One Earth, Volume 7

Supplemental information

Ozone-related acute excess mortality projected to increase in the absence of climate and air quality controls consistent with the Paris Agreement

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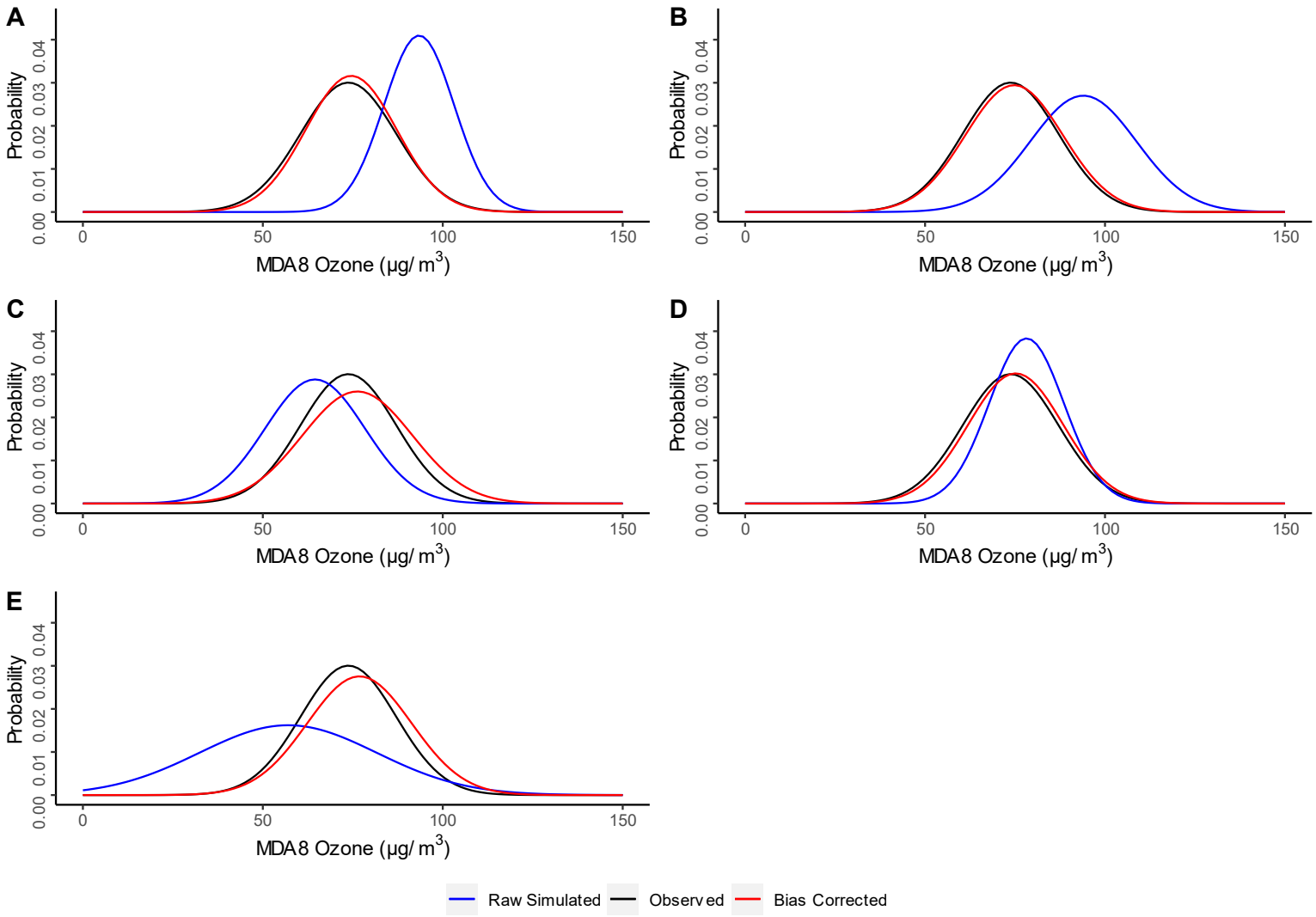

Fig S1. Raw simulated, observed, and bias corrected O_3 concentrations averaged over the 406 cities for each global chemistry-climate model in the present period. (A) CESM2, (B) EC-Earth3-AerChem, (C) GFDL-ESM4, (D) MPI-ESM-1-2-HAM, and (E) UKESM-1-0-LL.

