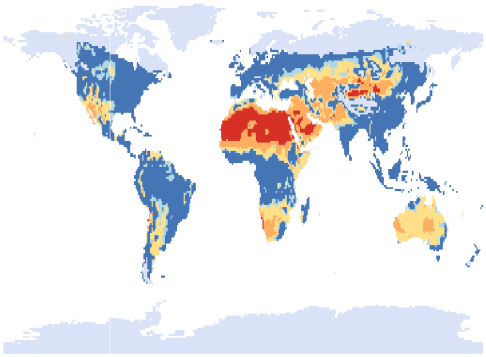
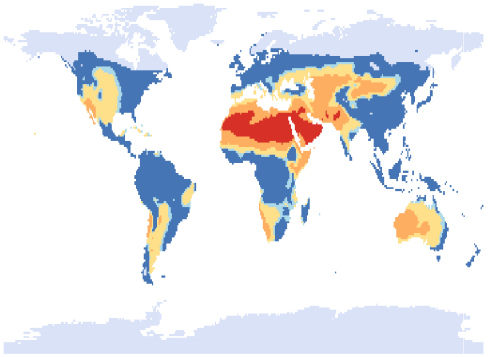
S1. Map of aridity categories for reference period 1970-2000, by CMIP6 source

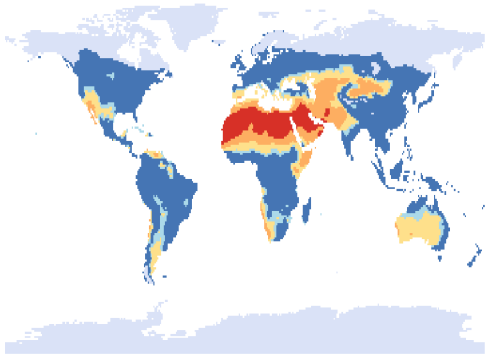
CAS-ESM2, 1970-2000



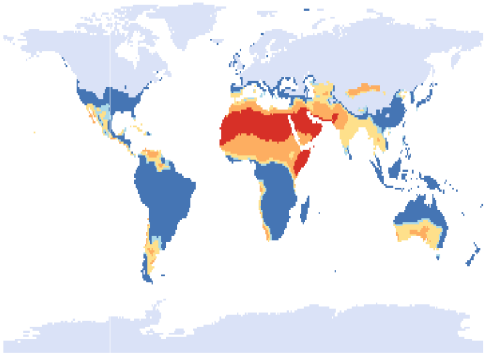
CESM, 1970-2000



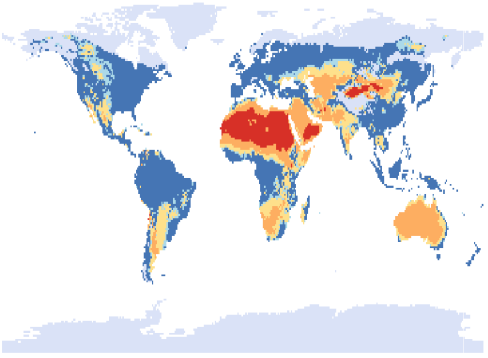
CMCC, 1970-2000



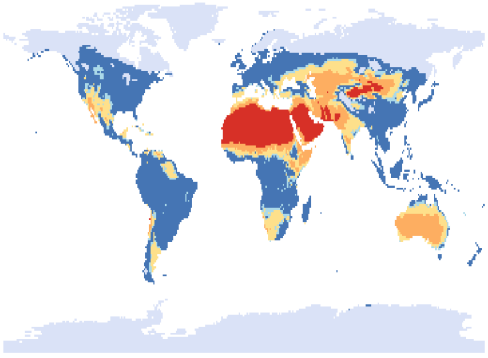
CMCC-ESM2, 1970-2000



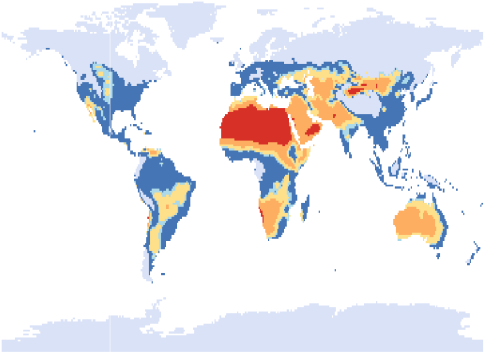
CNRM, 1970-2000



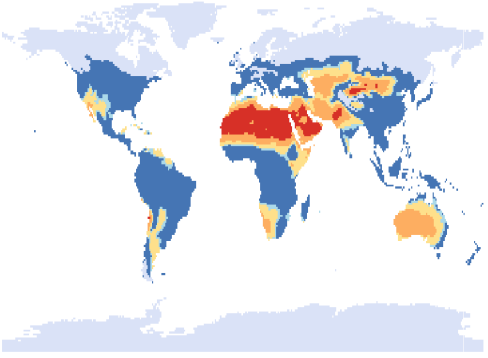
EC-Earth3, 1970-2000



