Supporting Information for *Aerosol choices influence precipitation changes across future scenarios*

Isabel L. McCoy[1,2], Mika Vogt[3], and Robert Wood[3]

[1]Rosenstiel School of Marine and Atmospheric Science, University of Miami, Miami, FL, 33149-1031, USA

[2]University Corporation for Atmospheric Research, Boulder, CO, 80307-3000, USA

[3]Department of Atmospheric Sciences, University of Washington, Seattle, WA, 98195-1640, USA

Contents of this file

1. Figures S1 to S3
2. Tables S1 to S3

Corresponding author: I. L. McCoy, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Miami, FL, 33149-1031, USA. (imccoy@ucar.edu)

January 2, 2022, 7:40pm

Table S1. Individual CMIP6 Models used in ScenarioMIP Ensemble

Name
CanESM5
CESM2-WACCM
CMCC-CM2-SR5
CMCC-ESM2
CNRM-CM6-1
CNRM-CM6-1-HR
CNRM-ESM2-1
GFDL-ESM4
INM-CM4-8
INM-CM5-0
IPSL-CM6A-LR
KACE-1-0-G
MIROC6
MIROC-ES2L
MPI-ESM1-2-HR
MPI-ESM1-2-LR
MRI-ESM2-0
NorESM2-LM
UKESM1-0-LL

Table S2. ScenarioMIP Global Ensemble Mean, SE Changes and Quantities

Variable	Units	SSP1-2.6	SSP2-4.5	SSP3-7.0	SSP5-8.5
ΔT	K	0.80±0.04	1.83±0.09	3.02±0.15	3.93±0.20
ΔWVP	kgm^{-2}	1.32±0.07	3.28±0.17	5.77±0.29	7.77±0.39
$\Delta AAOD$	$\cdot 10^{-3}$	-1.85±0.09	-1.95±0.10	0.14±0.02	-1.33±0.06
ΔCO_2*	ppm	37.8	187.9	416.7	660.0
ΔCH_4	ppb	-795±7	-203±12	1386±22	576±17
η	$Wm^{-2}K^{-1}$	2.26±0.22	2.05±0.27	1.89±0.25	1.87±0.29
$\overline{\eta_{SSP}}$	2.02 ± 0.26	-	-	-	-
η_a	$Wm^{-2}K^{-1}$	2.57±0.16	1.79±0.08	1.32±0.07	1.41±0.07
ΔP	Wm^{-2}	2.06±0.10	3.29±0.17	3.99±0.20	5.57±0.28
ΔP_{fast}	Wm^{-2}	0.44±0.27	-0.41±0.50	-2.11±0.83	-2.38±1.07
$\Delta P_{fastCO2}$	Wm^{-2}	-0.28±0.02	-1.19±0.10	-2.21±0.19	-3.02±0.26
$\Delta P_{fastCH4}$	Wm^{-2}	0.25±0.05	0.05±0.01	-0.25±0.05	-0.12±0.02
$\Delta P_{fastOther}$	Wm^{-2}	0.47±0.28	0.72±0.51	0.35±0.85	0.76±1.10
$\Delta P_{fastAAOD}$	Wm^{-2}	0.62±0.25	0.65±0.27	-0.05±0.34	0.45±0.28

* CO_2 is prescribed in ScenarioMIP simulations thus no SE is reported.

Table S3. ScenarioMIP Regional Ensemble Mean, SE for $\Delta AAOD$

Region	Units	SSP1-2.6	SSP2-4.5	SSP3-7.0	SSP5-8.5
Global	$\cdot 10^{-3}$	-1.85±0.09	-1.95±0.10	0.14±0.02	-1.33±0.06
Southeast Asia	$\cdot 10^{-3}$	-9.08±0.44	-10.0±0.5	-1.69±0.19	-9.55±0.45
Equatorial Africa	$\cdot 10^{-3}$	-3.44±0.15	-5.81±0.33	2.78±0.14	0.70±0.27

