



Supplement of

Global projections of aridity index for mid and long-term future based on CMIP6 scenarios

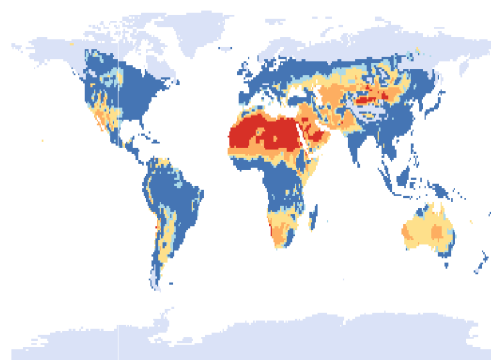
Camille Crapart et al.

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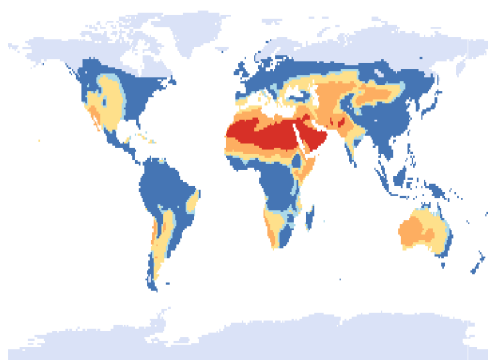
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Figure S1. Map of aridity categories for reference period 1970-2000, by CMIP6 source

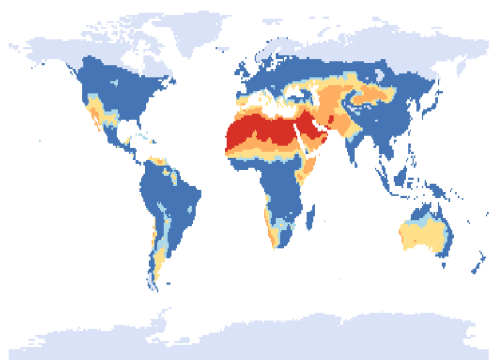
CAS-ESM2, 1970-2000



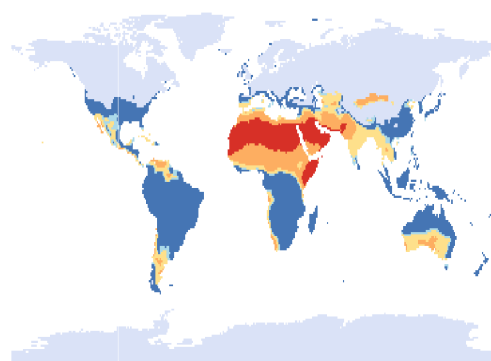
CESM, 1970-2000



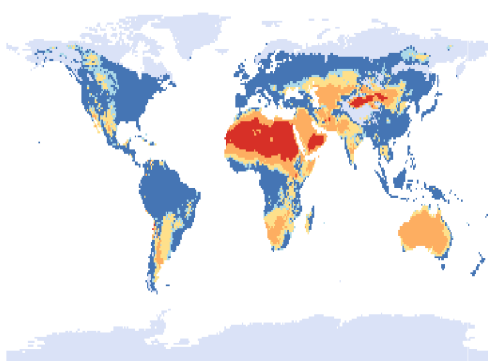
CMCC, 1970-2000



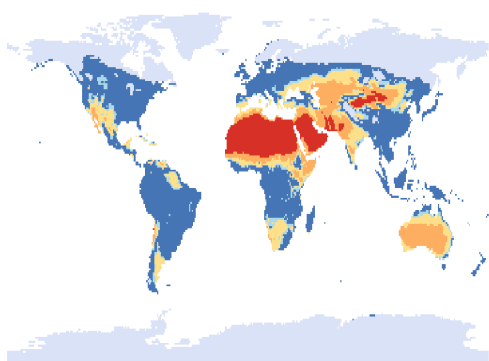
CMCC-ESM2, 1970-2000



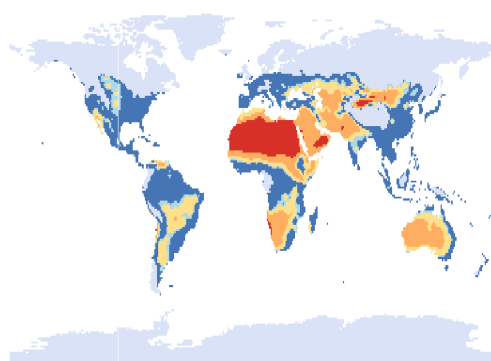
CNRM, 1970-2000



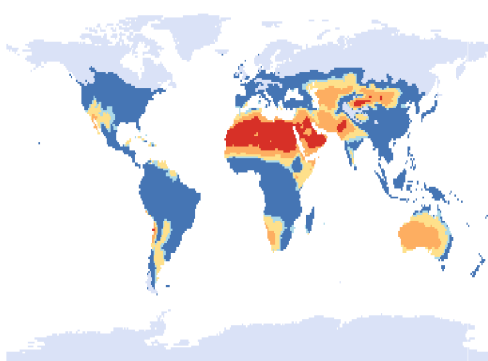
EC-Earth3, 1970-2000



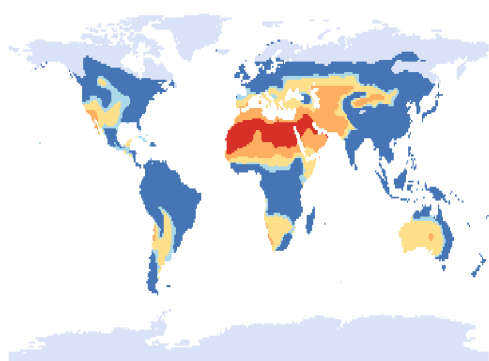
FGOALS, 1970-2000



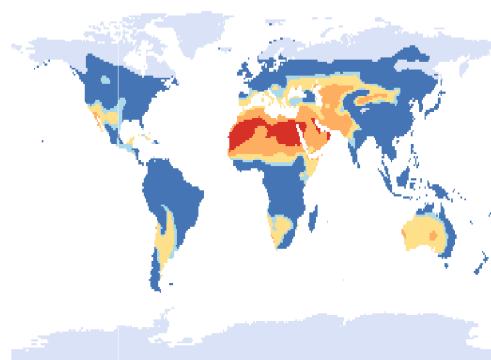
GFDL-ESM4, 1970-2000



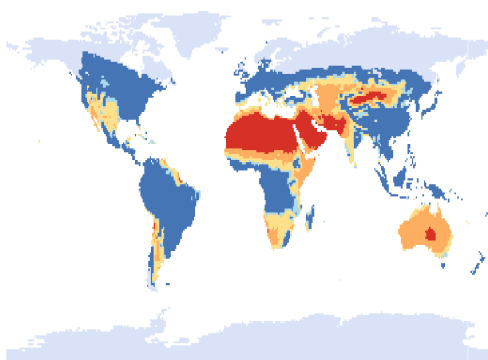
INM, 1970-2000



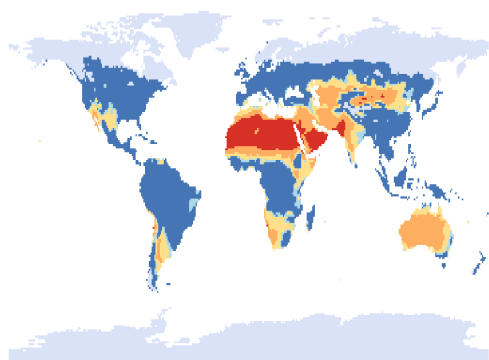
INM-CM5, 1970-2000



MPI, 1970-2000



MRI, 1970-2000



NorESM-2-MM, 1970-2000

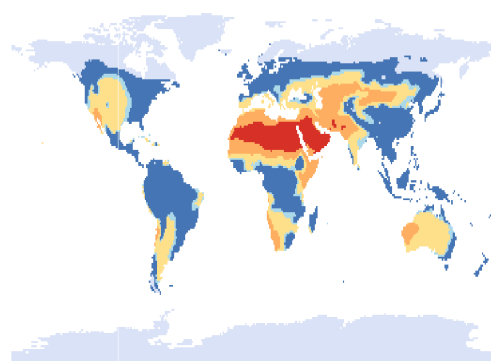
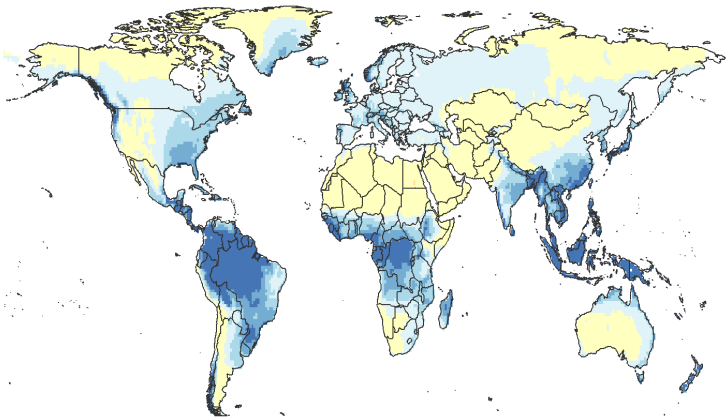
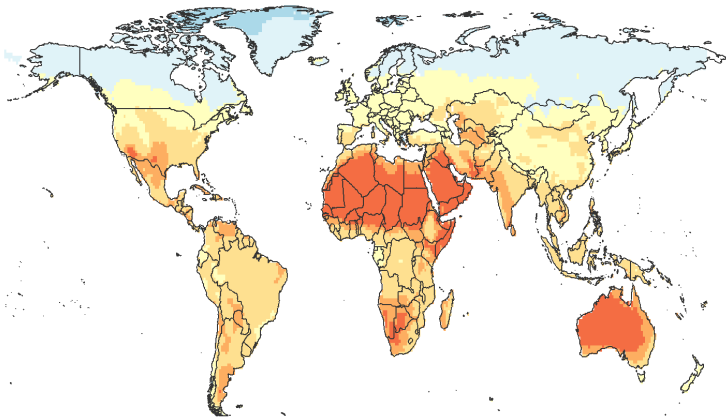


Figure S2. Differences in average annual precipitation and evapotranspiration in Worldclim, ERA5 and CMIP6

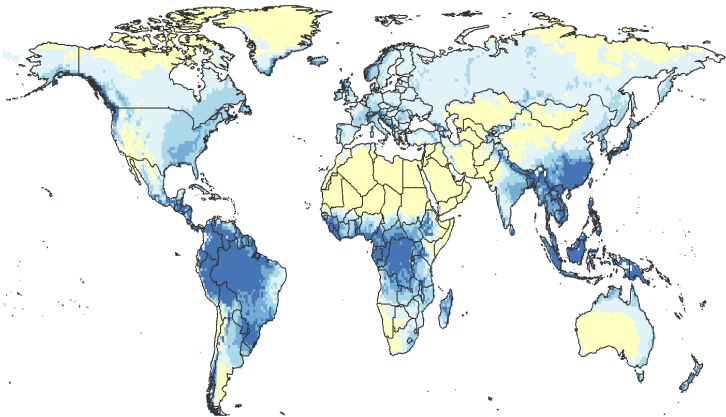
Annual precipitation in Wordclim



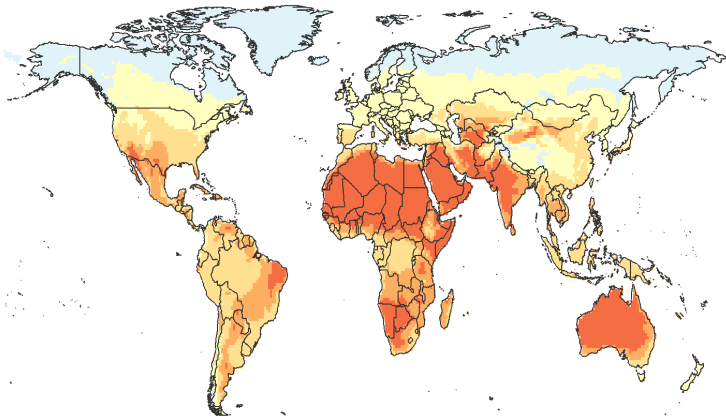
Annual evapotranspiration Wordclim



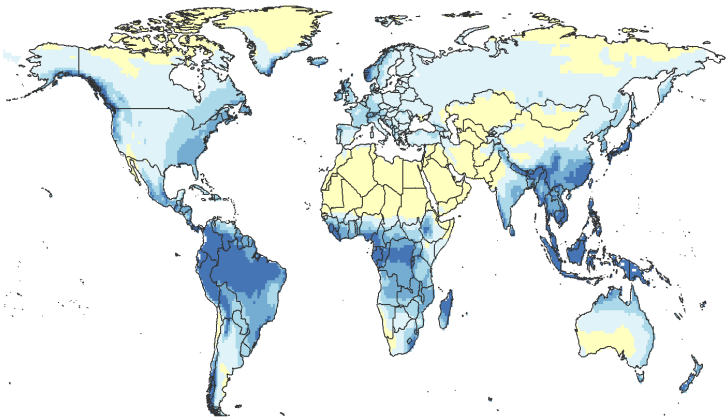
Annual precipitation in ERA5



Annual evapotranspiration ERA5



Annual precipitation CMIP6



Annual evapotranspiration CMIP6

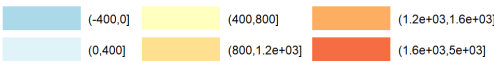
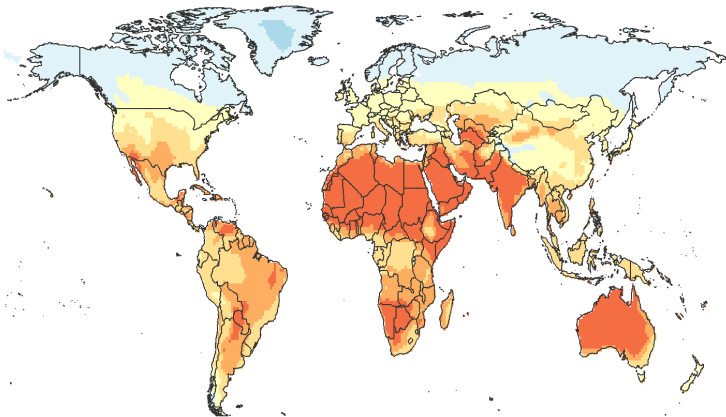