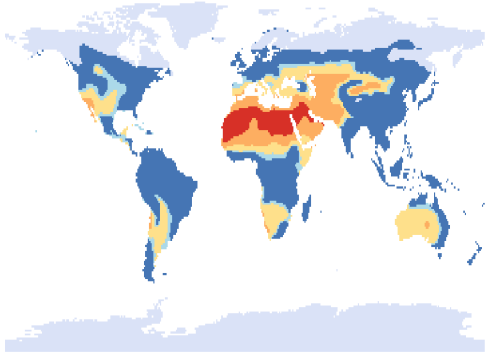
FGOALS, 1970-2000



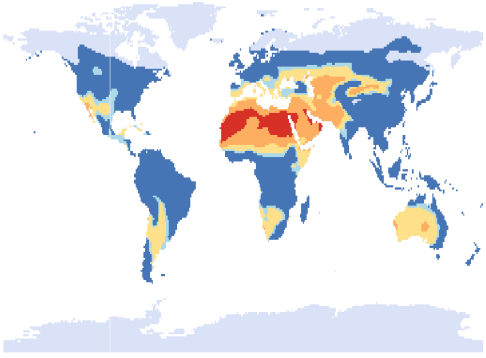
GFDL-ESM4, 1970-2000



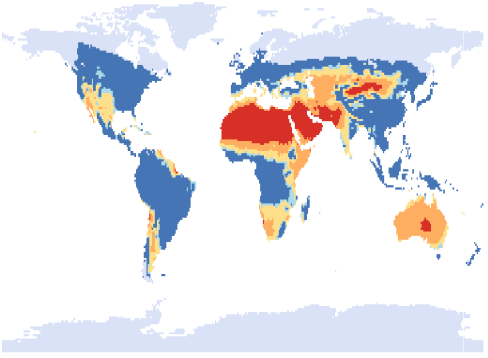
INM, 1970-2000



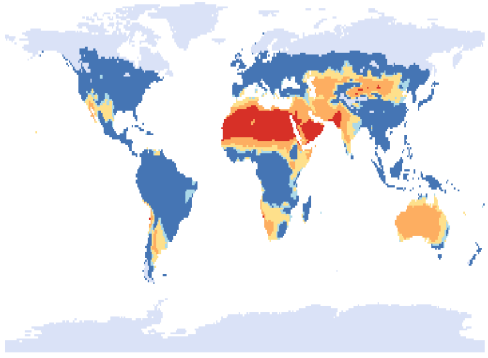
INM-CM5, 1970-2000



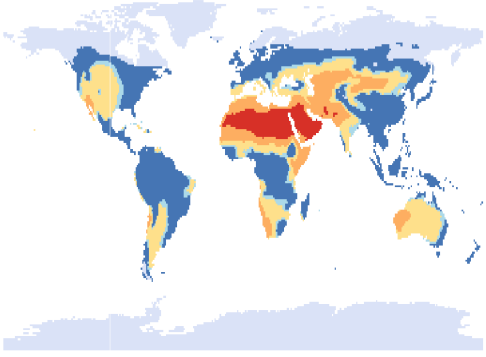
MPI, 1970-2000



MRI, 1970-2000

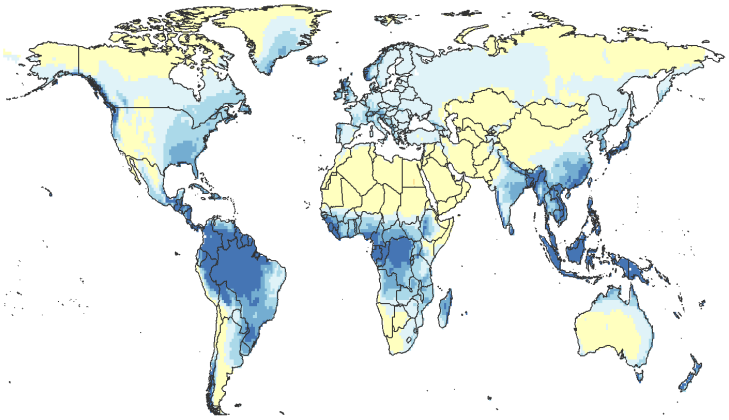


NorESM-2-MM, 1970-2000

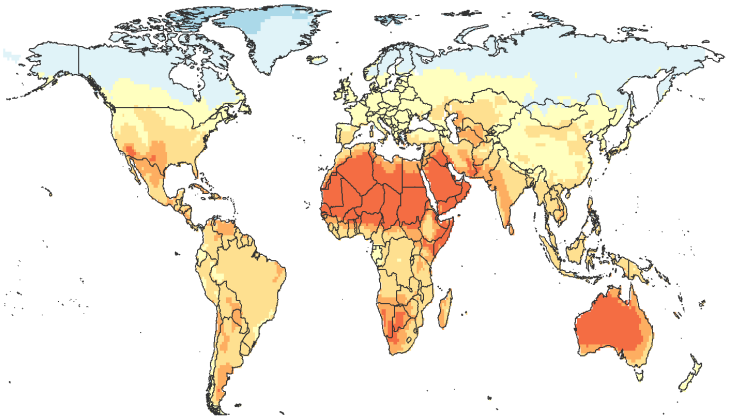


S2. Differences in average annual precipitation and evapotranspiration in Worldclim, ERA5 and CMIP6