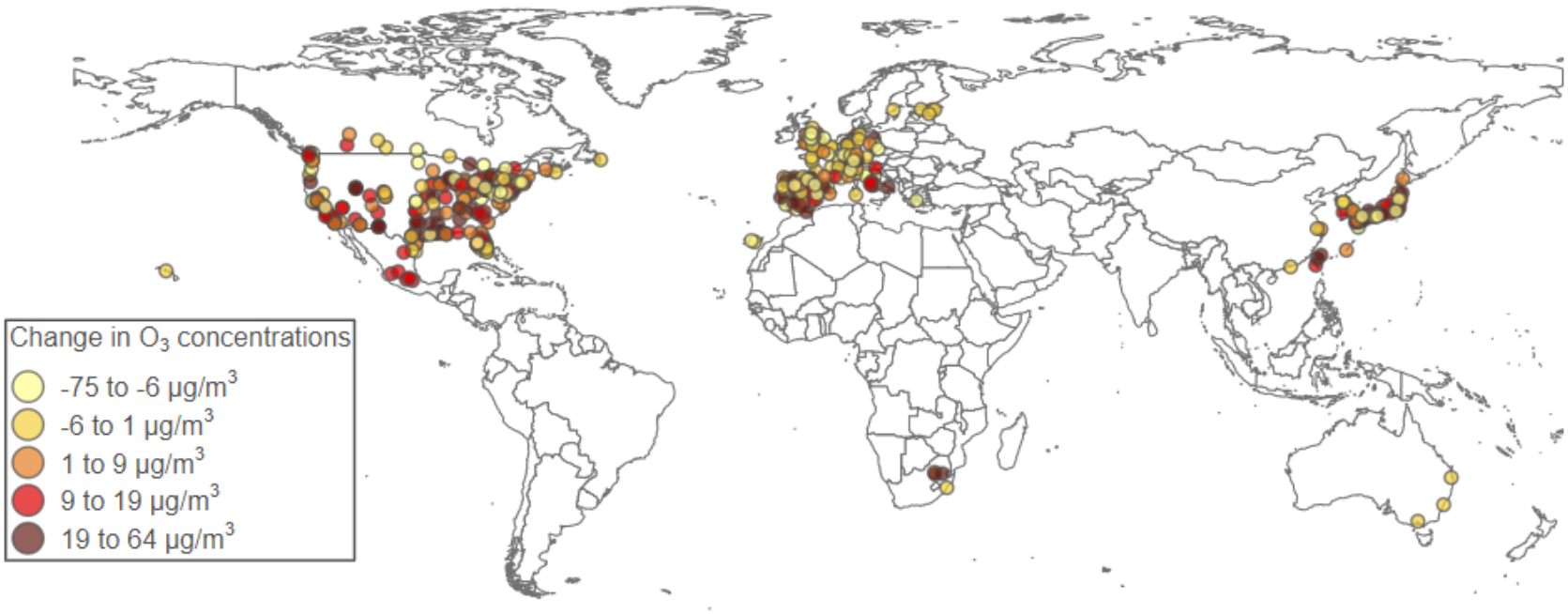

Fig S2. O_3 bias over the 406 cities average across the global-chemistry climate models in the present period. Global chemistry-climate models include CESM2, EC-Earth3-AerChem, GFDL-ESM4, MPI-ESM-1-2-HAM, and UKESM-1-0-LL.