Figure S3. Multimodel average of aridity categories for SSP 2-4.5, 3-7.0 and 5-8.5

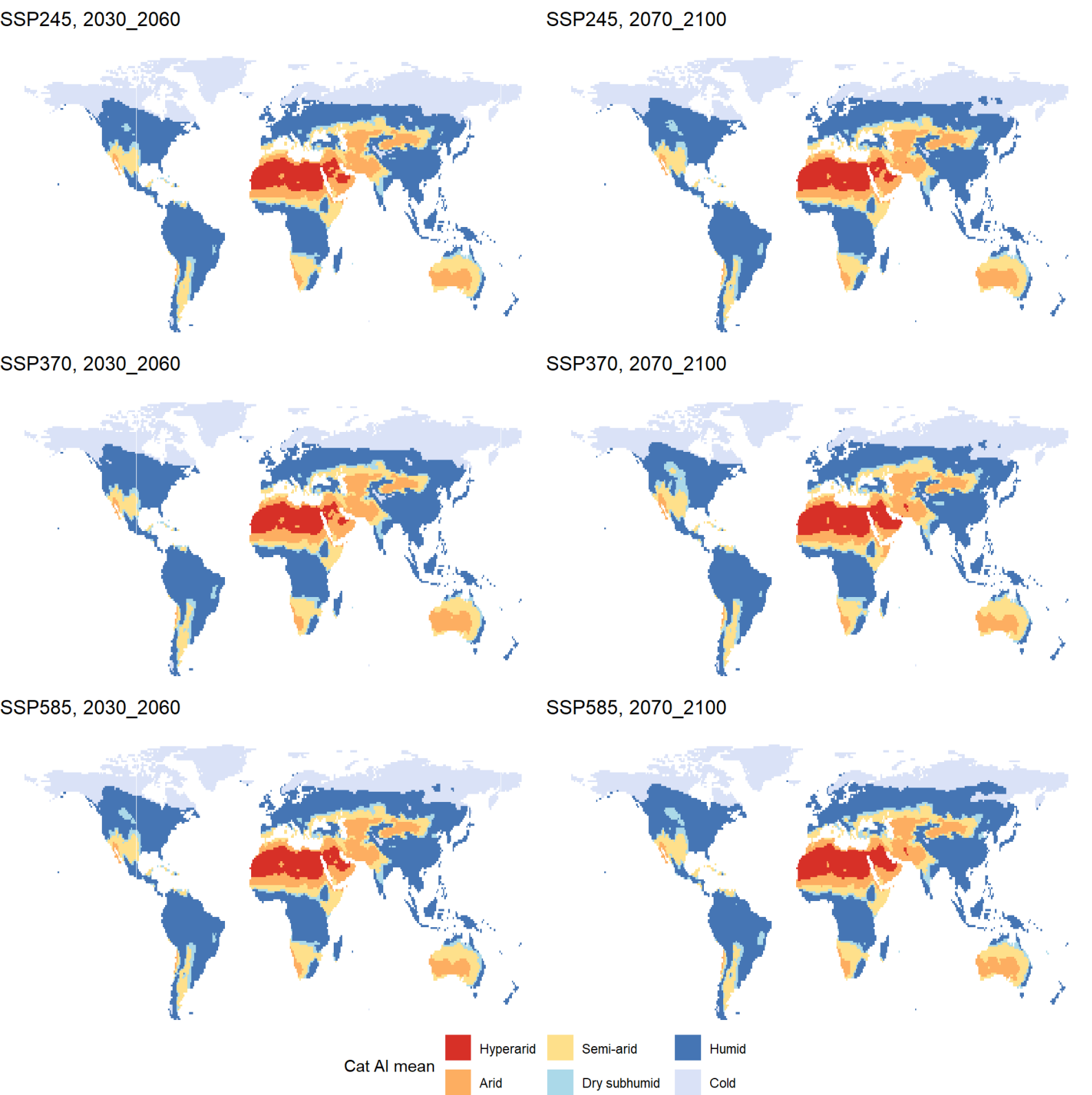
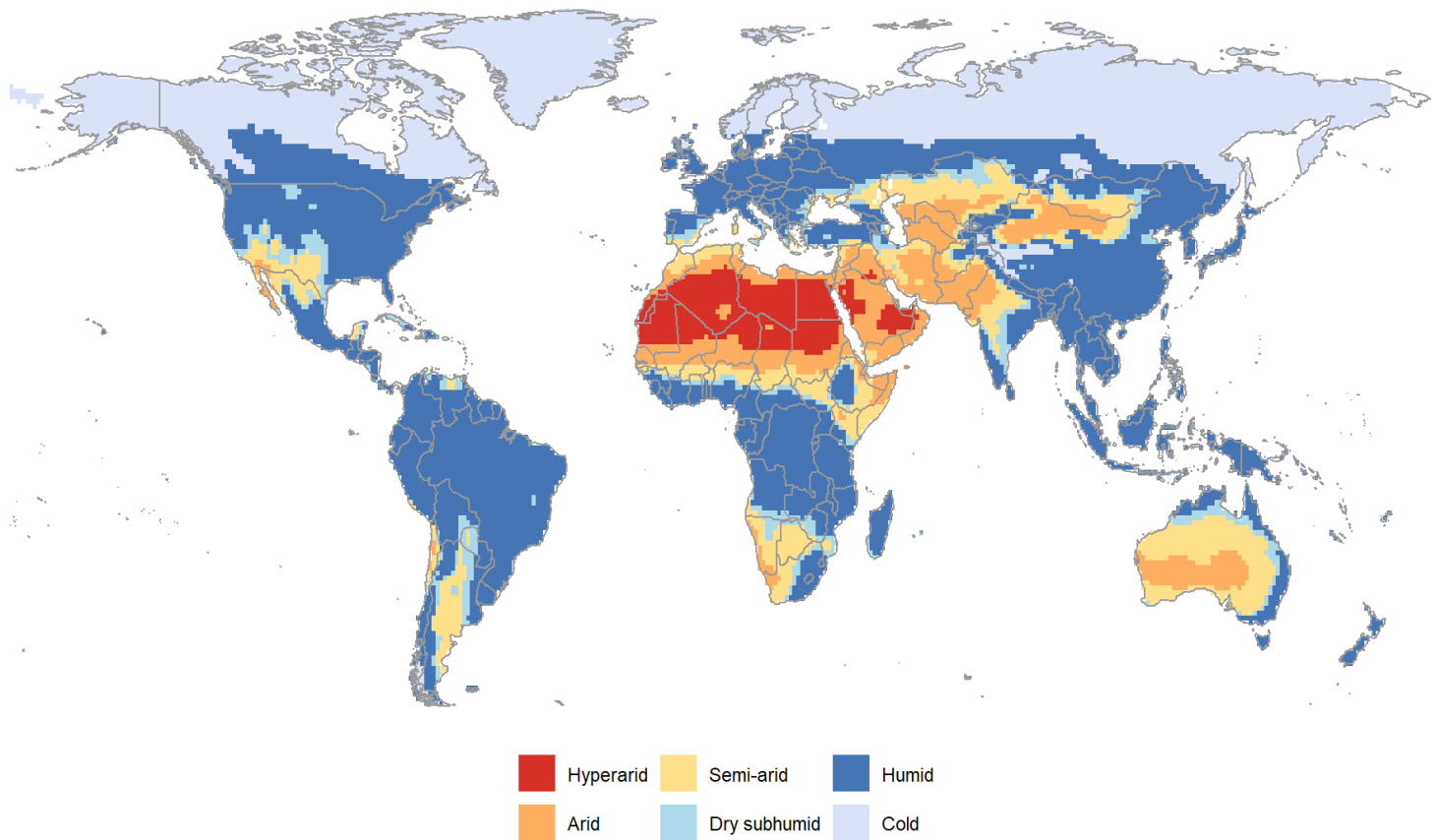


Figure S4. Aridity categories for reference period 1970-2000 and for the extreme case scenario SSP 5-8.5, period 2070-2100

Category AI 1970-2000



Category AI 2070-2100, SSP 585

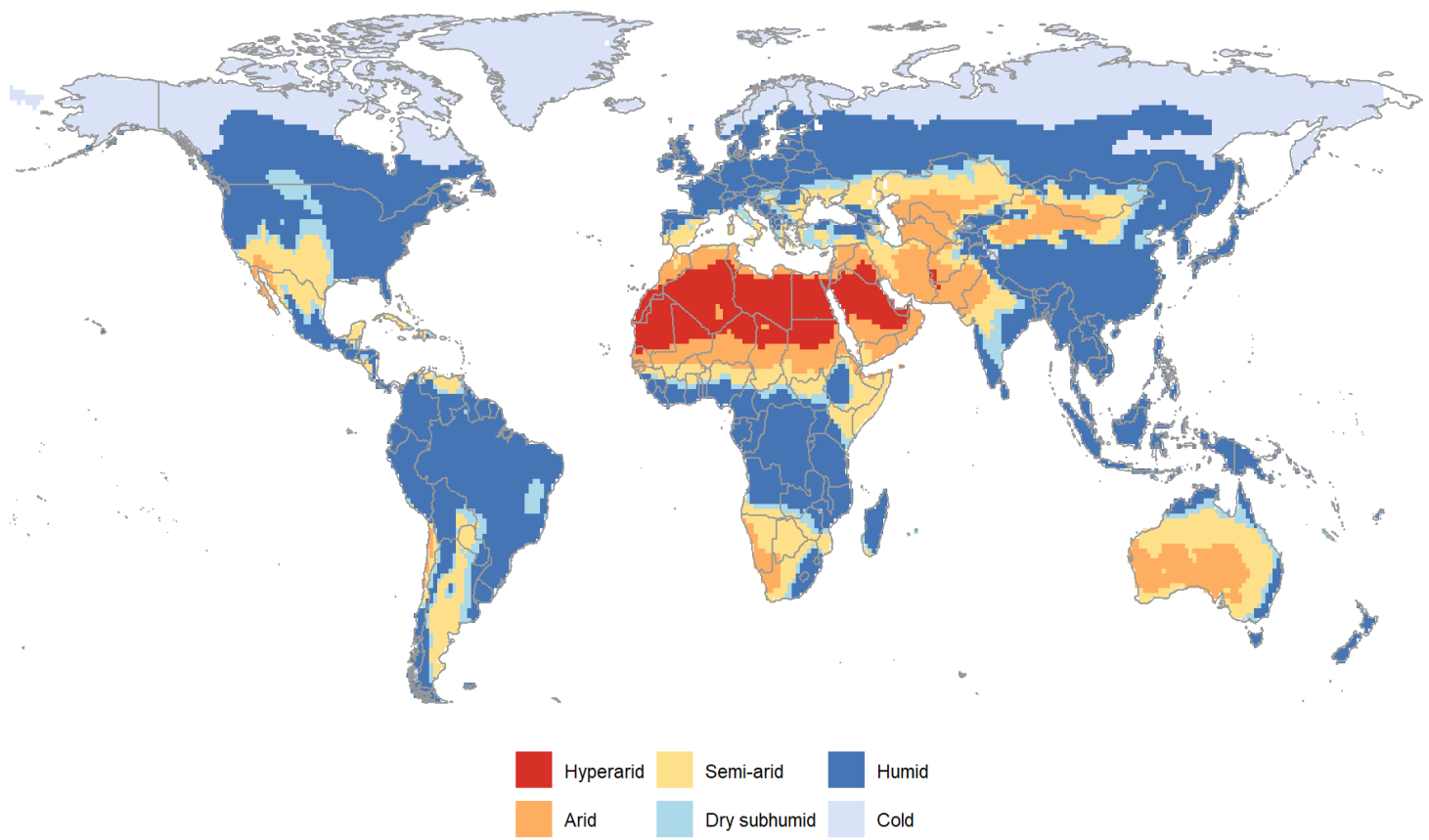
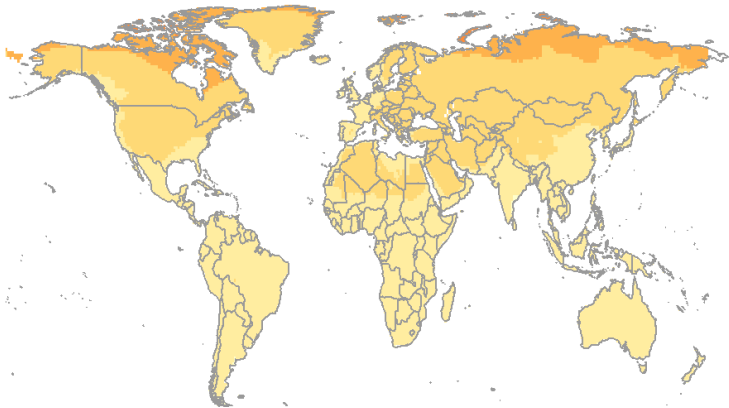
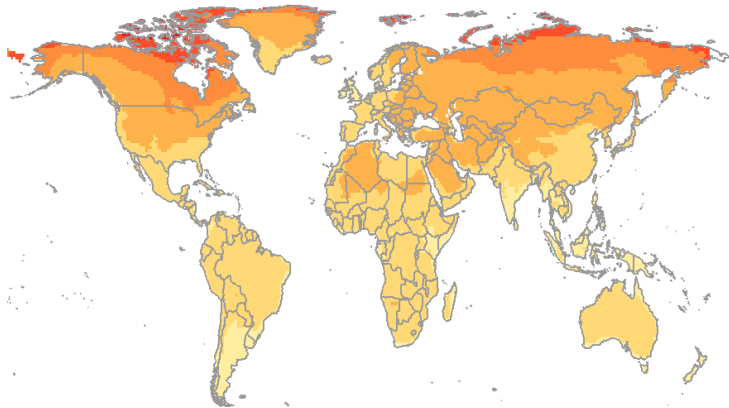