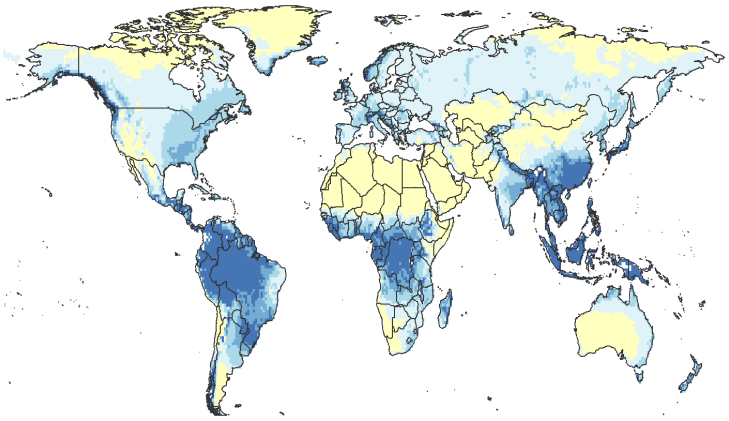
Annual precipitation in Wordclim



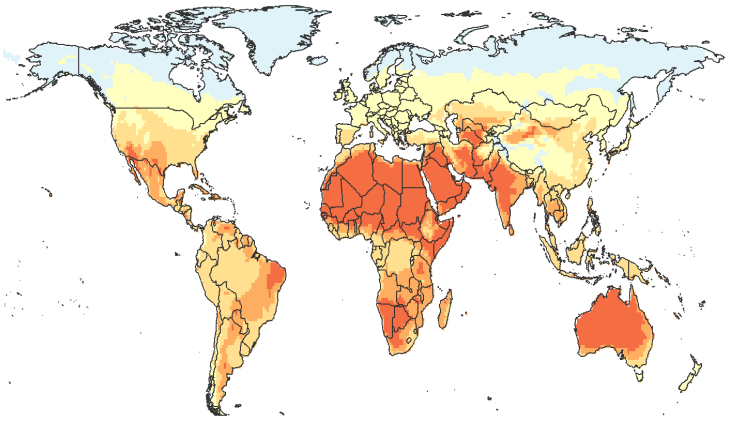
Annual evapotranspiration Wordclim



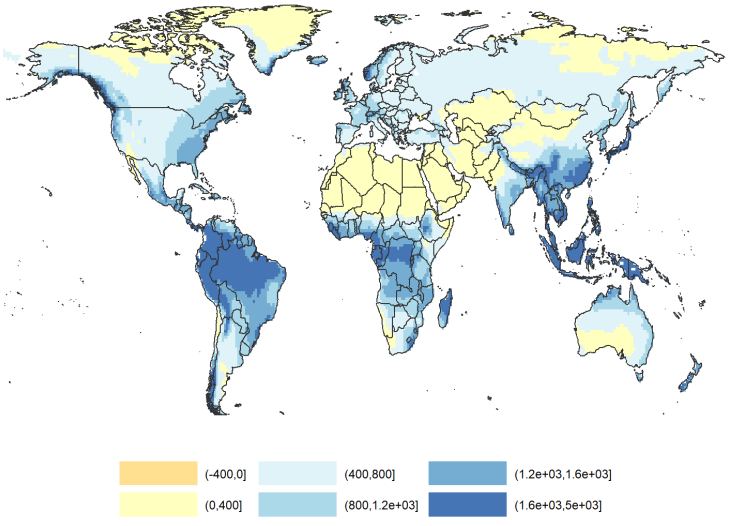
Annual precipitation in ERA5



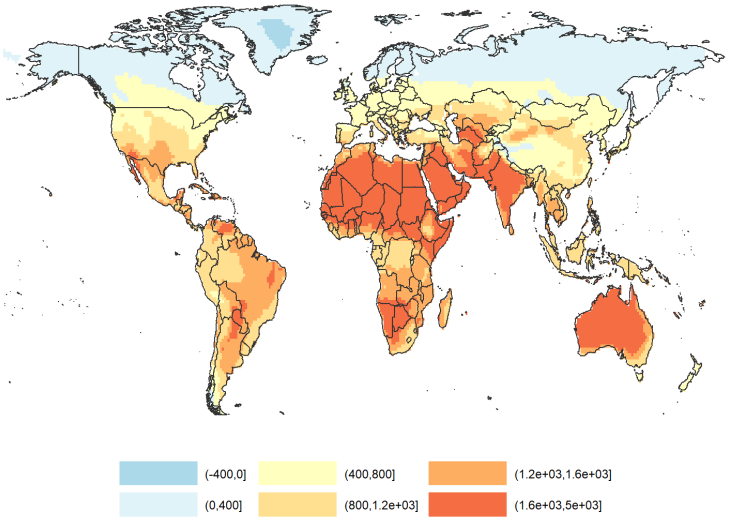
Annual evapotranspiration ERA5



Annual precipitation CMIP6