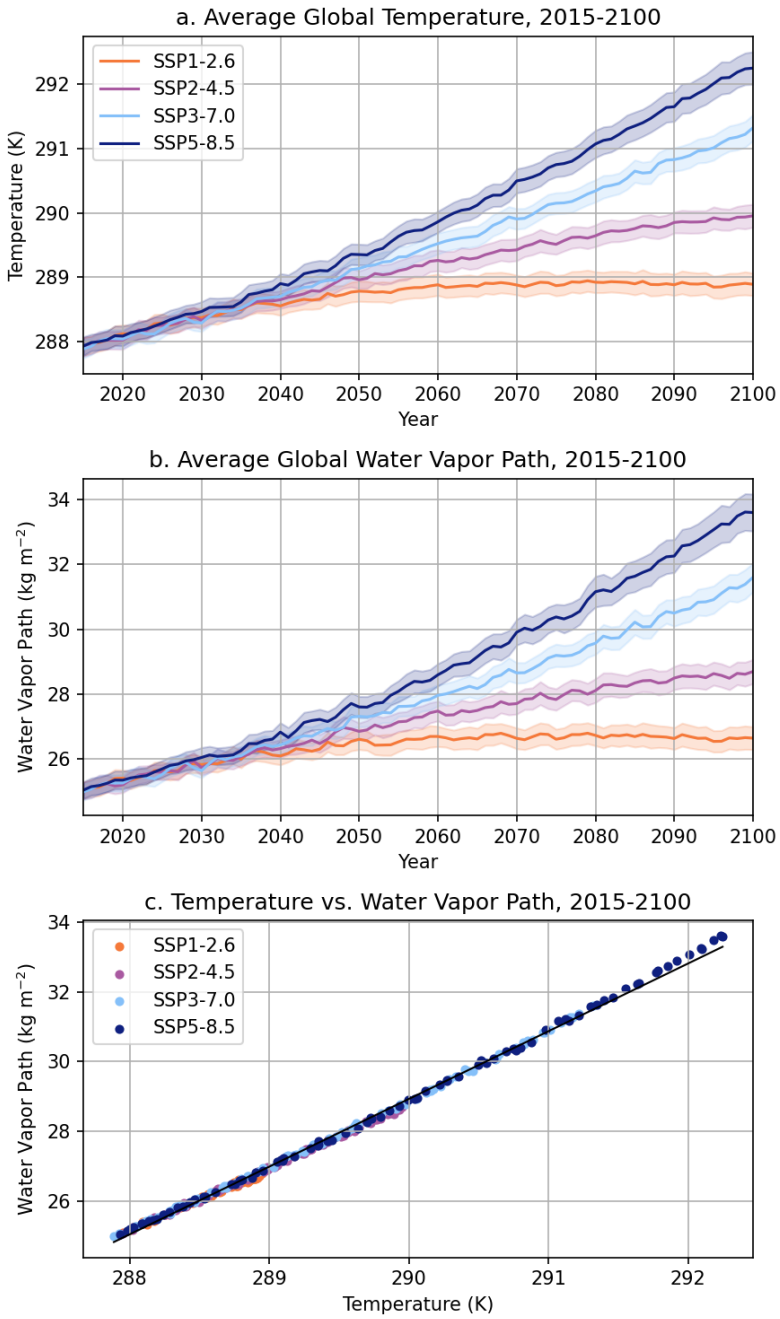

Figure S1. Global multi-model ensemble mean (line) and corresponding standard error (shading) by scenario across period of interest (2015-2100) for (a) temperature and (b) water vapor path. (c) The global multi-model ensemble mean temperature is correlated with water vapor path at R^2= 0.997 at 95% confidence and has a slope of m= 1.94 kg m^{-2} K^{-1}.

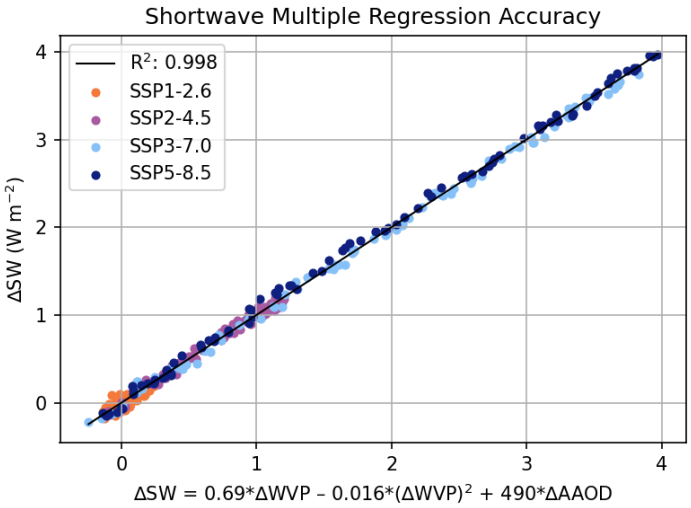

Figure S2. CMIP6 SSP change in SW vs. predicted change in SW based on changes in WVP and AAOD from Eq. 2. Each scatter point represents a year from 2015-2100.

