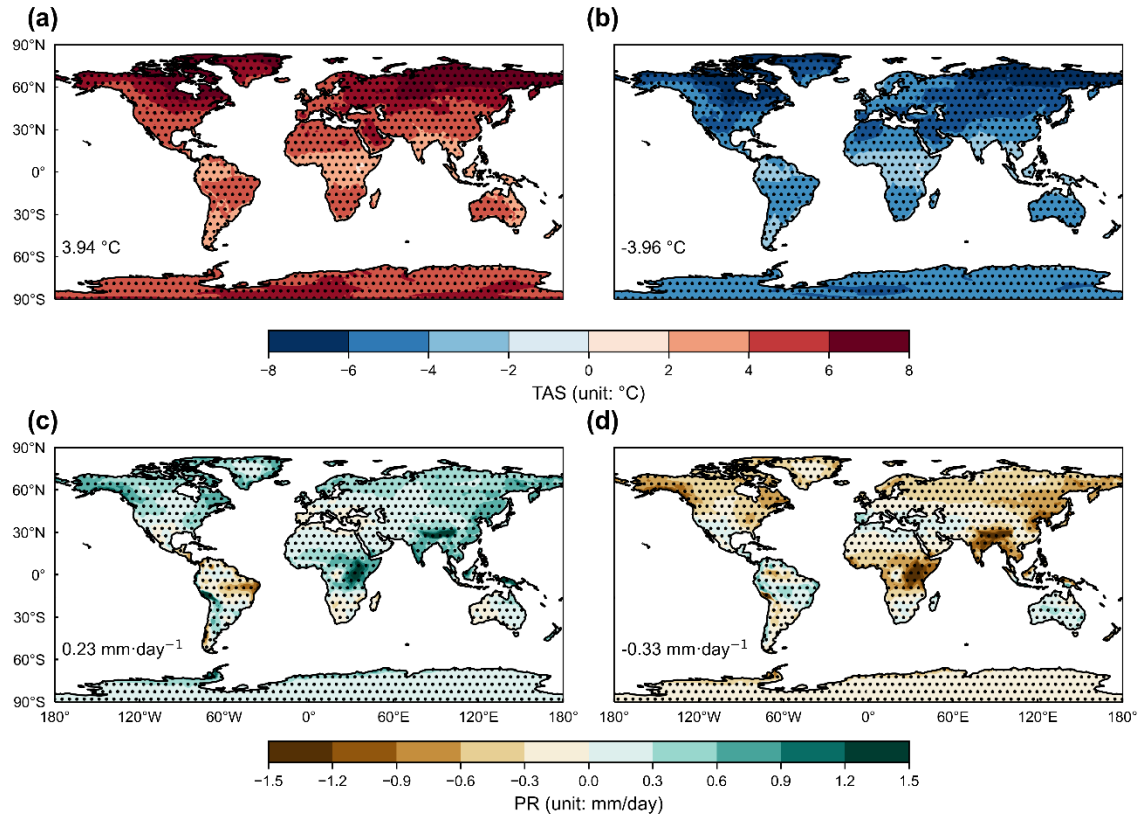
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Figure S1. Evaluation of climate models from GeoMIP6. Results shown are the Taylor diagram of annual mean (a) temperature and (b) precipitation for GeoMIP6 models during the period of 1995–2014.

Figure S2. Climatic responses to global warming and SAG in GLENS. Results shown are the spatial pattern of annual mean changes in (a, b) temperature and (c, d) precipitation at 2075-2094 under (a, c) RCP8.5 scenario relative to 2010-2030 baseline, as well as that under (b, d) SAG scenarios relative to control both at 2075-2094. The dotted areas indicate regions where at least two out of three members show changes with the same signs. The global mean value of the difference is shown at the lower left of each panel.