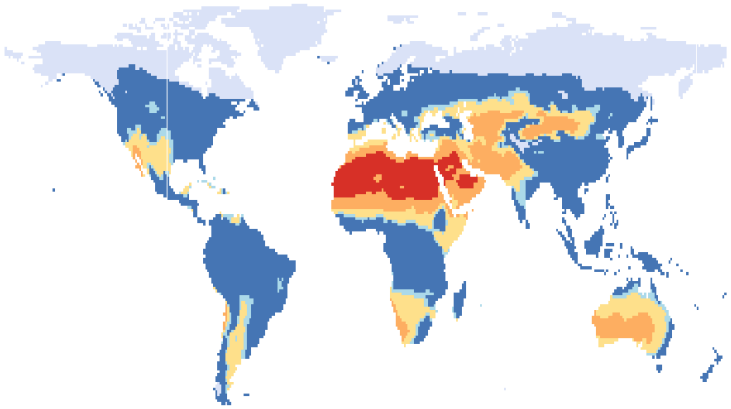


Annual evapotranspiration CMIP6

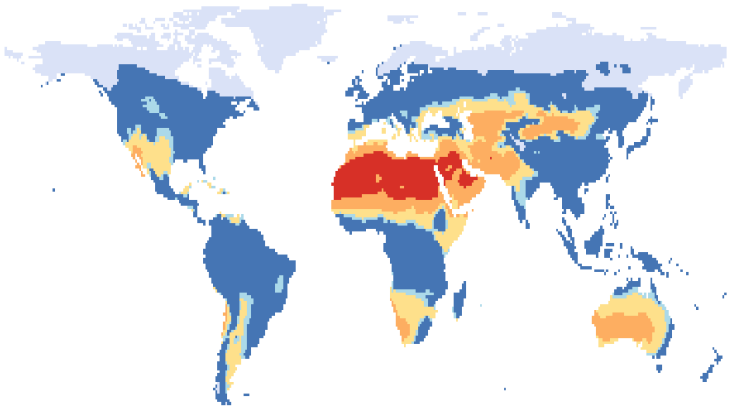


S3. Multimodel average of aridity categories for SSP 2-4.5, 3-7.0 and 5-8.5

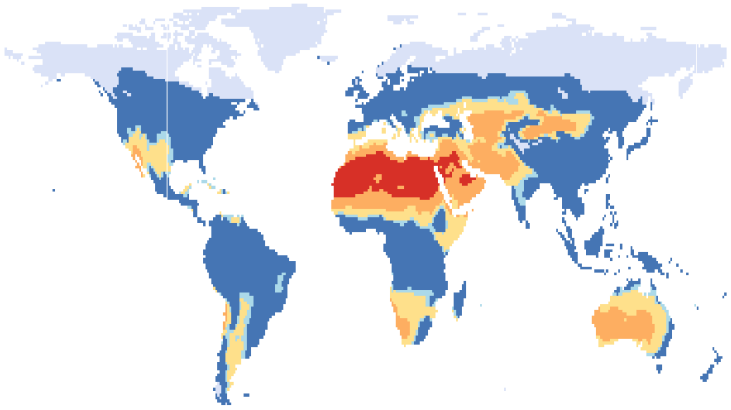
SSP245, 2030_2060



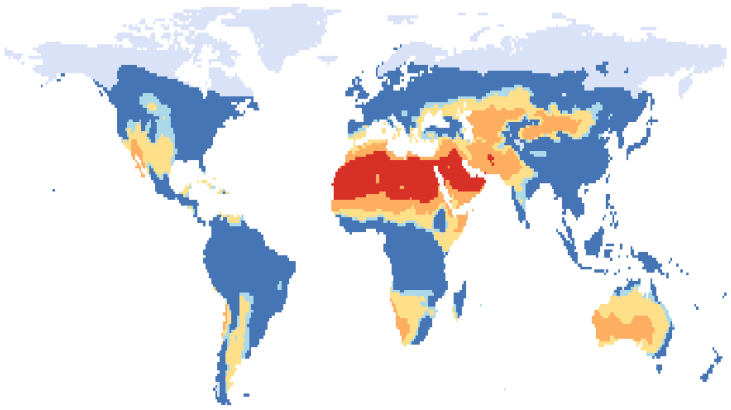
SSP245, 2070_2100



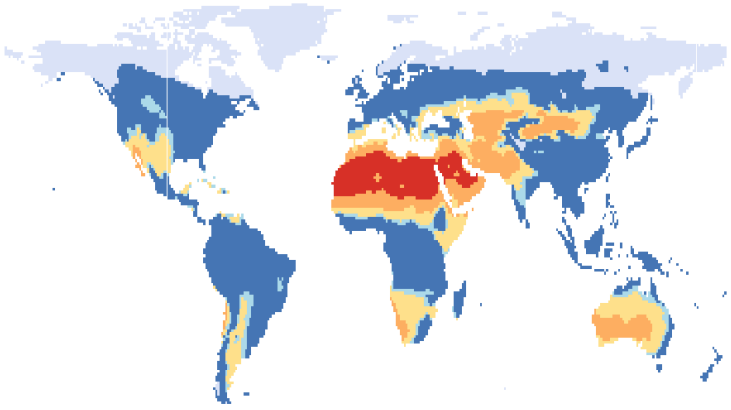
SSP370, 2030_2060