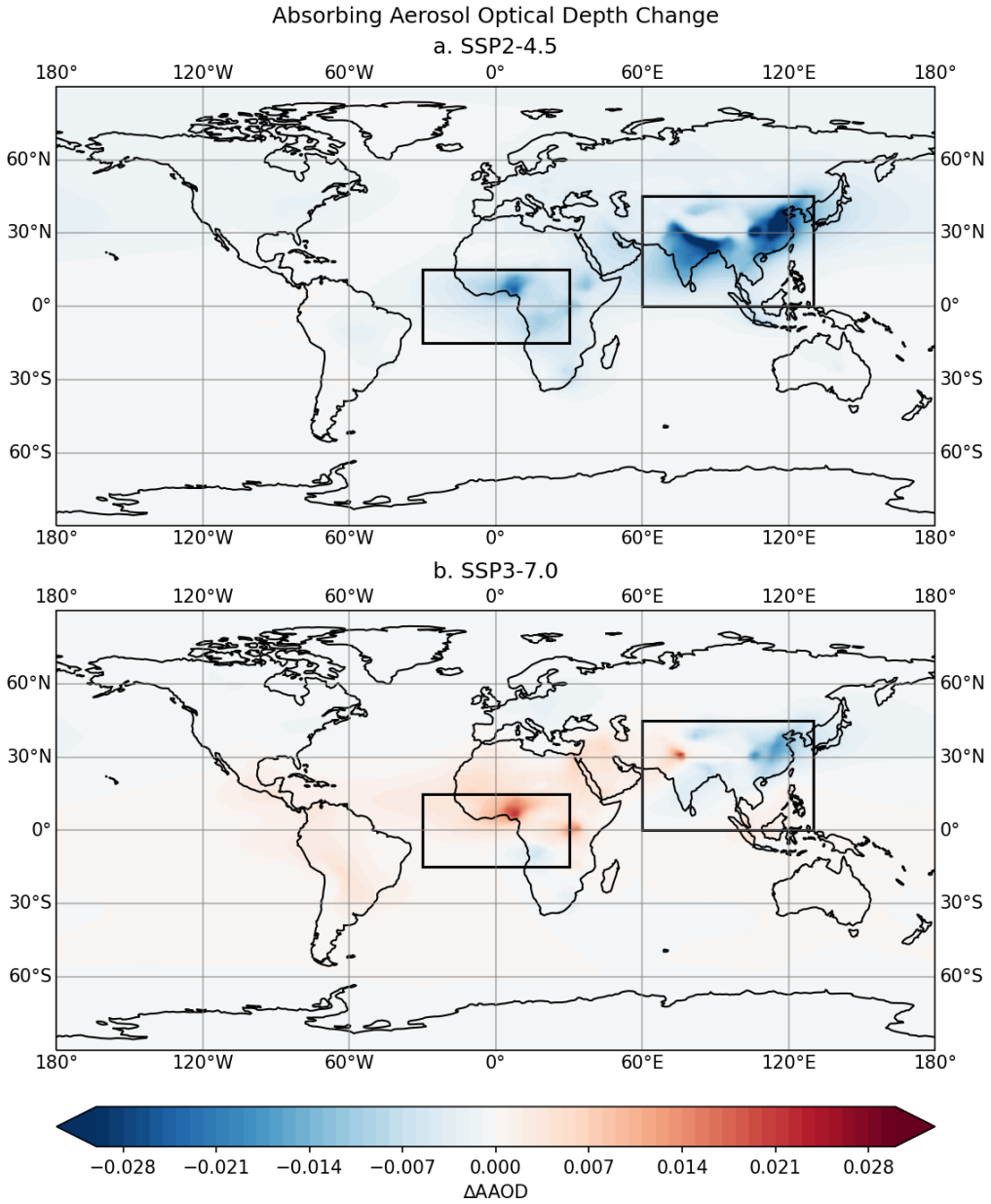

Figure S3. Global changes in AAOD between 2015-2025 and 2090-2100 for two CMIP6 SSP simulations with contrasting aerosol choices: (a) SSP2-4.5 (*Middle of the road*) and (b) SSP3-7.0 (*Regional Rivalry*). Two regions of interest are highlighted: Southeast Asia (0-45°N, 60-130°E) which experiences decreases in AAOD in both (a, b) and Equatorial Africa (15°S-15°N, 30°W-30°E) which experiences decreases in AAOD in (a) but increases in (b). See Table S3 for values.