Figure S5. Temperature anomalies compared to reference period 1970-2000, in °C

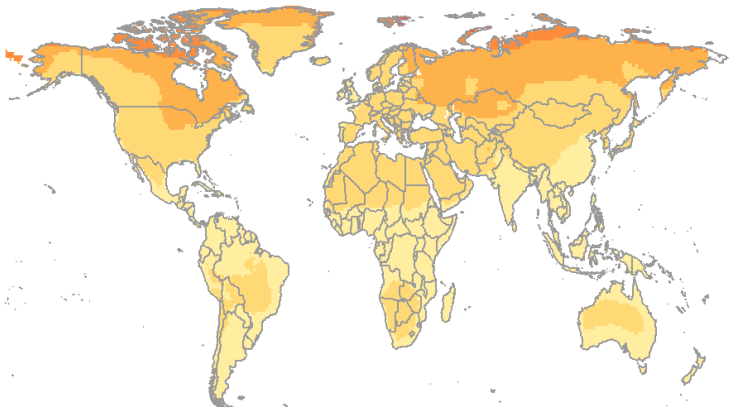
SSP245 , 2030_2060



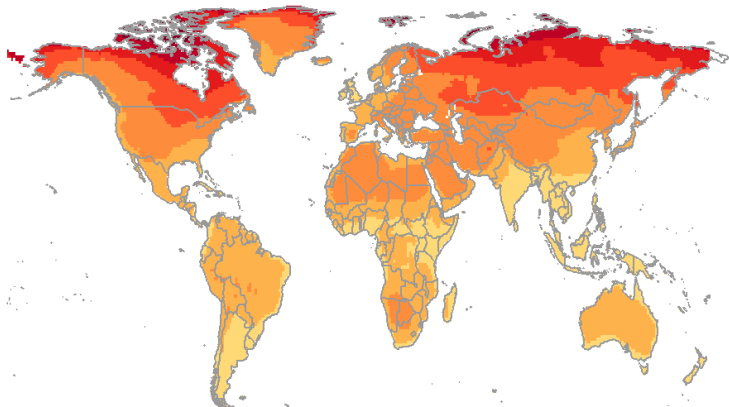
SSP245 , 2070_2100



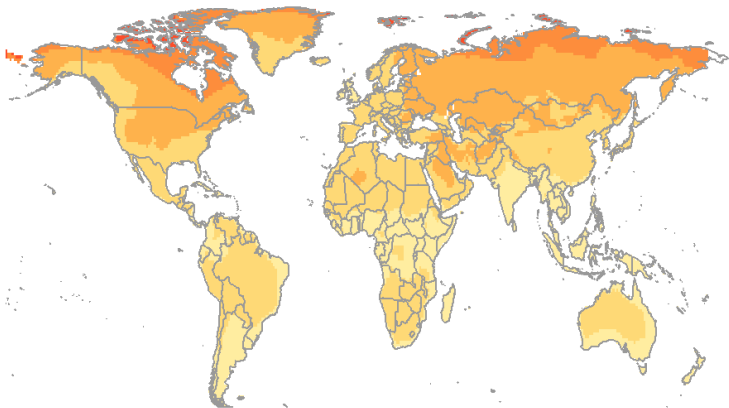
SSP370 , 2030_2060



SSP370 , 2070_2100



SSP585 , 2030_2060



SSP585 , 2070_2100

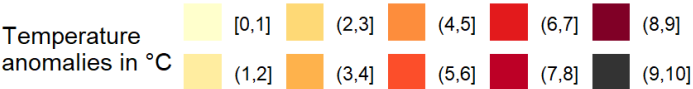
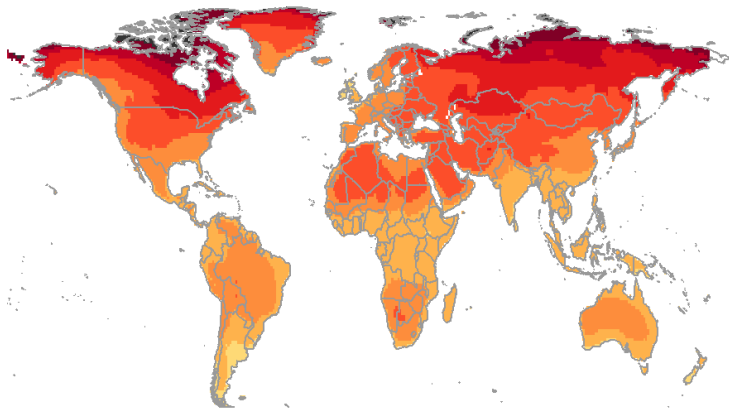
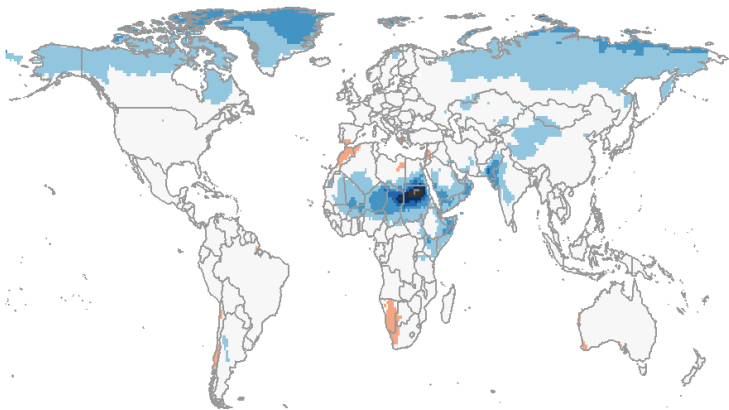
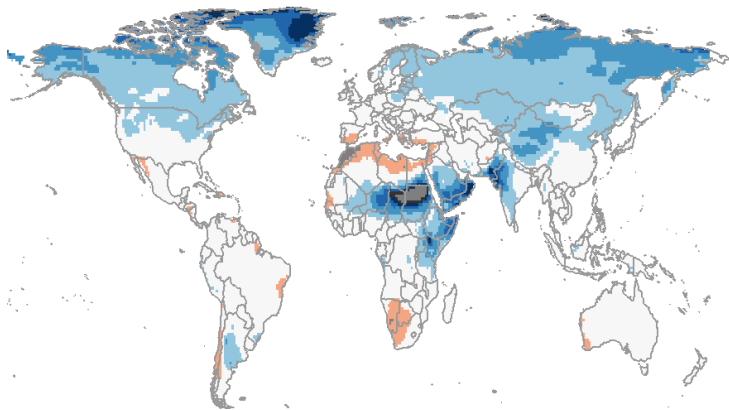


Figure S6. Precipitation anomalies compared to reference period 1970-2000, in %

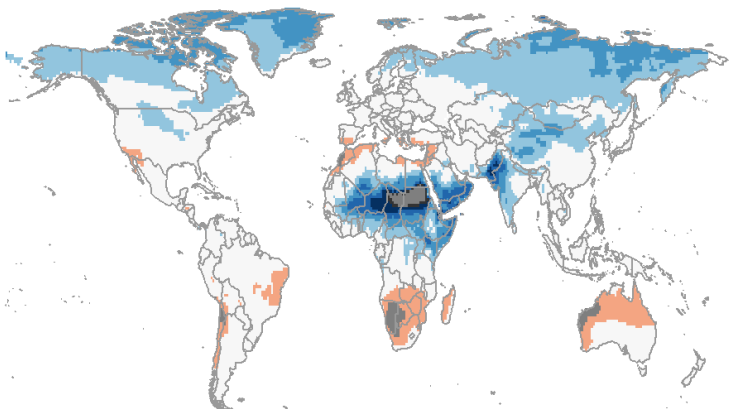
SSP245 , 2030_2060



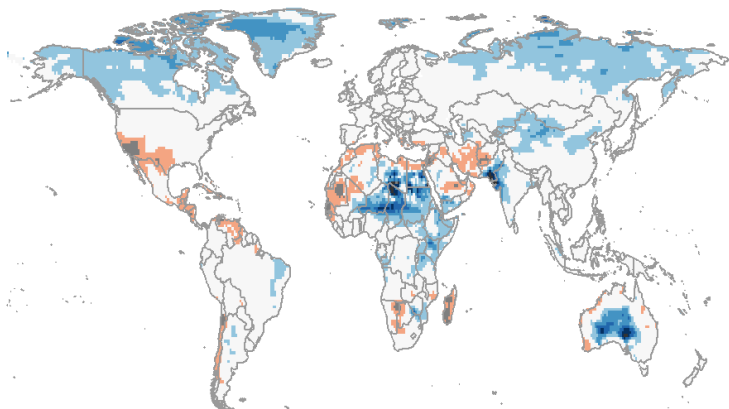
SSP245 , 2070_2100



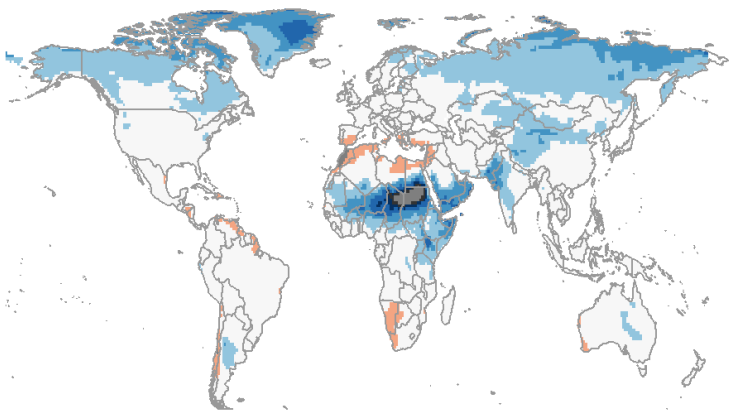
SSP370 , 2030_2060



SSP370 , 2070_2100



SSP585 , 2030_2060



SSP585 , 2070_2100

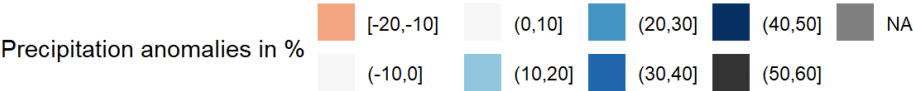
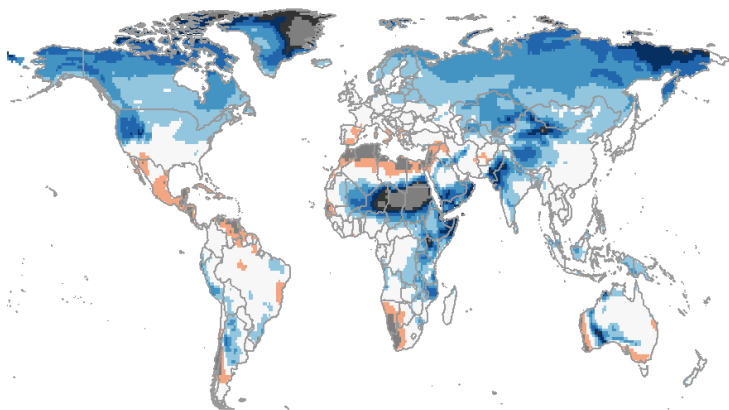