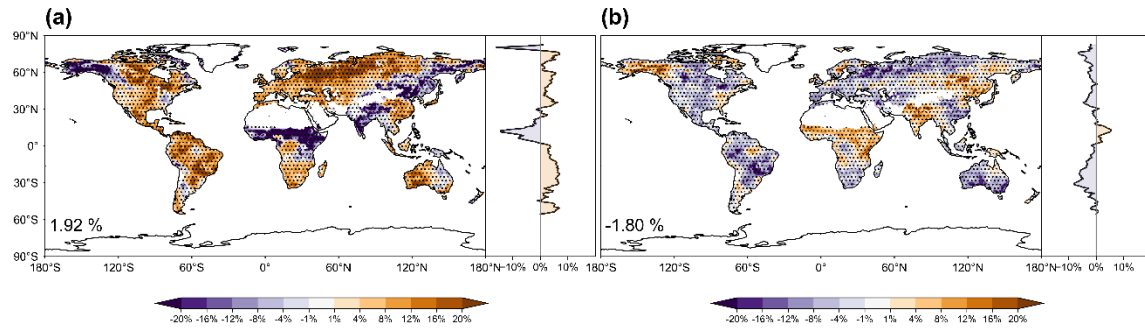
Figure S3. Changes in frequency of drought extremes by global warming and SAG in GLENS. Results shown are the changes in frequency of drought extremes (scPDSI < -4) at 2075-2094 under (a) RCP8.5 scenario relative to 2010-2030 baseline, as well as that under (b) SAG scenarios relative to control both at 2075-2094. The dotted areas indicate regions where at least two out of three members show changes with the same signs. Latitudinal distribution is shown on the right of each panel. The global mean value of the difference is shown at the lower left of each panel.
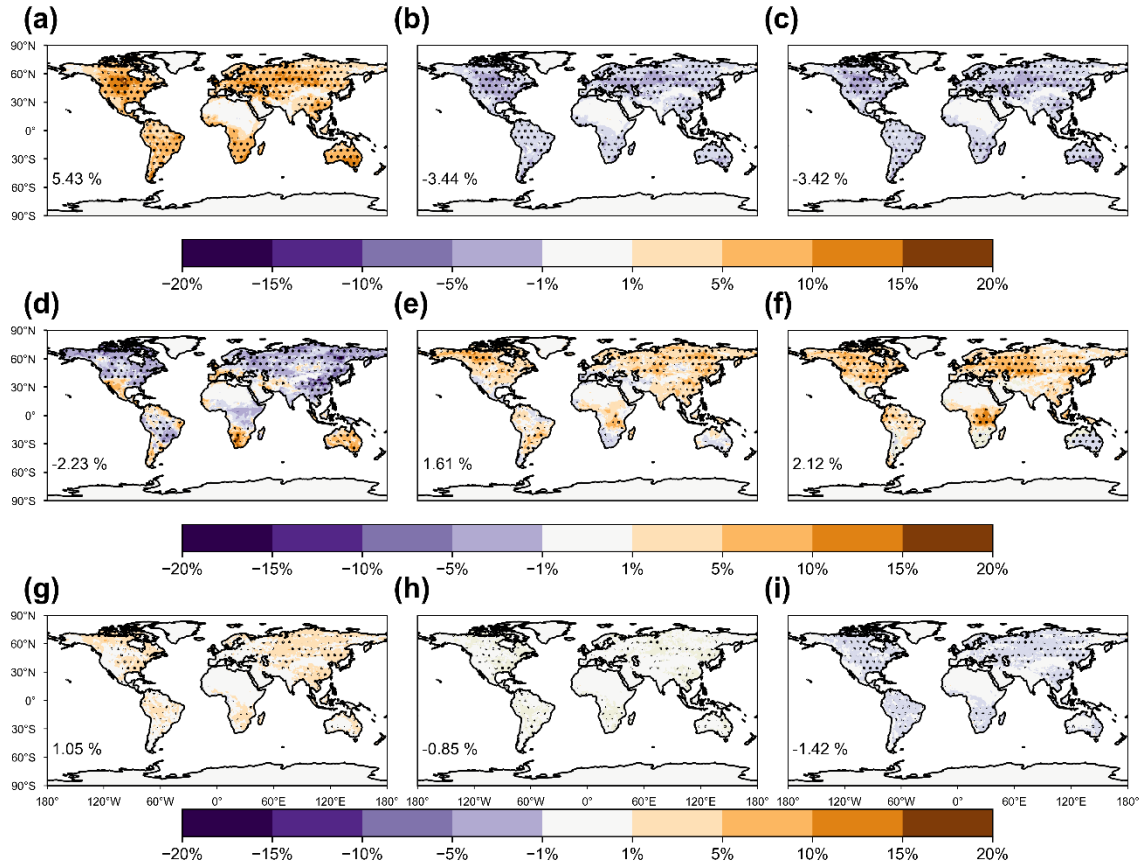
Figure S4. Changes in frequency of drought extremes due to different factors. Results shown are the changes in frequency of drought extremes (scPDSI < -4) at 2081-2100 under SSP5-8.5 scenario relative to the historical period of 1995-2014 attributable to (a) temperature, (d) precipitation, and (g) radiation changes, as well as that under (b, e, h) G6solar and (c, f, i) G6sulfur scenarios relative to SSP5-8.5 both at 2081-2100 attributable to (b, c) temperature, (e, f) precipitation, and (h, i) radiation changes. The dotted areas indicate regions where at least four out of five models show changes with the same signs.