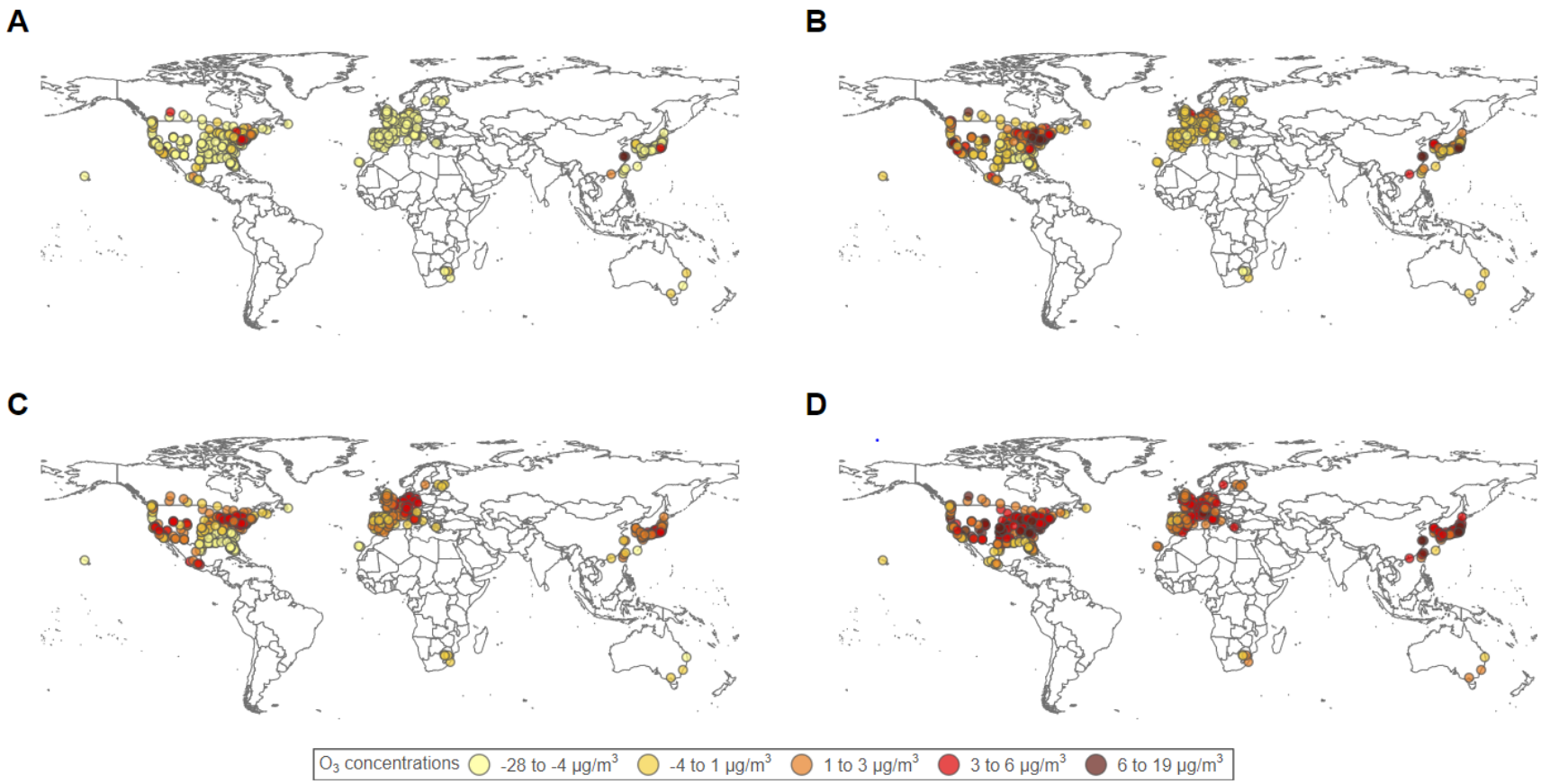

Fig S3. Absolute change in MDA8 O_3 concentration at 406 locations in 20 countries between the present (2010-2014) and future (2050-2054) time periods. (A) absolute change in O_3 concentrations under SSP 1-2.6, (B) absolute change in O_3 concentrations under SSP 2-4.5, (C) absolute change in O_3 concentrations under SSP 3-7.0, and (D) absolute change in O_3 concentrations under SSP 5-8.5. O_3 concentration is the maximum daily 8-hour average.