Figure S7. Gridcells changing towards a wetter category compared to 1970-2000 for the SSP 2-4.5, 3-7.0 and 5-8.5

SSP245 , 2030_2060



SSP245 , 2070_2100



SSP370 , 2030_2060



SSP370 , 2070_2100



SSP585 , 2030_2060



SSP585 , 2070_2100

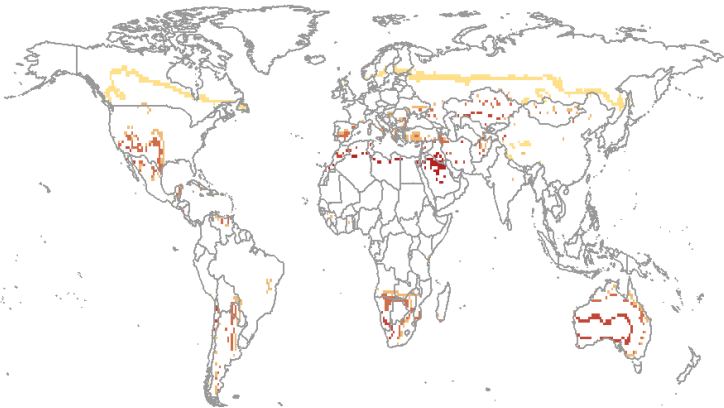


Change of category compared to 1970-2000

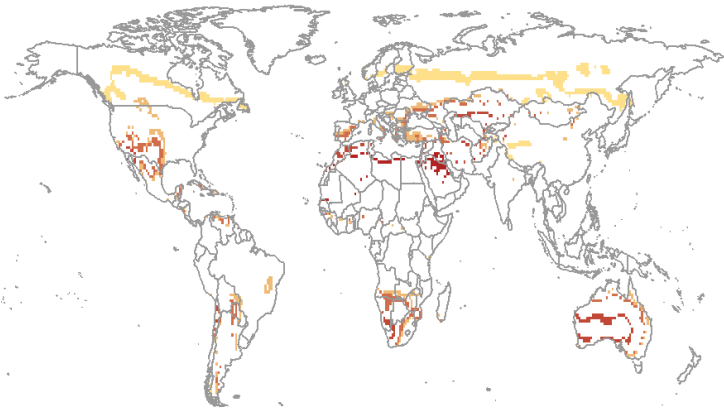
Hyperarid to Arid	Semi-arid to Dry subhumid
Arid to Semi-arid	Dry subhumid to Humid

Figure S8. Gridcells changing towards a dryer category compared to 1970-2000 for the SSP 2-4.5, 3-7.0 and 5-8.5

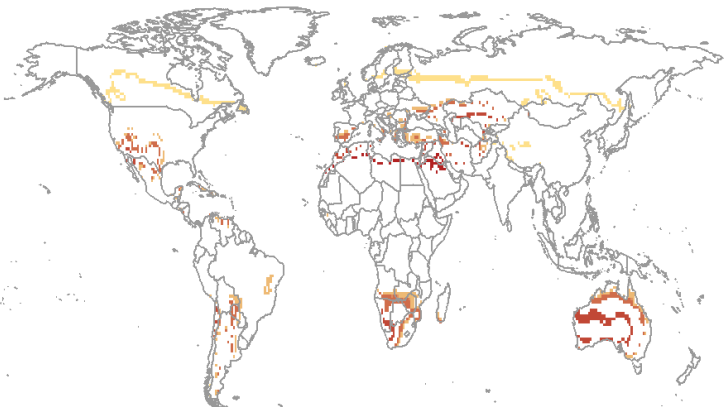
SSP245 , 2030_2060



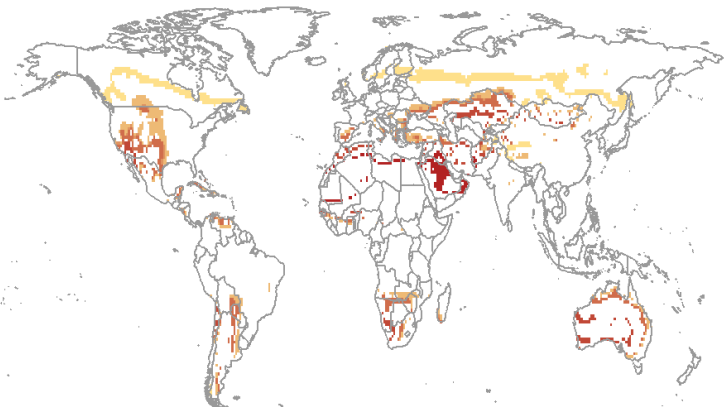
SSP245 , 2070_2100



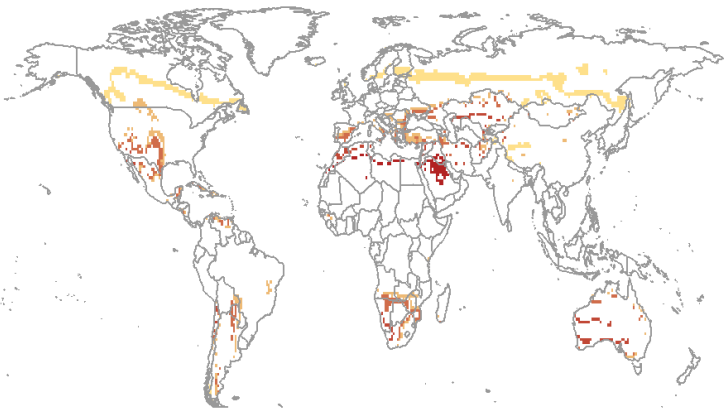
SSP370 , 2030_2060



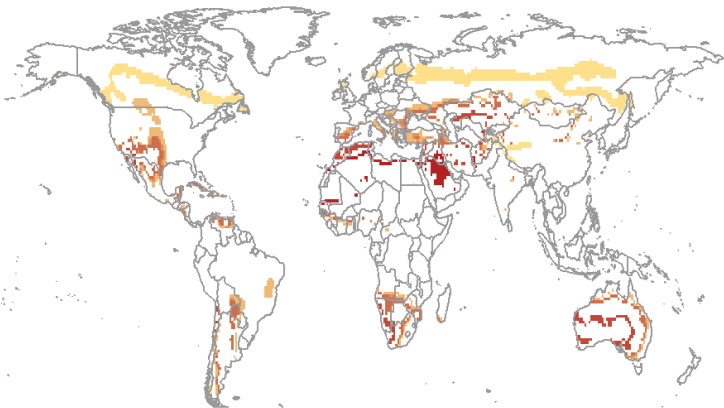
SSP370 , 2070_2100



SSP585 , 2030_2060



SSP585 , 2070_2100



Change of category compared to 1970-2000

Cold to Humid	Humid to Semi-arid	Semi-arid to Arid
Humid to Dry subhumid	Dry subhumid to Semi-arid	Arid to Hyperarid

Figure S9. IPCC regions

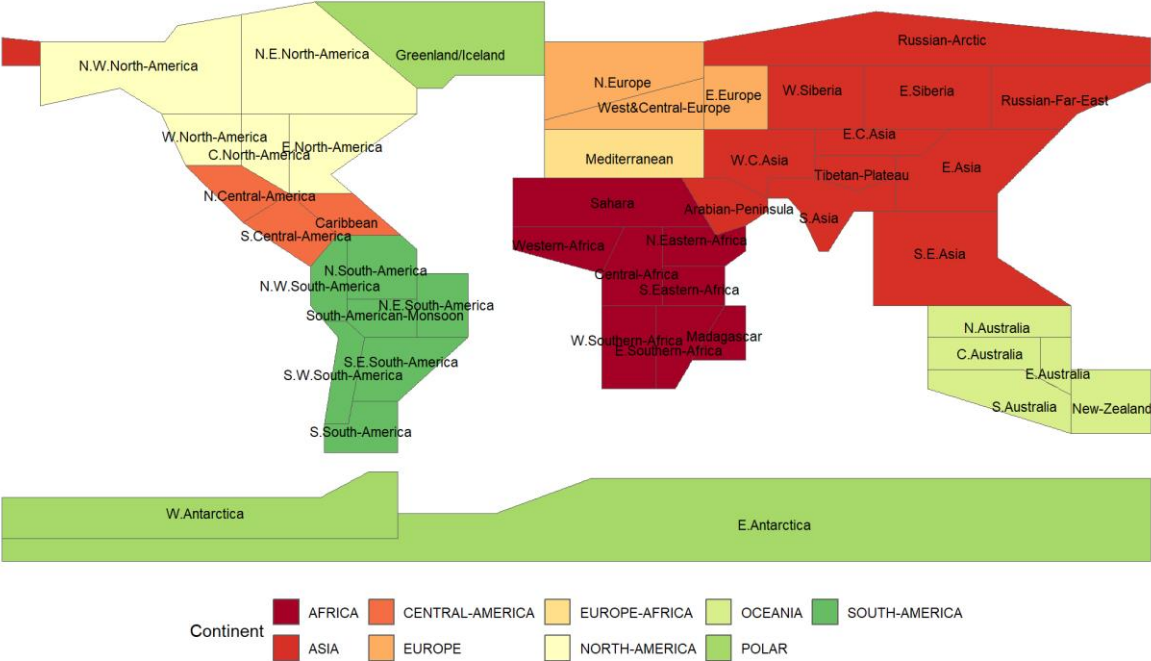


Table S1. Proportion and change of proportion of drylands by Continent and by SSP

		SSP 2 – 4.5	SSP 3 – 7.0	SSP 5 – 8.5
Africa	Proportion in the reference period 1970-2000, in %	64.9 ± 7.32		
	Proportion for the period 2070-2100, in %	68.7 ± 7.8	68.4 ± 6.89	69.2 ± 12.58
	Change, in %	3.8 ± 10.7 %	3.5 ± 10.1	4.3 ± 14.6
Asia	Proportion in the reference period 1970-2000, in %	28.5 ± 3.33		
	Proportion for the period 1970-2100, in %	29.9 ± 3.56	30.5 ± 3.09	32.5 ± 5.86
	Change, in %	1.4 ± 4.9	2 ± 4.5	4 ± 6.7
Central America	Proportion in the reference period 1970-2000, in %	52.8 ± 11.64		
	Proportion for the period 1970-2100, in %	64.8 ± 12.84	68.7 ± 13.21	73.1 ± 13.72
	Change, in %	12 ± 17.3	15.9 ± 17.6	20.3 ± 18
Europe	Proportion in the reference period 1970-2000, in %	14.3 ± 4.12		
	Proportion for the period 1970-2100, in %	17.4 ± 5.44	20.9 ± 7.1	20.2 ± 6.36
	Change, in %	3.1 ± 6.8	6.6 ± 8.2	5.9 ± 7.6
Europe-Africa	Proportion in the reference period 1970-2000, in %	66.7 ± 14.24		
	Proportion for the period 1970-2100, in %	77 ± 13.61	77.5 ± 14.81	80.2 ± 14.82
	Change, in %	10.3 ± 19.7	10.8 ± 20.5	13.5 ± 20.6
North-America	Proportion in the reference period 1970-2000, in %	8.9 ± 5.02		
	Proportion for the period 1970-2100, in %	12 ± 5.87	13.7 ± 4.53	13.4 ± 6.74
	Change, in %	3.1 ± 7.7	4.8 ± 6.8	4.5 ± 8.4
Oceania	Proportion in the reference period 1970-2000, in %	80.1 ± 31.77		
	Proportion for the period 1970-2100, in %	83.7 ± 25.99	82.8 ± 26.32	83.6 ± 26.16
	Change, in %	3.6 ± 41	2.7 ± 41.3	3.5 ± 41.2
South-America	Proportion in the reference period 1970-2000, in %	23.1 ± 5.05		
	Proportion for the period 1970-2100, in %	31.1 ± 10.78	30.8 ± 8.35	34.3 ± 11
	Change, in %	8 ± 11.9	7.7 ± 9.8	11.2 ± 12.1