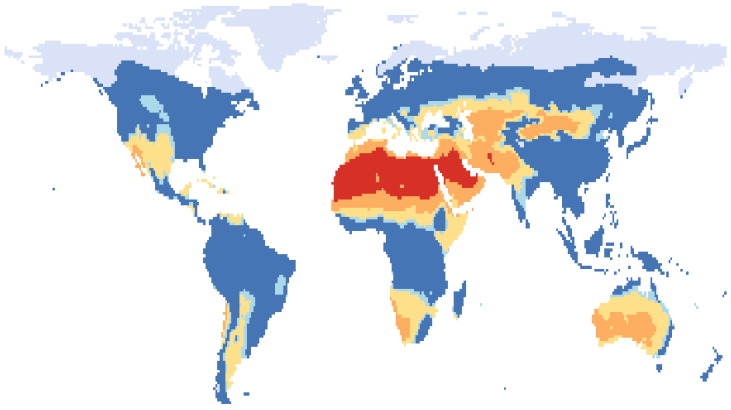
SSP370, 2070_2100

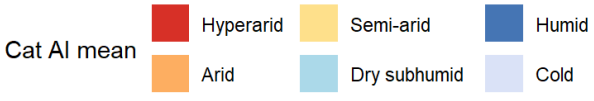


SSP585, 2030_2060



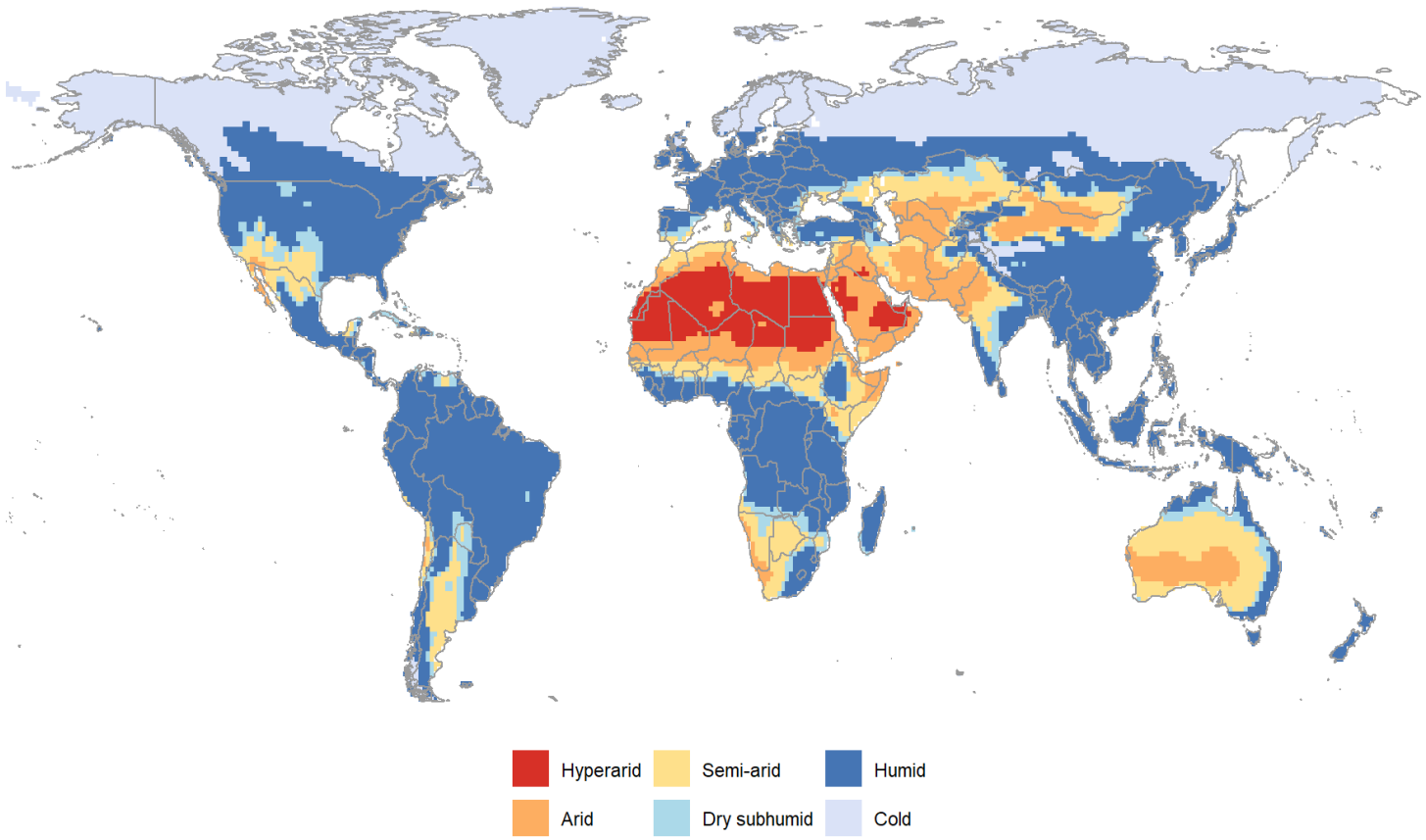
SSP585, 2070_2100



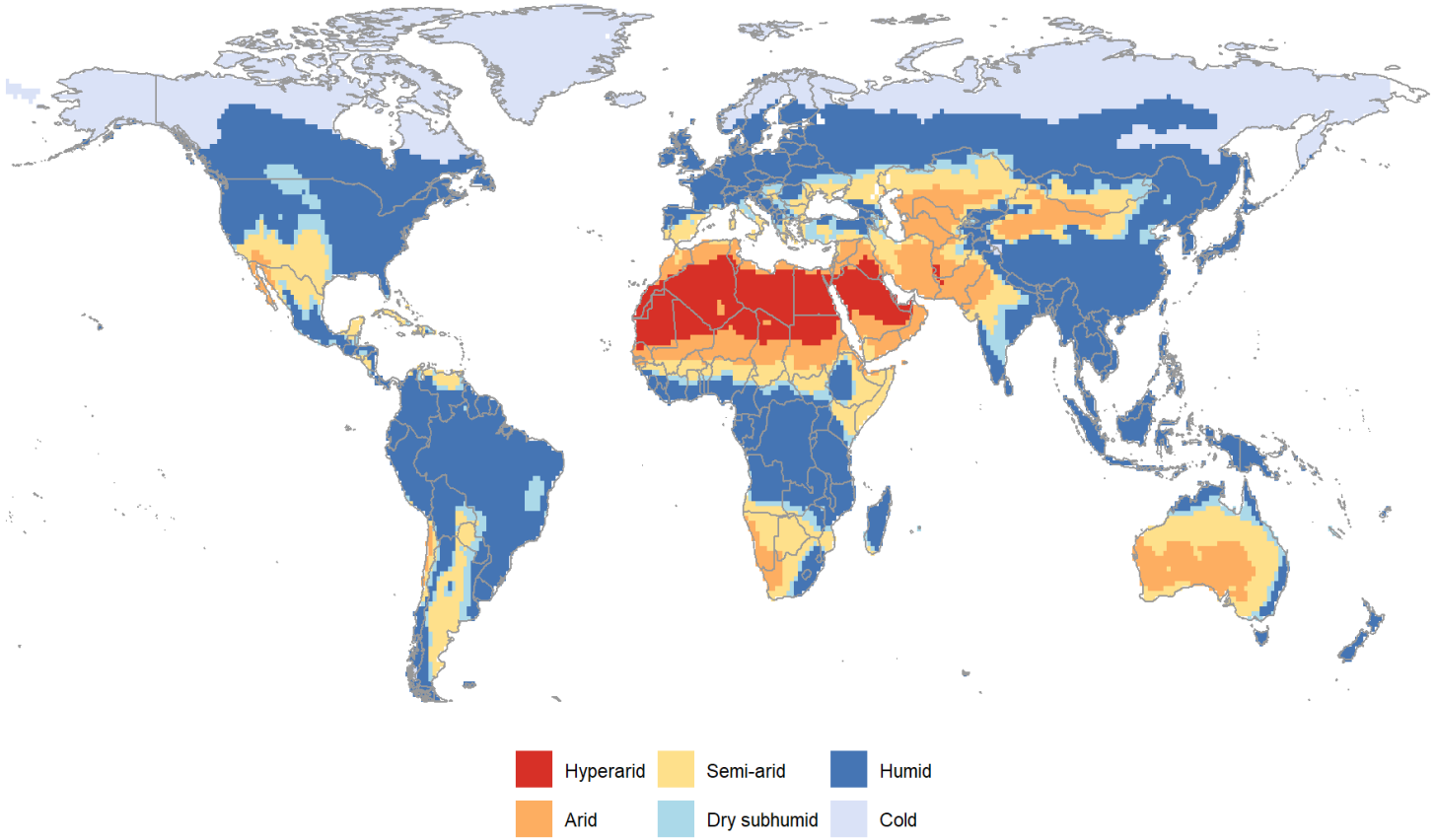


S4. Aridity categories for reference period 1970-2000 and for the extreme case scenario SSP 5-8.5, period 2070-2100