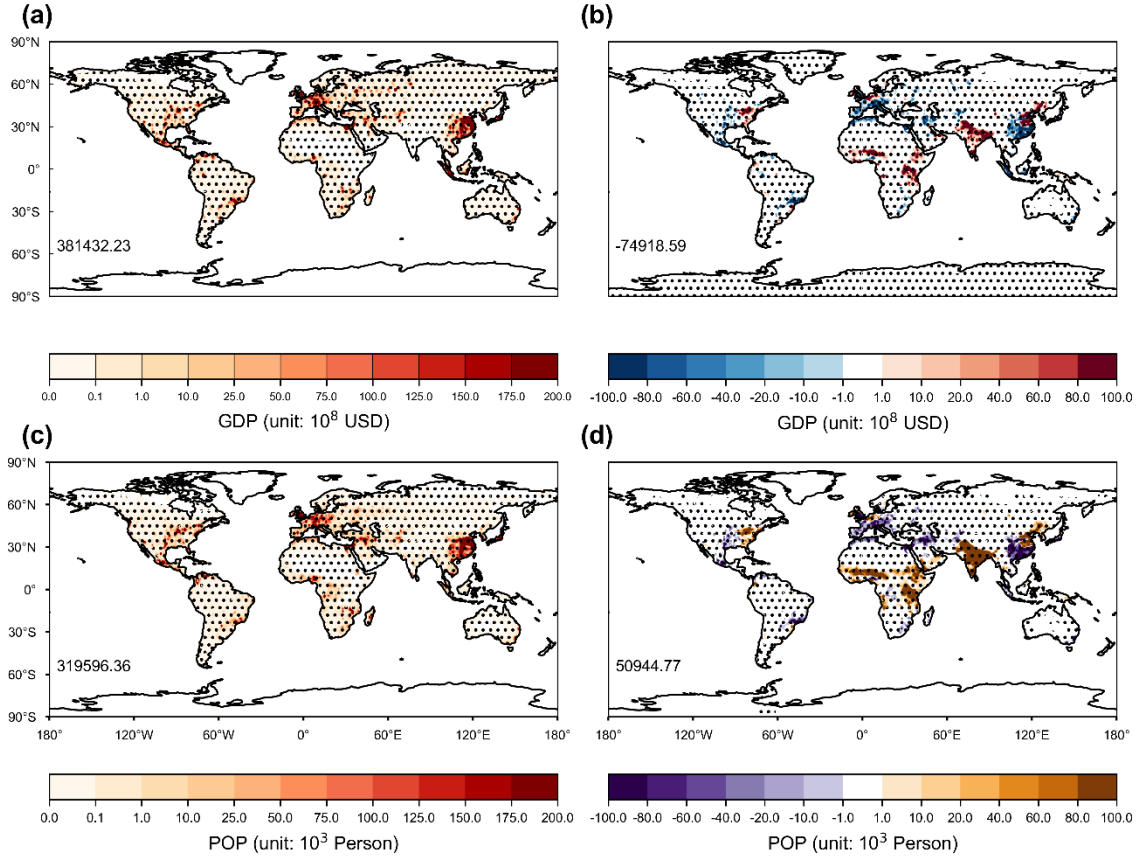
Figure S5. Changes in GDP and population exposure to drought extremes by global warming and SAG in GLENS. Results shown are the changes of (a, b) GDP and (c, d) population (POP) exposure to drought extremes at 2075-2094 (a, c) under RCP8.5 scenario relative to 2010-2030 baseline, as well as that (b, d) under SAG scenarios relative to control both at 2075-2094. The dotted areas indicate regions where at least two out of three models show changes with the same signs. The global mean value of the difference is shown at the lower left of each panel.