Table S2. Proportion of aridity categories by period, model and continent

AFRICA

	period	Hyperarid	Arid	Semi-Arid	Dry subhumid	Sum drylands	Humid	Cold
historical	1850_1880	27.2 ± 4.7	17.1 ± 4.9	15.6 ± 3.6	6.3 ± 1.4	66.2 ± 7.81	33.7 ± 7.1	0 ± 0
historical	1970_2000	26.9 ± 4.7	16.7 ± 4.2	15.1 ± 3.4	6.2 ± 1.5	64.9 ± 7.32	32.8 ± 6.2	2.3 ± 0
historical	1985_2015	26.5 ± 4.8	17.1 ± 4.6	15.4 ± 3.3	6 ± 1.5	65 ± 7.57	32.7 ± 6.3	2.2 ± 0
SSP245	2030_2060	27 ± 4.8	18 ± 4.9	16.5 ± 3.5	6.4 ± 1.7	67.9 ± 7.89	32 ± 7.6	0 ± 0
SSP245	2070_2100	27.9 ± 4.7	17.4 ± 5	17.2 ± 3.4	6.2 ± 1.5	68.7 ± 7.8	31.3 ± 7.9	0 ± 0
SSP370	2030_2060	26 ± 5	16.6 ± 3.6	17.2 ± 1.8	6.8 ± 1	66.6 ± 6.5	32.3 ± 6.7	1.1 ± 0
SSP370	2070_2100	28 ± 3.5	17.6 ± 4.8	16.6 ± 3.1	6.2 ± 1.6	68.4 ± 6.89	30.4 ± 6.4	1.2 ± 0
SSP585	2030_2060	27.1 ± 4.6	17.6 ± 4.8	16.8 ± 3.5	6.3 ± 1.5	67.8 ± 7.66	32.1 ± 7.5	0 ± 0
SSP585	2070_2100	29.7 ± 10.5	17.3 ± 5.3	16.2 ± 4.2	6 ± 1.5	69.2 ± 12.58	30.9 ± 8.6	0 ± 0

Figure S10. Percent change of Aridity index in Africa

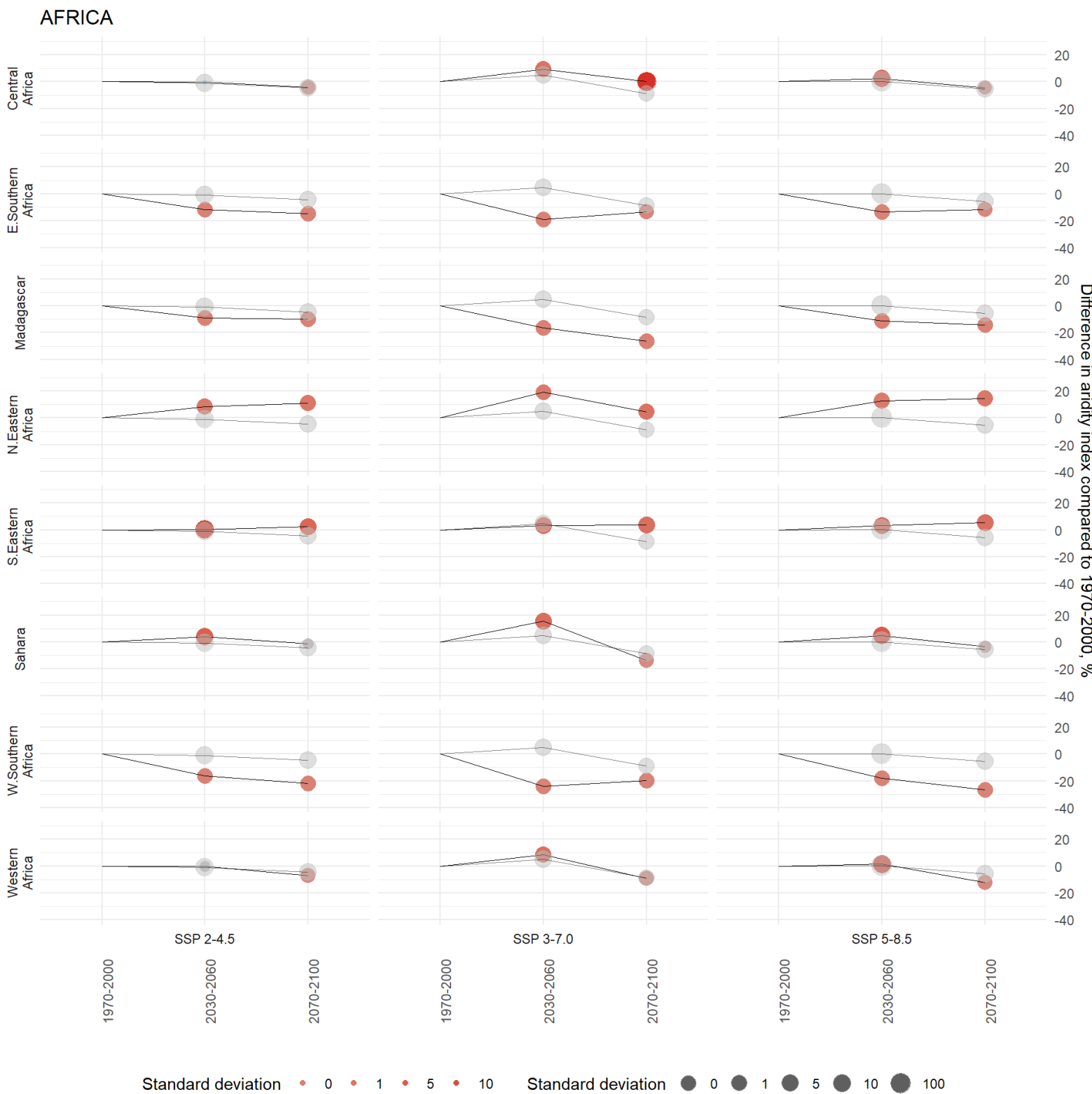


Table S3. Proportion of aridity categories by period, model and continent

NORTH AMERICA

model	period	Hyperarid	Arid	Semi-Arid	Dry subhumid	Sum drylands	Humid	Cold
historical	1850–1880	0 ± 0	0.4 ± 0.2	5.8 ± 5.6	4.3 ± 2.6	10.5 ± 6.18	35.1 ± 9	54.2 ± 10.9
historical	1970–2000	0 ± 0	0.4 ± 0.2	4.3 ± 4.4	4.2 ± 2.4	8.9 ± 5.02	34.5 ± 9.8	56.5 ± 11.7
historical	1985–2015	0 ± 0	0.3 ± 0.2	4.6 ± 3.8	4.1 ± 2.2	9 ± 4.4	33.6 ± 10.3	57.2 ± 11.5
SSP245	2030–2060	0 ± 0	0.4 ± 0.3	6.5 ± 5.5	4.7 ± 2.6	11.6 ± 6.09	37.5 ± 8.7	50.8 ± 11.1
SSP245	2070–2100	0 ± 0	0.5 ± 0.3	6.4 ± 5.1	5.1 ± 2.9	12 ± 5.87	39.7 ± 9	48.1 ± 11
SSP370	2030–2060	0 ± 0	0.5 ± 0.4	5.9 ± 4.8	4.6 ± 2.7	11 ± 5.52	37 ± 9.7	51.8 ± 12.2
SSP370	2070–2100	0.1 ± 0	0.8 ± 0.7	7.6 ± 4	5.2 ± 2	13.7 ± 4.53	38.4 ± 10.6	47.7 ± 11.2
SSP585	2030–2060	0 ± 0	0.5 ± 0.4	6.6 ± 5.2	5.2 ± 2.8	12.3 ± 5.92	38.2 ± 9.1	49.3 ± 11.7
SSP585	2070–2100	0.2 ± 0	1 ± 1.4	7 ± 6.1	5.2 ± 2.5	13.4 ± 6.74	42.1 ± 9.3	44.5 ± 11.3

Figure S11. Percent change of Aridity index in North America

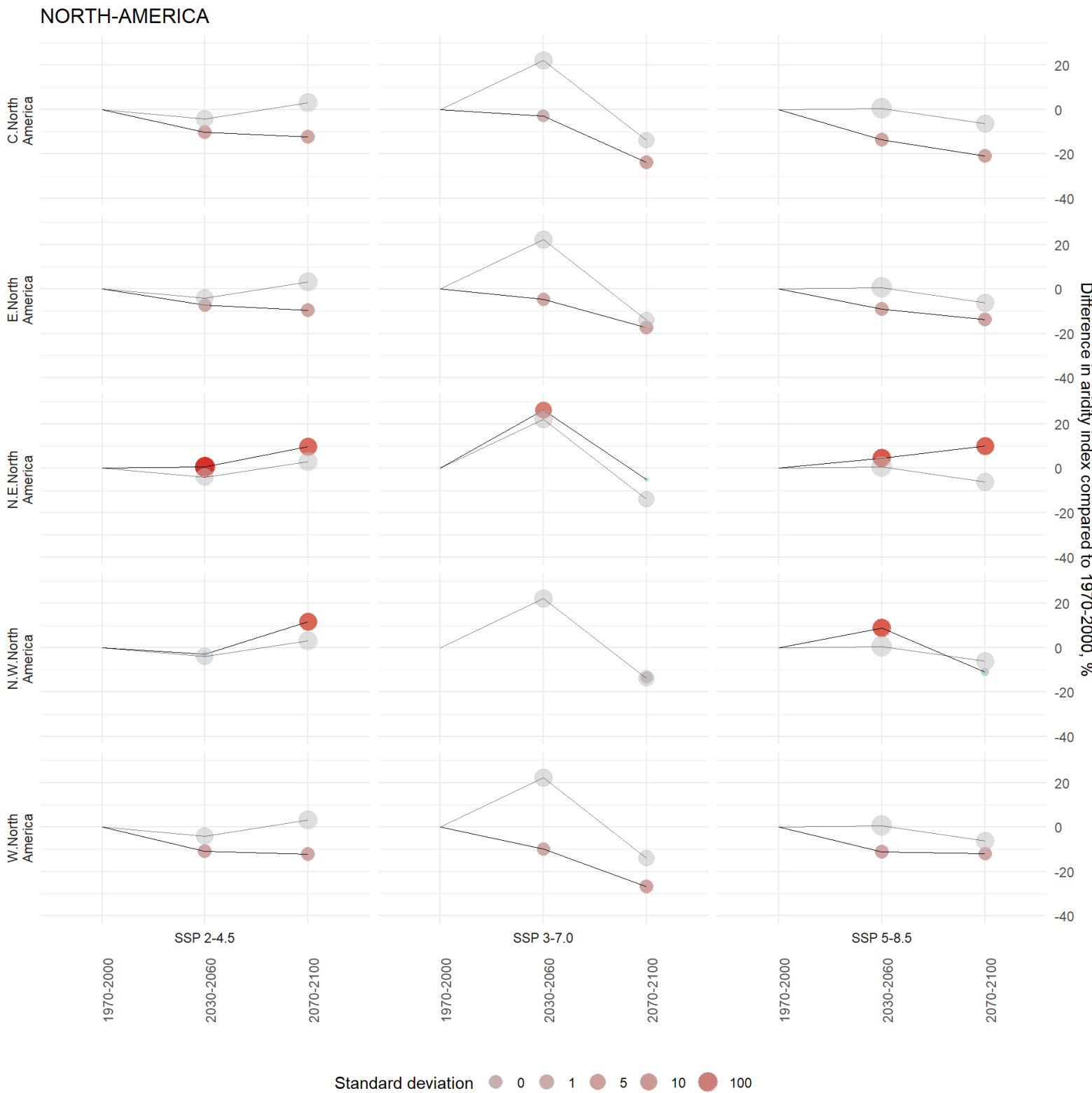


Table S4. Proportion of aridity categories by period, model and continent

CENTRAL AMERICA

model	period	Hyperarid	Arid	Semi-Arid	Dry subhumid	Sum drylands	Humid	Cold
historical	1850_1880	0 ± 0	8.4 ± 3.6	30.1 ± 5.1	16.1 ± 8.7	54.6 ± 10.71	45 ± 6.1	0 ± 0
historical	1970_2000	0 ± 0	8.4 ± 4.1	29.7 ± 7.6	14.7 ± 7.8	52.8 ± 11.64	44.9 ± 12	2 ± 0
historical	1985_2015	0 ± 0	9 ± 4.2	30.7 ± 7	14.8 ± 7.4	54.5 ± 11.02	43.8 ± 11.5	1.4 ± 0
SSP245	2030_2060	0 ± 0	11.9 ± 6.2	36.3 ± 8	13.9 ± 6.2	62.1 ± 11.87	37.6 ± 8.6	0 ± 0
SSP245	2070_2100	0 ± 0	12.3 ± 5.5	38.1 ± 8.5	14.4 ± 7.9	64.8 ± 12.84	34.8 ± 8.6	0 ± 0
SSP370	2030_2060	0 ± 0	12.6 ± 6.3	31.4 ± 7.1	15 ± 7.9	59 ± 12.35	40.7 ± 11.8	0 ± 0
SSP370	2070_2100	4 ± 5.2	16 ± 5.5	35.5 ± 9.5	13.2 ± 5.2	68.7 ± 13.21	30.9 ± 10.6	0 ± 0
SSP585	2030_2060	0 ± 0	13 ± 7	37.6 ± 9	14.1 ± 7.1	64.7 ± 13.43	35 ± 9.4	0 ± 0
SSP585	2070_2100	2 ± 2.4	16.6 ± 8	41.2 ± 7.7	13.3 ± 7.7	73.1 ± 13.72	26.6 ± 8.8	0 ± 0