Category AI 1970-2000

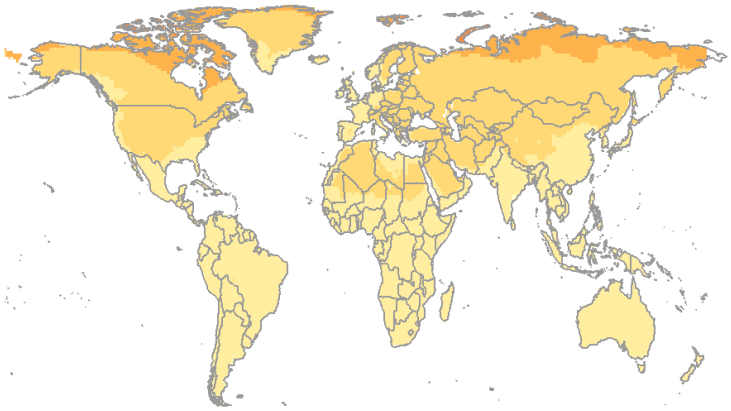


Category AI 2070-2100, SSP 585

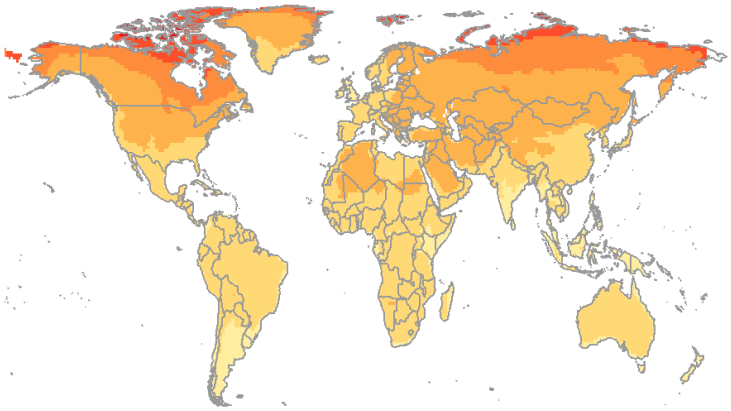


S5. Temperature anomalies compared to reference period 1970-2000, in °C

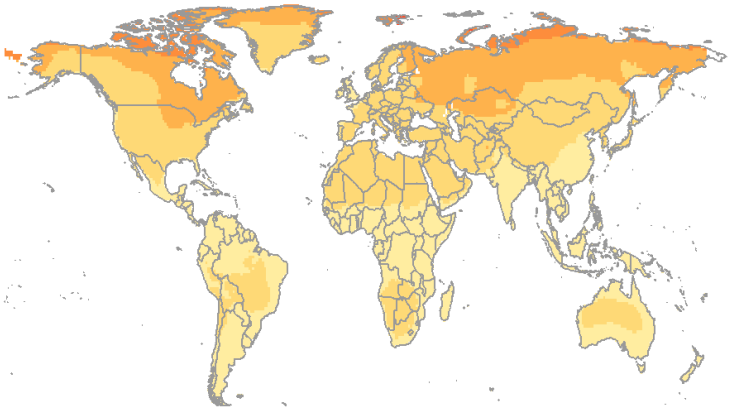
SSP245 , 2030_2060



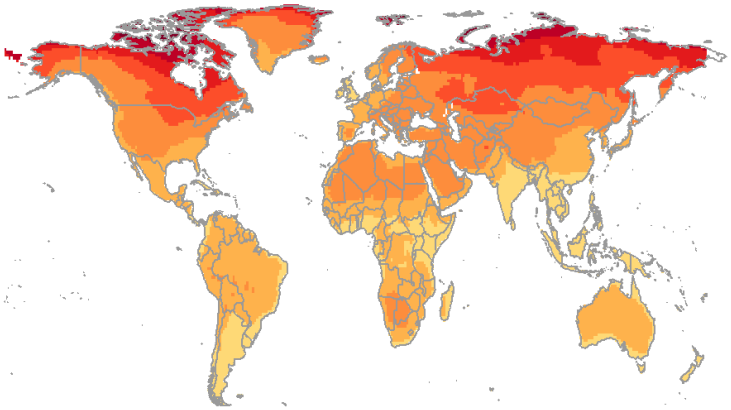
SSP245 , 2070_2100



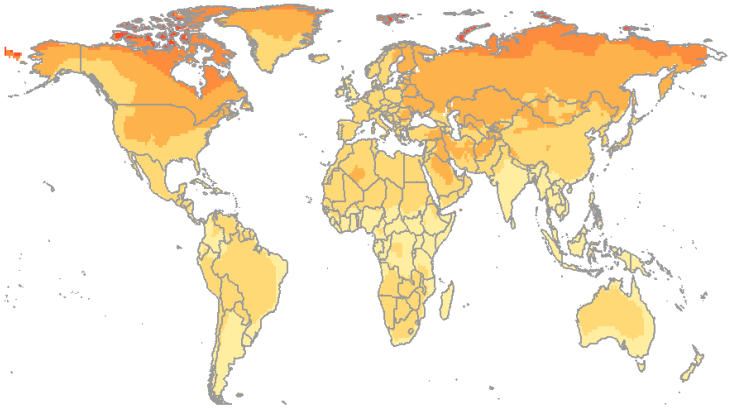
SSP370 , 2030_2060



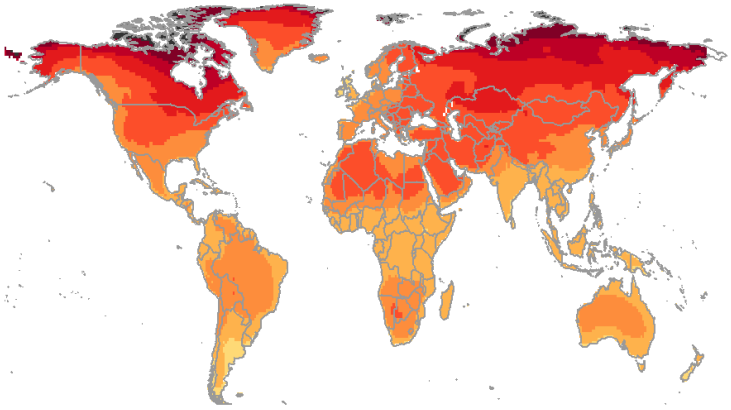
SSP370 , 2070_2100

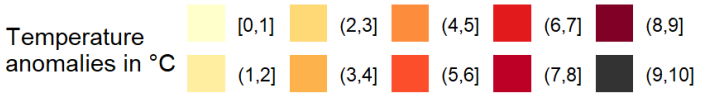


SSP585 , 2030_2060



SSP585 , 2070_2100