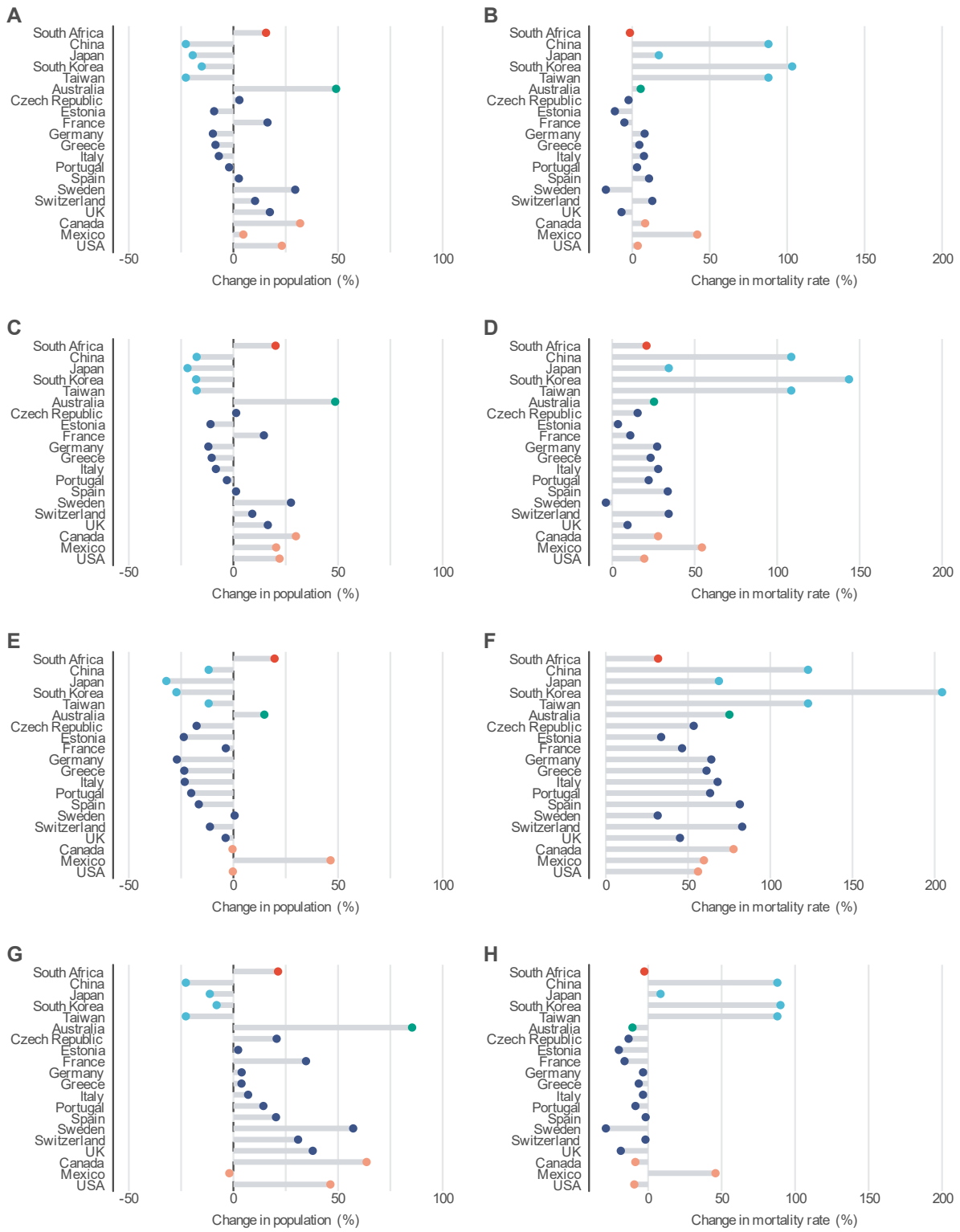

Fig S4. Change in population and mortality rates in 20 countries. Change in national population under (A) SSP 1-2.6, (C) SSP 2-4.5, (E) SSP 3-7.0, and (G) SSP 5-8.5. Change in national mortality rates under (B) SSP 1-2.6, (D) SSP 2-4.5, (F) SSP3-7.0, and (H) SSP 5-8.5.

Table S1. Change in O_3 concentrations between present (2010-2014) and future (2050-2054) time periods. City-level changes in O_3 concentrations are aggregated to the country level and rounded to the nearest whole number.