Figure S12. Percent change of Aridity index in Central America

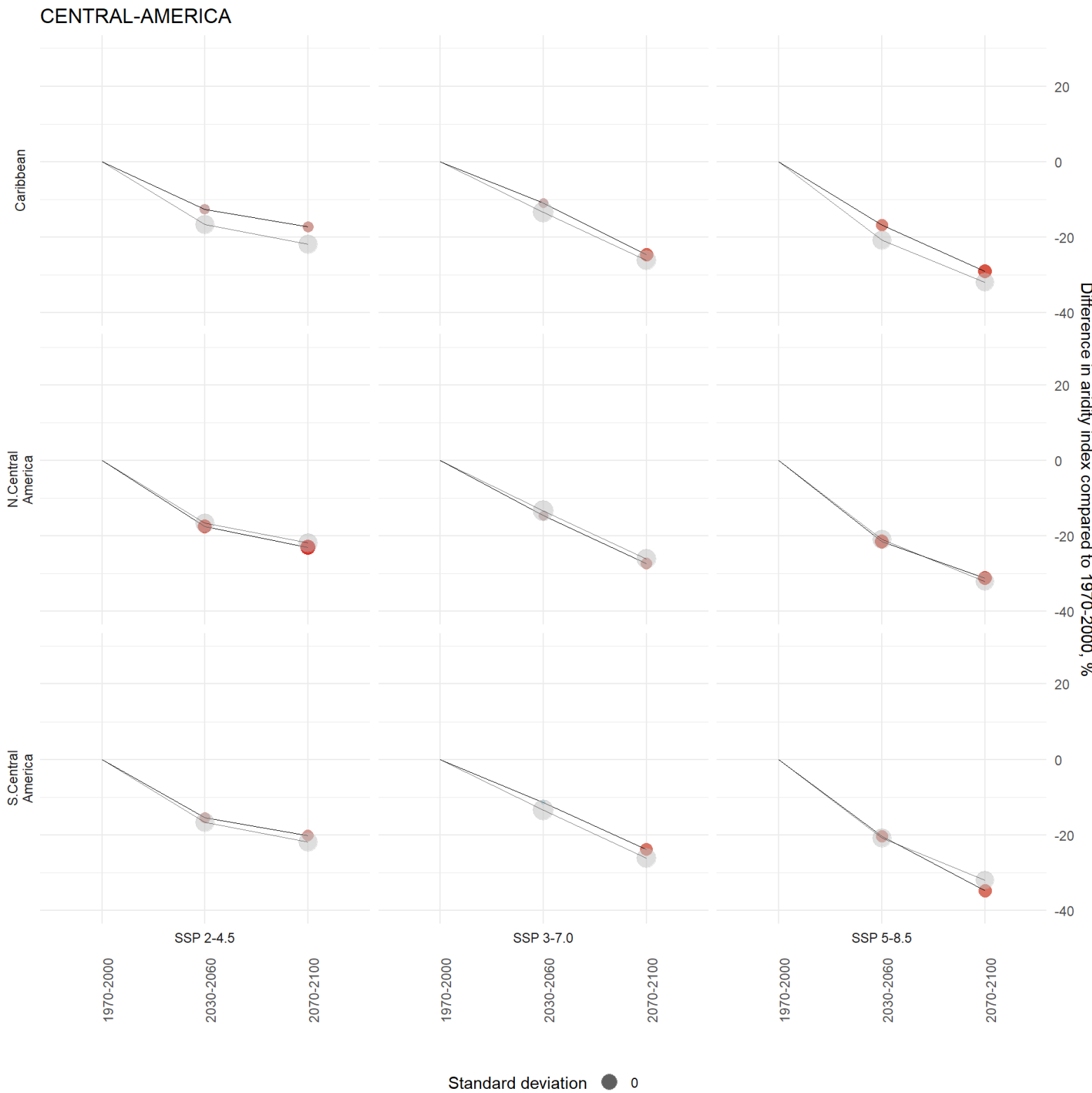


Table S5. Proportion of aridity categories by period, model and continent

SOUTH AMERICA

model	period	Hyperarid	Arid	Semi-Arid	Dry subhumid	Sum drylands	Humid	Cold
historical	1850_1880	0.1 ± 0.1	2.1 ± 1.7	15.2 ± 8.7	7.4 ± 2.6	24.8 ± 9.24	73.2 ± 11.7	1.9 ± 1
historical	1970_2000	0.1 ± 0.1	1.8 ± 1.3	13.9 ± 4.3	7.3 ± 2.3	23.1 ± 5.05	74.5 ± 7.3	2.3 ± 2.6
historical	1985_2015	0.2 ± 0.1	2 ± 1.2	14.5 ± 5.1	7.5 ± 2.4	24.2 ± 5.76	73.6 ± 7.7	2.1 ± 2.6
SSP245	2030_2060	0.2 ± 0.2	2.7 ± 2.2	17.4 ± 9.6	8.8 ± 3.6	29.1 ± 10.49	69.4 ± 13.1	1.3 ± 0.9
SSP245	2070_2100	0.2 ± 0.1	3.3 ± 3.5	18.3 ± 9.1	9.3 ± 4.6	31.1 ± 10.78	67.5 ± 14.7	1.3 ± 0.7
SSP370	2030_2060	0.2 ± 0.1	2.2 ± 1.7	16.3 ± 5.5	8.8 ± 3.7	27.5 ± 6.84	70.5 ± 8.9	1.9 ± 1.6
SSP370	2070_2100	0.2 ± 0.1	3.3 ± 2.5	18.6 ± 7	8.7 ± 3.8	30.8 ± 8.35	67.3 ± 10.8	1.8 ± 1.8
SSP585	2030_2060	0.2 ± 0.1	3.1 ± 2.5	18.6 ± 9	9.2 ± 4.4	31.1 ± 10.33	67.6 ± 13.1	1.2 ± 0.8
SSP585	2070_2100	0.6 ± 1	4.4 ± 3.8	19.6 ± 9.5	9.7 ± 3.9	34.3 ± 11	64.4 ± 12.6	1.1 ± 0.7

Figure S13. Percent change of Aridity index in South America

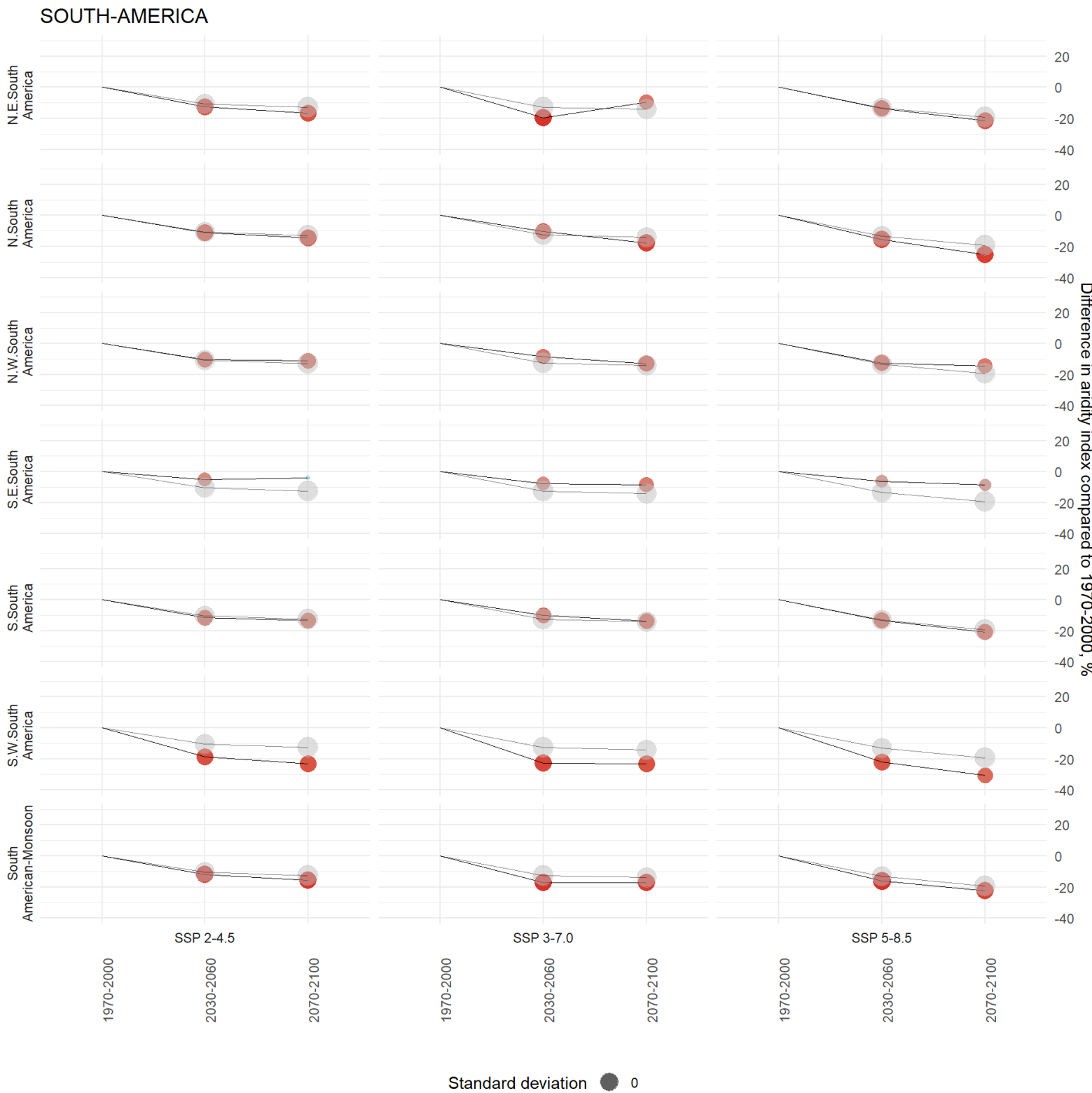


Table S6. Proportion of aridity categories by period, model and continent

EUROPE

model	period	Hyperarid	Arid	Semi-Arid	Dry subhumid	Sum drylands	Humid	Cold
historical	1850–1880	0 ± 0	1.9 ± 1.2	9.6 ± 4.1	4.5 ± 2.8	16 ± 5.11	49 ± 15.3	34.8 ± 20.2
historical	1970–2000	0 ± 0	1.5 ± 1	8.9 ± 3.4	3.9 ± 2.1	14.3 ± 4.12	44.9 ± 16.1	40.6 ± 20.4
historical	1985–2015	0 ± 0	1.3 ± 1	8.4 ± 2.9	3.8 ± 2	13.5 ± 3.66	46 ± 16.1	40.3 ± 19.9
SSP245	2030–2060	0 ± 0	1.9 ± 0.9	10.3 ± 3.6	5.1 ± 1.9	17.3 ± 4.17	52.7 ± 15.4	29.8 ± 19.7
SSP245	2070–2100	0 ± 0	2.2 ± 1.1	10.1 ± 4.8	5.1 ± 2.3	17.4 ± 5.44	55.4 ± 14.4	27 ± 18.6
SSP370	2030–2060	0 ± 0	2.1 ± 1	9.7 ± 4.7	4.8 ± 2.5	16.6 ± 5.42	52.7 ± 15.7	30.4 ± 20
SSP370	2070–2100	0 ± 0	3.1 ± 1.1	11.4 ± 5.9	6.4 ± 3.8	20.9 ± 7.1	52.8 ± 14.3	26 ± 18.6
SSP585	2030–2060	0 ± 0	2.3 ± 1.1	10.5 ± 3.7	4.9 ± 2.4	17.7 ± 4.55	55.2 ± 15.8	26.9 ± 19.9
SSP585	2070–2100	0 ± 0	3 ± 1.7	11.1 ± 5.4	6.1 ± 2.9	20.2 ± 6.36	57.2 ± 12.8	22.5 ± 17.3