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

SSP245 , 2030_2060

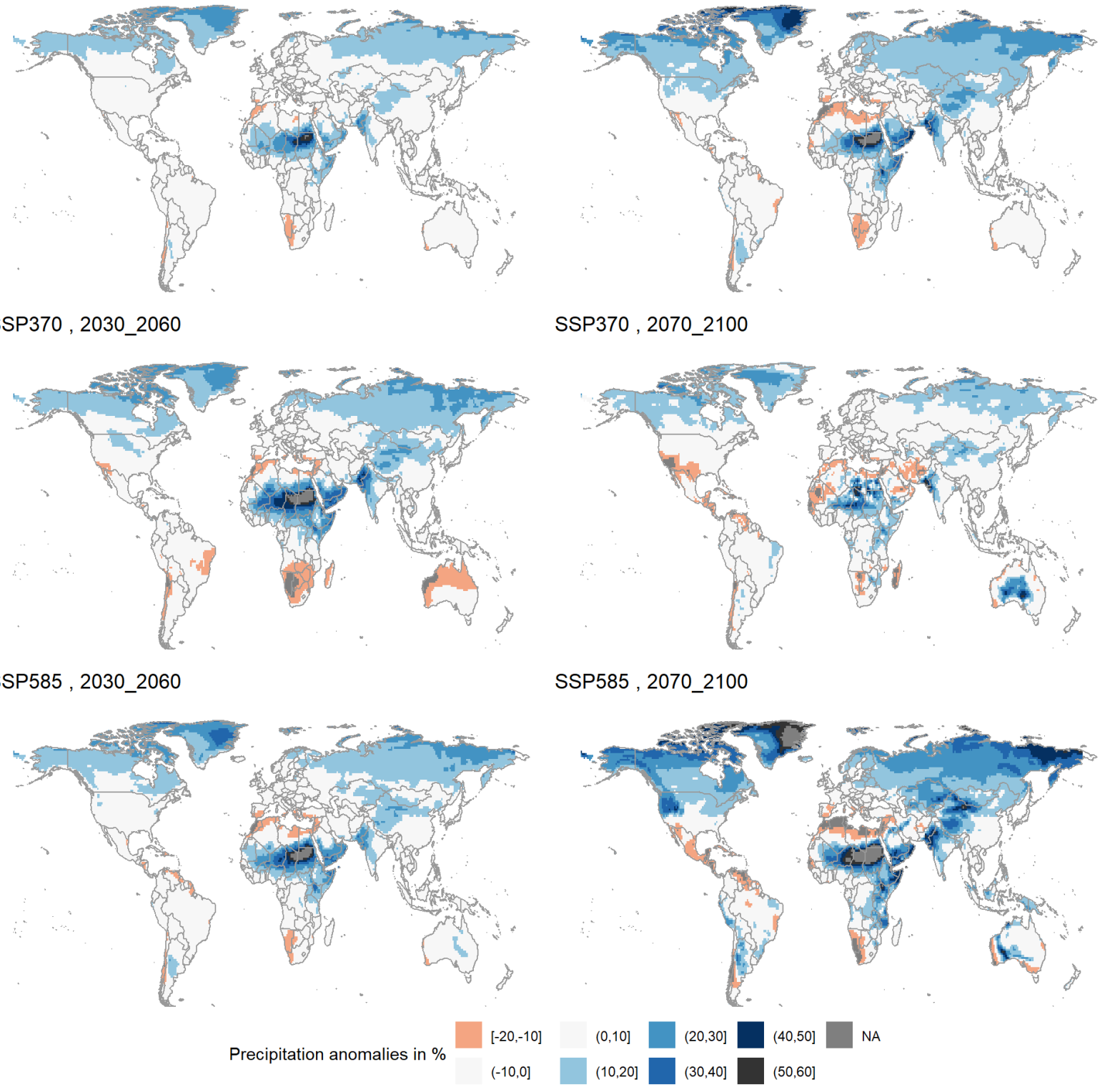
SSP245 , 2070_2100

SSP370 , 2030_2060

SSP370 , 2070_2100

SSP585 , 2030_2060

SSP585 , 2070_2100



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

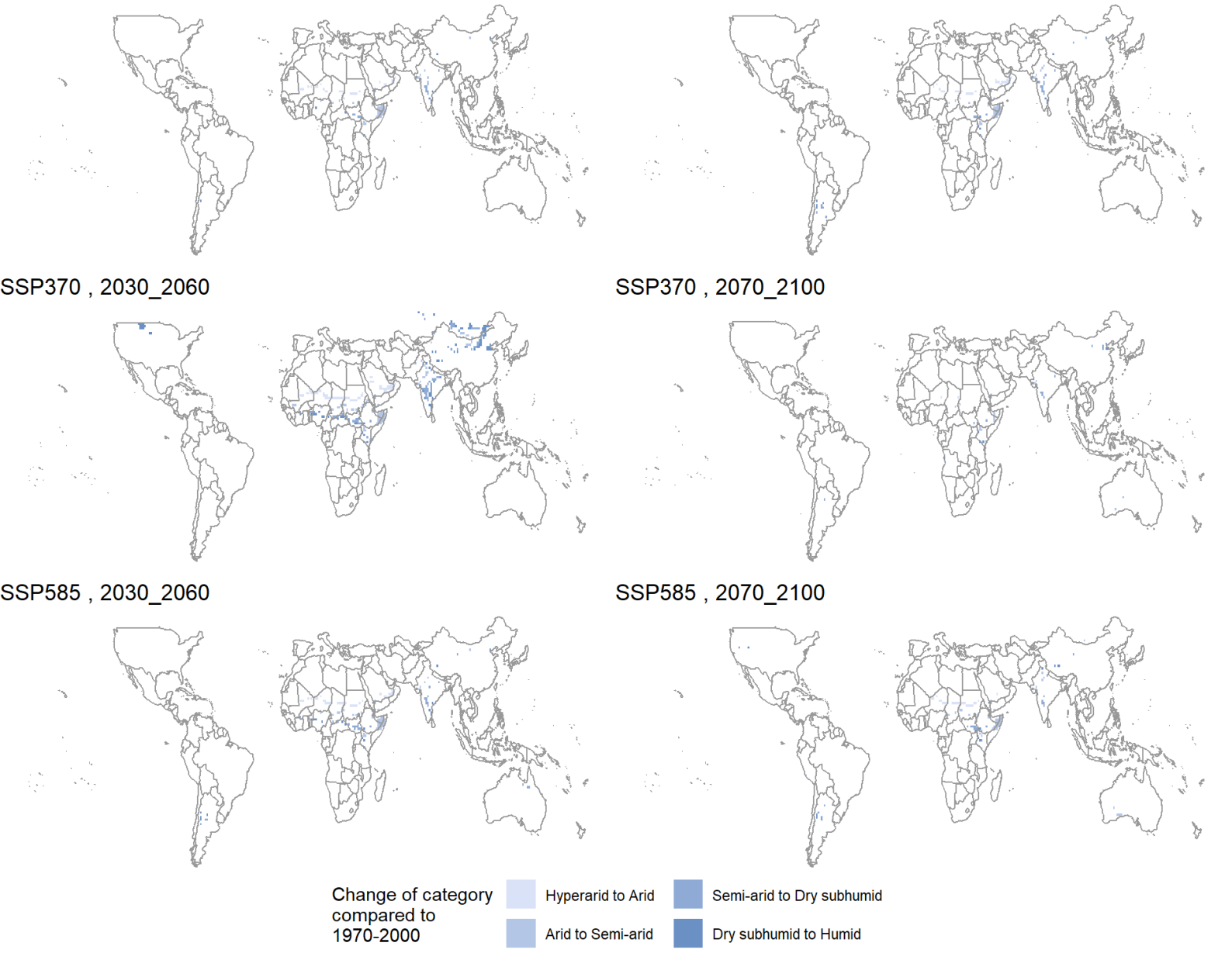
SSP245 , 2070_2100

SSP370 , 2030_2060

SSP370 , 2070_2100

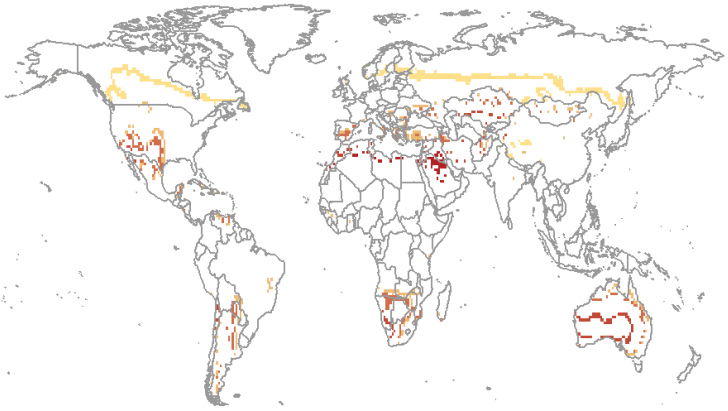
SSP585 , 2030_2060

SSP585 , 2070_2100

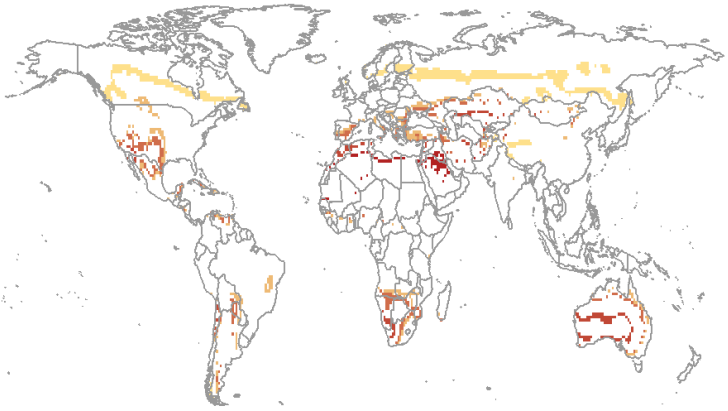


S8. Gridcells changing towards a dryer category compared to 1970-2000 for the SSP 2-4.5, 3-7.0 and 5-8.5