		O_3 concentrations (μg/m^3)				
Country	**Number of cities**	**Present data**	**SSP 1-2.6**	**SSP 2-4.5**	**SSP 3-7.0**	**SSP 5-8.5**
Australia	3	34	29	33	36	35
Canada	26	81	84	88	87	89
China	3	58	68	69	63	63
Czech Republic	1	75	58	76	82	79
Estonia	4	57	50	56	60	59
France	18	70	53	66	75	75
Germany	12	62	52	63	71	68
Greece	1	74	54	69	78	81
Italy	13	72	49	66	79	79
Japan	43	80	77	87	88	90
Mexico	8	133	132	135	141	131
Portugal	6	76	59	73	79	78
South Africa	4	78	73	73	81	81
South Korea	7	69	63	72	74	75
Spain	47	73	56	71	77	77
Sweden	1	61	53	62	65	67
Switzerland	8	74	54	70	82	78
Taiwan	3	109	95	108	113	107
UK	15	59	47	59	64	61

USA	183	84	85	92	89	92

Table S2. O_3-related mortality by global climate model in 4 cities in the present (2010-2014) period.

		O_3-related mortality (deaths/yr)	
Global climate model	City	**Raw simulated O_3**	**Bias corrected O_3**
CESM2	Valley of Mexico, Mexico	323	535
EC-Earth3-AerChem	Valley of Mexico, Mexico	67	530
GFDL-ESM4	Valley of Mexico, Mexico	11	614
MPI-ESM-1-2-HAM	Valley of Mexico, Mexico	28	584
UKESM-1-0-LL	Valley of Mexico, Mexico	0	524
CESM2	Los Angeles, USA	253	223
EC-Earth3-AerChem	Los Angeles, USA	227	320
GFDL-ESM4	Los Angeles, USA	31	303
MPI-ESM-1-2-HAM	Los Angeles, USA	227	178
UKESM-1-0-LL	Los Angeles, USA	0	225
CESM2	Tokyo, Japan	203	133
EC-Earth3-AerChem	Tokyo, Japan	312	151
GFDL-ESM4	Tokyo, Japan	218	144
MPI-ESM-1-2-HAM	Tokyo, Japan	82	162
UKESM-1-0-LL	Tokyo, Japan	63	193
CESM2	Riverside, USA	118	132
EC-Earth3-AerChem	Riverside, USA	97	123
GFDL-ESM4	Riverside, USA	6	157
MPI-ESM-1-2-HAM	Riverside, USA	105	124
UKESM-1-0-LL	Riverside, USA	0	151

Table S3. Global climate model and ensemble members.

Global climate model	Scenario	Ensemble member	Citation
CESM2	Historical	ic1 – 001, ic1 – 002, ic1 – 003, ic1 – 004, ic2 – 001, ic2 – 002, ic2 – 003, ic2 – 004, ic3 – 001, ic3 – 002, ic3 – 003, ic3 – 004, ic4 – 001, ic4 – 002, ic4 – 003, ic4 – 004	1
CESM2	SSP 3-7.0	001, 002, 003, 004	2
EC-Earth3-AerChem	Historical	r1i1p1f1, r4i1p1f1	3
EC-Earth3-AerChem	SSP 3-7.0	r1i1p1f1, r4i1p1f1	4
GFDL-ESM4	Historical	r1i1p1f1	5
GFDL-ESM4	SSP 1-2.6	r1i1p1f1	6
GFDL-ESM4	SSP 2-4.5	r2i1p1f1, r3i1p1f1	7
GFDL-ESM4	SSP 3-7.0	r1i1p1f1	8
MPI-ESM-1-2-HAM	Historical	r1i1p1f1, r2i1p1f1, r3i1p1f1	9
MPI-ESM-1-2-HAM	SSP 3-7.0	r1i1p1f1, r2i1p1f1, r3i1p1f1	10
UKESM-1-0-LL	Historical	r1i1p1f2	11
UKESM-1-0-LL	SSP 1-2.6	r1i1p1f2	12
UKESM-1-0-LL	SSP 2-4.5	r1i1p1f2	13
UKESM-1-0-LL	SSP 3-7.0	r1i1p1f2	14
UKESM-1-0-LL	SSP 5-8.5	r1i1p1f2	15

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