Figure S14. Percent change of Aridity index in Europe

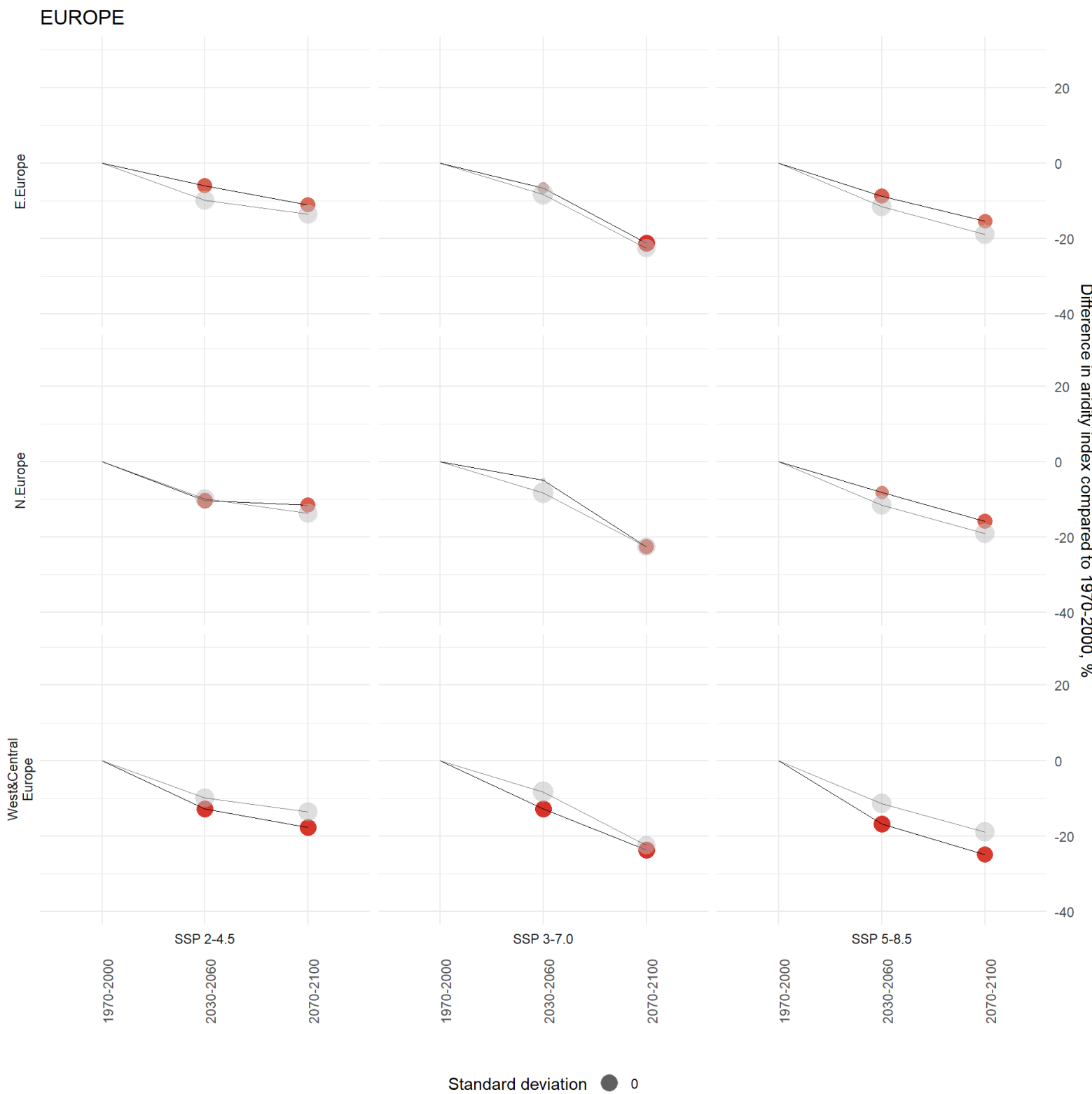


Table S7. Proportion of aridity categories by period, model and continent

MEDITERRANEAN BASIN

model	period	Hyperarid	Arid	Semi-Arid	Dry subhumid	Sum drylands	Humid	Cold
historical	1850–1880	5.9 ± 4.9	23.6 ± 7	21.3 ± 8.8	8.8 ± 3.3	59.6 ± 12.7	24.9 ± 14.2	14.5 ± 0
historical	1970–2000	7 ± 5.5	26.5 ± 7.5	23.3 ± 10.3	9.9 ± 3.2	66.7 ± 14.24	27.5 ± 16.5	4.5 ± 7.5
historical	1985–2015	7.1 ± 5.9	26.3 ± 7.1	22.2 ± 7.7	10.3 ± 4.2	65.9 ± 12.73	27.8 ± 14.3	5.2 ± 7
SSP245	2030–2060	9.9 ± 6.6	28.9 ± 8.6	26.7 ± 8.9	9.4 ± 3.4	74.9 ± 14.43	23.1 ± 16.2	0.9 ± 0
SSP245	2070–2100	11.7 ± 5.7	28.6 ± 8.8	27.2 ± 8.1	9.5 ± 3.1	77 ± 13.61	21.9 ± 13.9	0 ± 0
SSP370	2030–2060	10.3 ± 6.3	28.2 ± 8.4	26 ± 8.7	9 ± 2.8	73.5 ± 13.92	24.8 ± 14	0.5 ± 0
SSP370	2070–2100	13.2 ± 6.2	27.3 ± 8.6	28.3 ± 9.7	8.7 ± 3.6	77.5 ± 14.81	21.2 ± 16.2	0 ± 0
SSP585	2030–2060	11.1 ± 6.4	28.8 ± 8.3	27.5 ± 8.8	8.7 ± 3	76.1 ± 14.01	22.6 ± 14.1	0.2 ± 0
SSP585	2070–2100	15.2 ± 5.7	29.1 ± 10.1	27.9 ± 8.8	8 ± 2.8	80.2 ± 14.82	18.6 ± 13.6	0 ± 0

Figure S15. Percent change of Aridity index in Europe

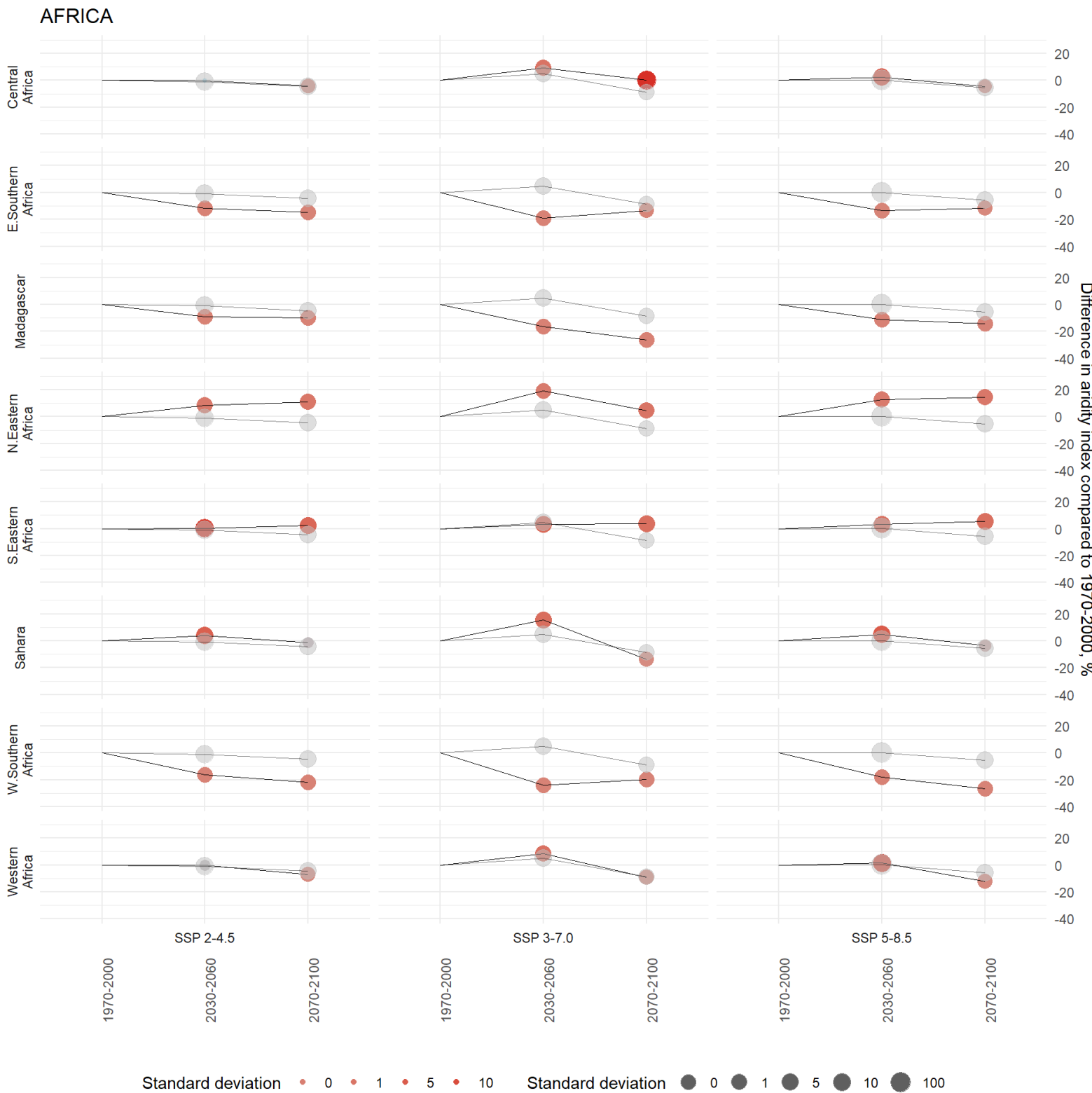


Table S9. Proportion of aridity categories by period, model and continent

ASIA

model	period	Hyperarid	Arid	Semi-Arid	Dry subhumid	Sum drylands	Humid	Cold
historical	1850_1880	3.9 ± 2.3	12.2 ± 1.9	9.2 ± 1.5	4 ± 1.4	29.3 ± 3.62	32.4 ± 7.7	38 ± 9.2
historical	1970_2000	3.8 ± 2.1	12 ± 1.8	8.9 ± 1.5	3.8 ± 1.1	28.5 ± 3.33	30.7 ± 8.5	40.5 ± 9.6
historical	1985_2015	3.7 ± 2.2	11.8 ± 1.6	8.6 ± 1.5	3.7 ± 1.1	27.8 ± 3.3	30.1 ± 7.6	41.8 ± 8.8
SSP245	2030_2060	3.5 ± 1.8	12.5 ± 1.6	9.4 ± 1.6	4.3 ± 1.7	29.7 ± 3.35	34.3 ± 8.1	35.8 ± 9.2
SSP245	2070_2100	3.7 ± 2	12.5 ± 1.7	9.5 ± 1.7	4.2 ± 1.7	29.9 ± 3.56	36.2 ± 8.6	33.7 ± 9.3
SSP370	2030_2060	3.4 ± 2.3	12.4 ± 1.5	8.9 ± 1.7	3.7 ± 1.3	28.4 ± 3.48	34 ± 7.2	37.3 ± 9.5
SSP370	2070_2100	4.6 ± 1.9	12.5 ± 1.5	9.6 ± 1.5	3.8 ± 1.2	30.5 ± 3.09	35.2 ± 9.2	34.1 ± 9.7
SSP585	2030_2060	3.8 ± 2	12.5 ± 1.6	9.5 ± 1.8	4.2 ± 1.6	30 ± 3.52	35.4 ± 8.4	34.4 ± 9.3
SSP585	2070_2100	4.8 ± 3.2	13.1 ± 3.2	10.4 ± 3.4	4.2 ± 1.5	32.5 ± 5.86	36.5 ± 11.7	30.7 ± 9.9