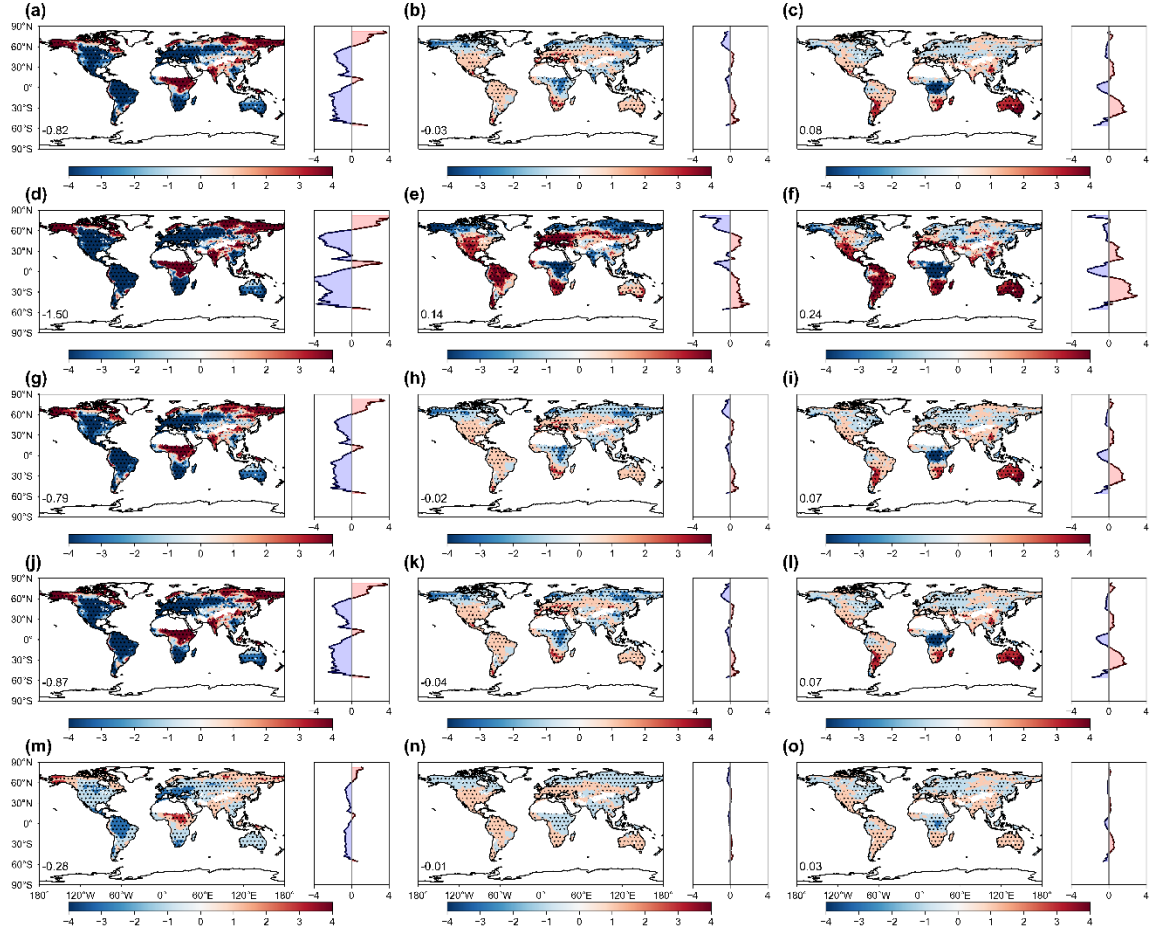
Figure S6. Change of drought status indicated by different indices. Results shown are the changes of drought indices (a, d, g, j, m) at 2081-2100 under SSP5-8.5 scenario relative to the historical period of 1995-2014, as well as that under (b, e, h, k, n) G6solar and (c, f, i, l, o) G6sulfur scenarios relative to SSP5-8.5 both at 2081-2100. Drought indices include (a, b, c) self-calibrating Palmer Drought Severity Index (scPDSI), (d, e, f) PDSI, (g, h, i) Palmer Modified Drought Index (PMDI), (j, k, l) Palmer Hydrological Drought Index (PHDI), and (m, n, o) Palmer Z Index. The latitudinal distribution of the changes is shown on the right side of each panel. The dotted areas indicate regions where at least four out of five models show changes with the same signs.