Figure S16. Percent change of Aridity index in Asia

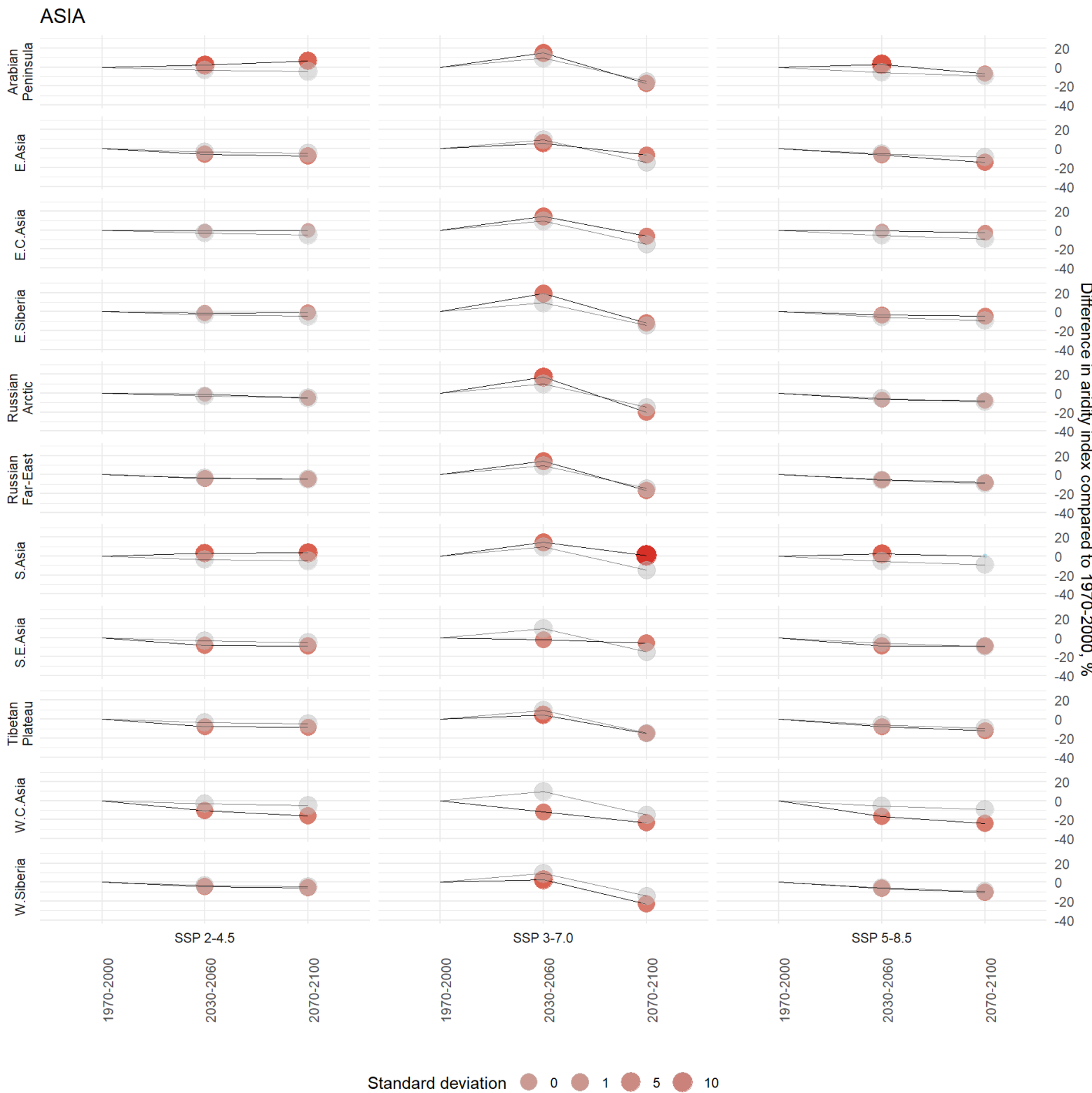


Table S10. Proportion of aridity categories by period, model and continent

OCEANIA

model	period	Hyperarid	Arid	Semi-Arid	Dry subhumid	Sum drylands	Humid	Cold
historical	1850–1880	5.3 ± 0	32 ± 26	36.7 ± 17.1	6.6 ± 3.1	80.6 ± 31.27	18.9 ± 12.5	0.3 ± 0.2
historical	1970–2000	5.2 ± 0	31.3 ± 26.4	36.8 ± 17.4	6.8 ± 3.1	80.1 ± 31.77	19.3 ± 12.8	0.5 ± 0.4
historical	1985–2015	5.2 ± 0	33.4 ± 26.1	35.5 ± 17.9	6.8 ± 3.2	80.9 ± 31.81	18.4 ± 12.3	0.6 ± 0.3
SSP245	2030–2060	10.4 ± 0	35.8 ± 23.5	31.7 ± 15.1	5.7 ± 2.6	83.6 ± 28.05	15.9 ± 11.9	0.3 ± 0.3
SSP245	2070–2100	10.5 ± 0	37.9 ± 22.2	29.1 ± 13.1	6.2 ± 3.3	83.7 ± 25.99	16.2 ± 12	0.1 ± 0
SSP370	2030–2060	10.7 ± 0	34.8 ± 22.6	33.4 ± 15.3	5.8 ± 2.5	84.7 ± 27.41	14.9 ± 8.1	0.3 ± 0.2
SSP370	2070–2100	10.5 ± 10.2	38.1 ± 19.7	28.5 ± 13.8	5.7 ± 3.2	82.8 ± 26.32	16.8 ± 16.3	0.3 ± 0.3
SSP585	2030–2060	5.6 ± 3.6	35.6 ± 25.3	33.8 ± 16.7	6.7 ± 3.6	81.7 ± 30.74	17.7 ± 13.8	0.3 ± 0.3
SSP585	2070–2100	9.3 ± 6.4	39.4 ± 21.7	29.4 ± 12.9	5.5 ± 2.5	83.6 ± 26.16	16.2 ± 12.5	0 ± 0

Figure S17. Percent change of Aridity index in Oceania

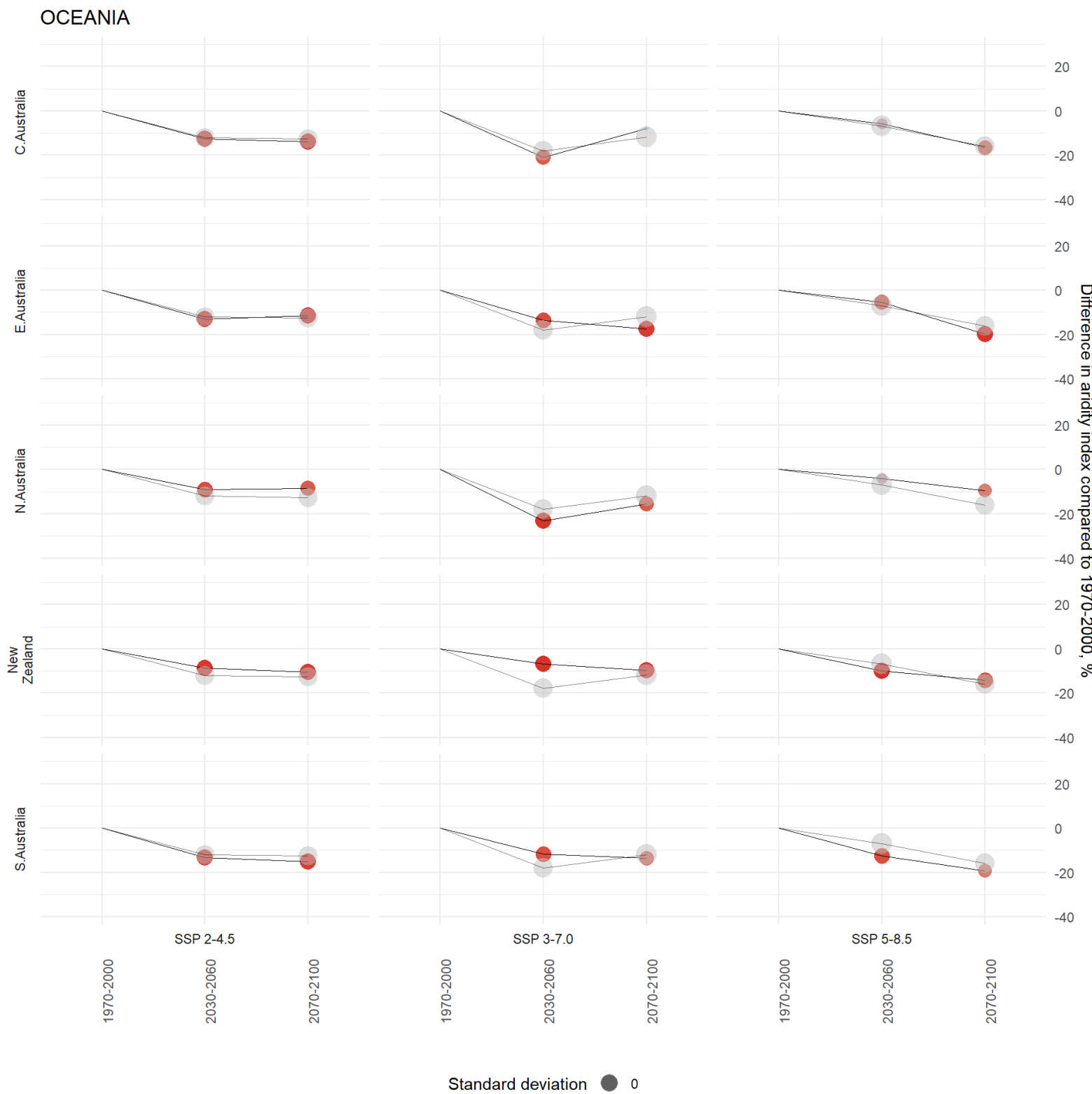
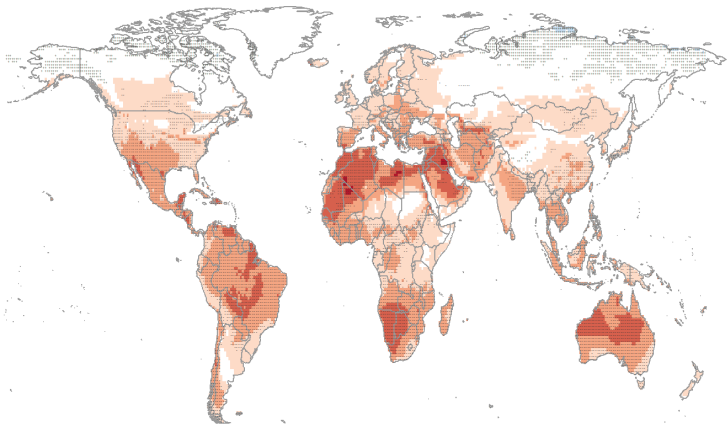
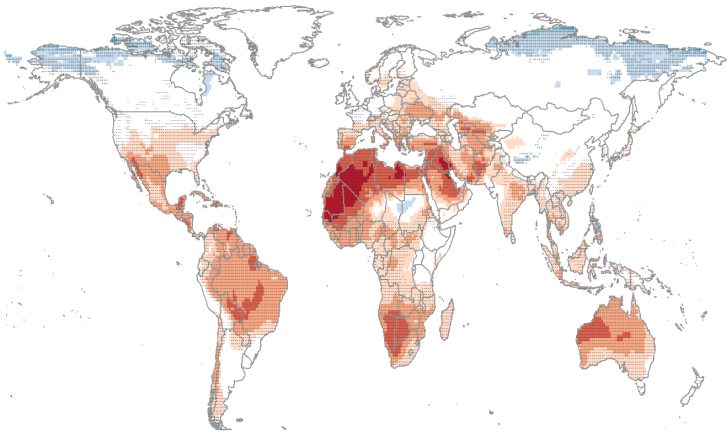


Figure S17. AI changes when using Thornthwaite aridity index

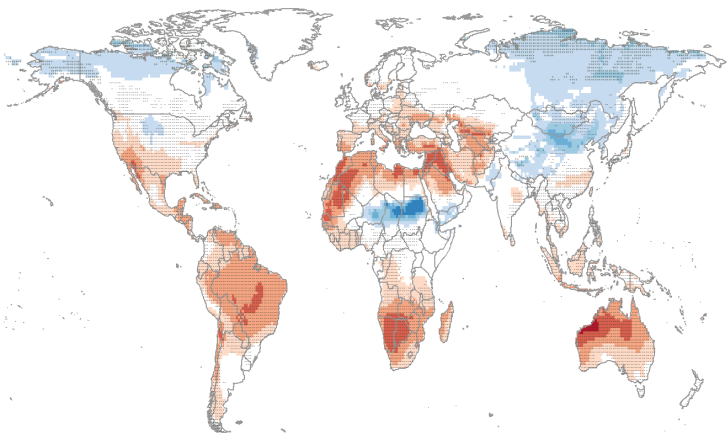
SSP245 , 2030_2060



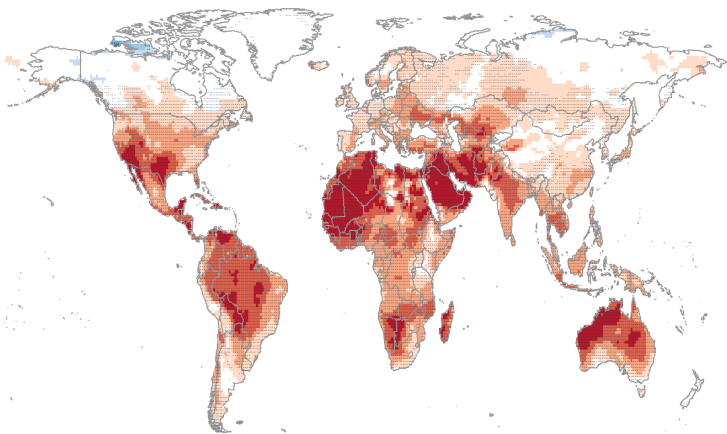
SSP245 , 2070_2100



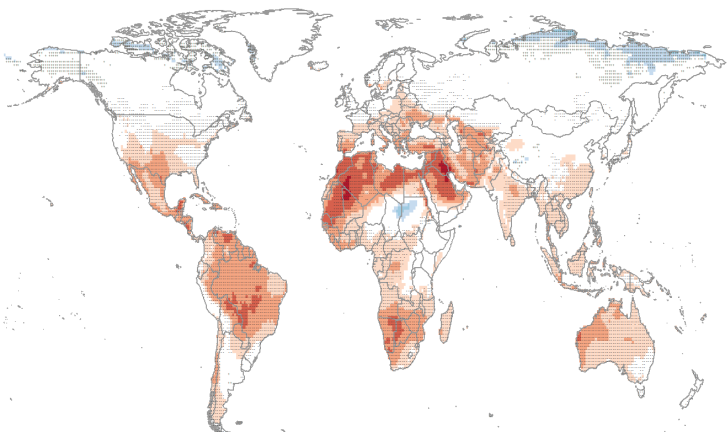
SSP370 , 2030_2060



SSP370 , 2070_2100



SSP585 , 2030_2060



SSP585 , 2070_2100