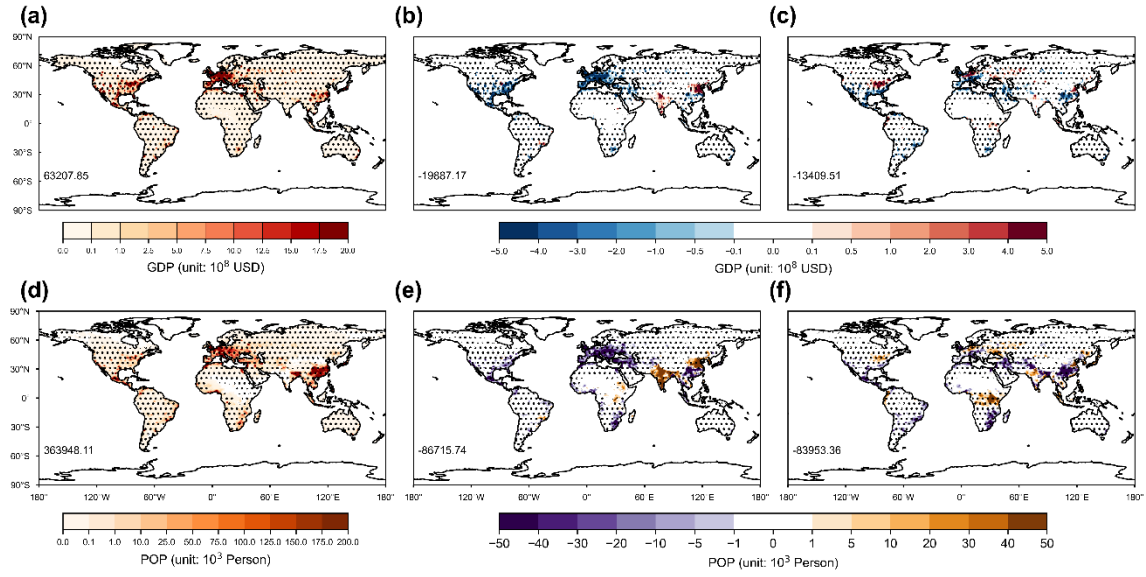
Figure S7. The same as **Figure 3.** but present-day GDP and population is applied.
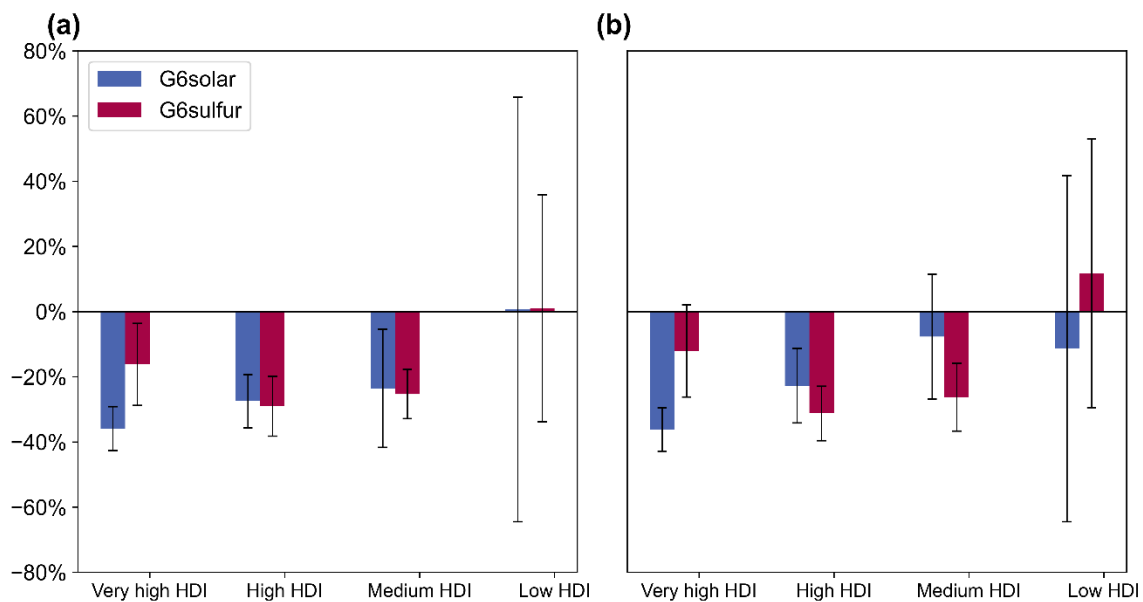
Figure S8. The same as **Figure 4.** but present-day GDP and population is applied.

Table S1. Summary of the GeoMIP6 models used in drought assessment.

Models	Stratospheric aerosols in G6sulfur	Resolution
CNRM-ESM2-1	Prescribed aerosol distribution	$1.4°×1.4°$
IPSL-CM6A-LR	Actual SO_2 injections	$2.5°×1.25°$
UKESM1-0-LL	Actual SO_2 injections	$1.875°×1.25°$
MPI-ESM1-2-HR	Prescribed aerosol distribution	$0.9375°× 0.9375°$
MPI-ESM1-2-LR	Prescribed aerosol distribution	$1.875° × 1.875°$

Table S2. Summary of the GLENS experiment used in drought assessment.

Experiment	Model	Time Series	Members
Control	CESM1(WACCM)	2010-2097	3
Control	CESM1(WACCM)	2010-2030	17
Feedback	CESM1(WACCM)	2020-2099	20

Table S3. Summary of scPDSI calculated with varied meteorological forcings.

Name	Temperature	Precipitation	Radiation	Period
HIST	HIST	HIST	HIST	1995-2014
SSP585	SSP585	SSP585	SSP585	2081-2100
G6sulfur	G6sulfur	G6sulfur	G6sulfur	2081-2100
G6solar	G6solar	G6solar	G6solar	2081-2100
$T_{G6sulfur}P_{S5}R_{S5}$	G6sulfur	SSP585	SSP585	2081-2100
$T_{S5}P_{G6sulfur}R_{S5}$	SSP585	G6sulfur	SSP585	2081-2100
$T_{S5}P_{S5}R_{G6sulfur}$	SSP585	SSP585	G6sulfur	2081-2100
$T_{G6solar}P_{S5}R_{S5}$	G6solar	SSP585	SSP585	2081-2100
$T_{S5}P_{G6solar}R_{S5}$	SSP585	G6solar	SSP585	2081-2100
$T_{S5}P_{S5}R_{G6solar}$	SSP585	SSP585	G6solar	2081-2100
$T_{HIST}P_{S5}R_{S5}$	HIST	SSP585	SSP585	2081-2100
$T_{S5}P_{HIST}R_{S5}$	SSP585	HIST	SSP585	2081-2100
$T_{S5}P_{S5}R_{HIST}$	SSP585	SSP585	HIST	2081-2100