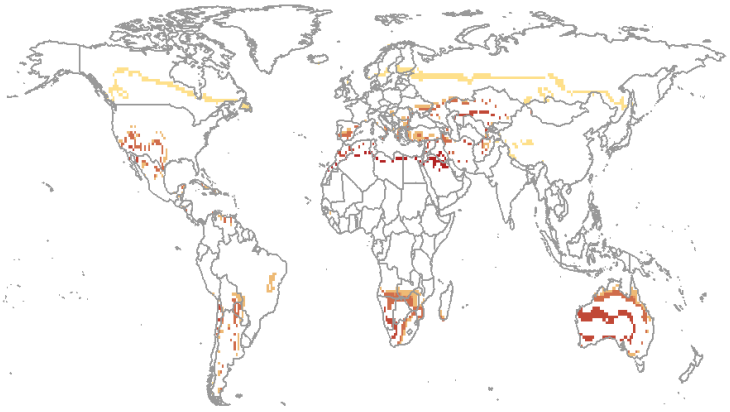
SSP245 , 2030_2060



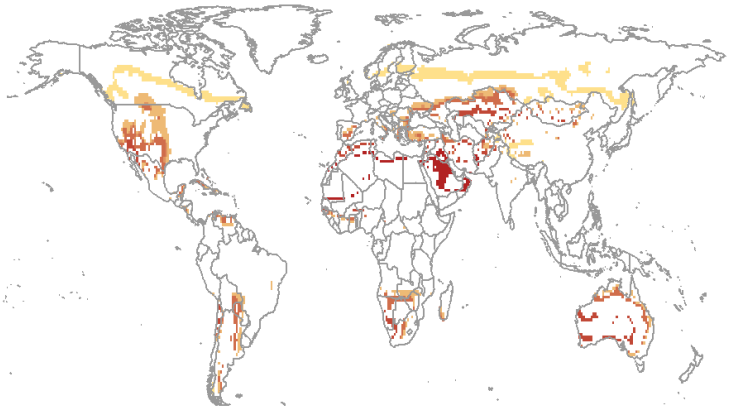
SSP245 , 2070_2100



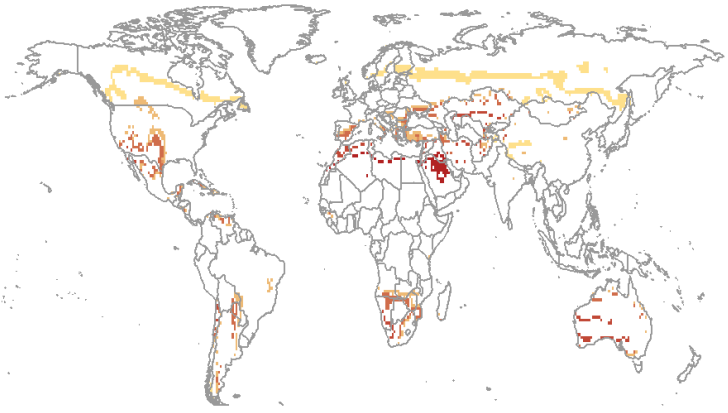
SSP370 , 2030_2060



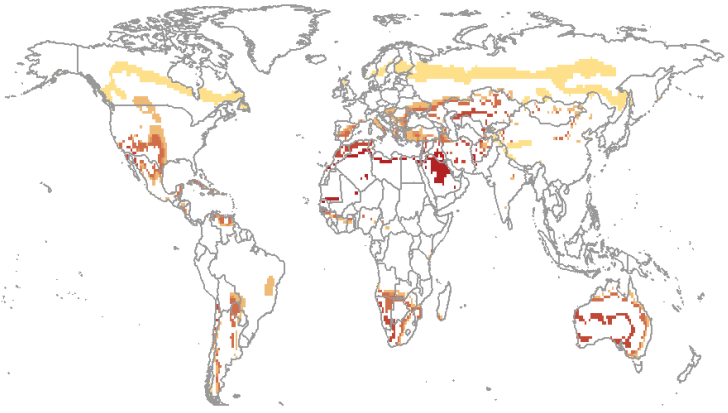
SSP370 , 2070_2100



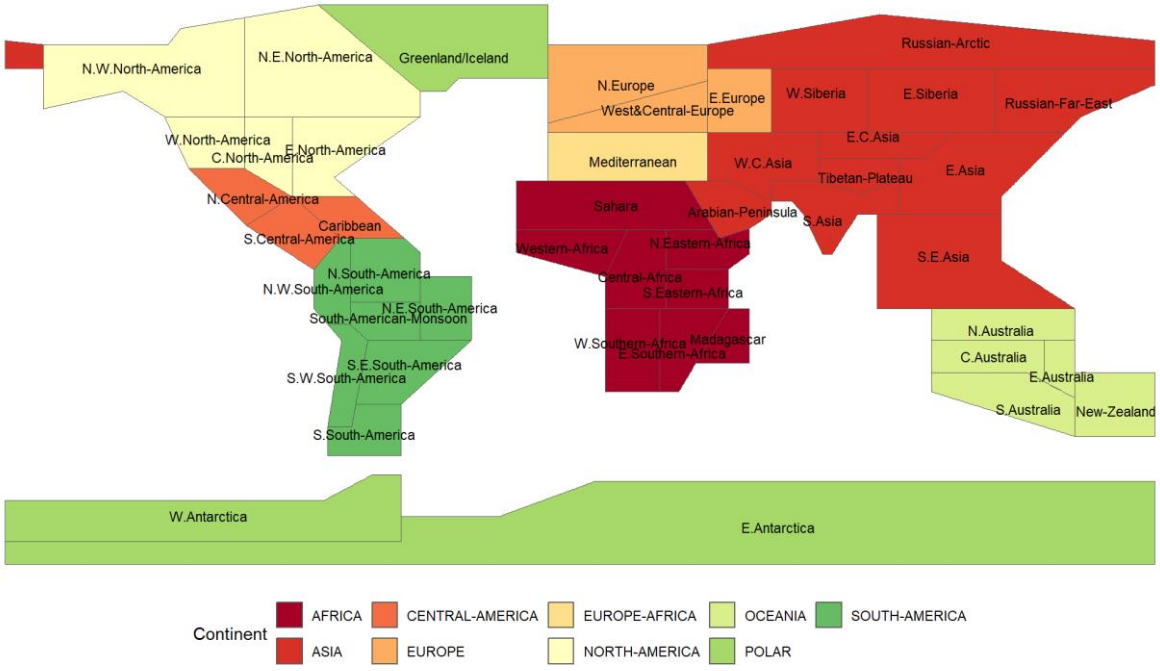
SSP585 , 2030_2060



SSP585 , 2070_2100



S9. IPCC regions



T1. Proportion and change of proportion of drylands by Continent and by SSP

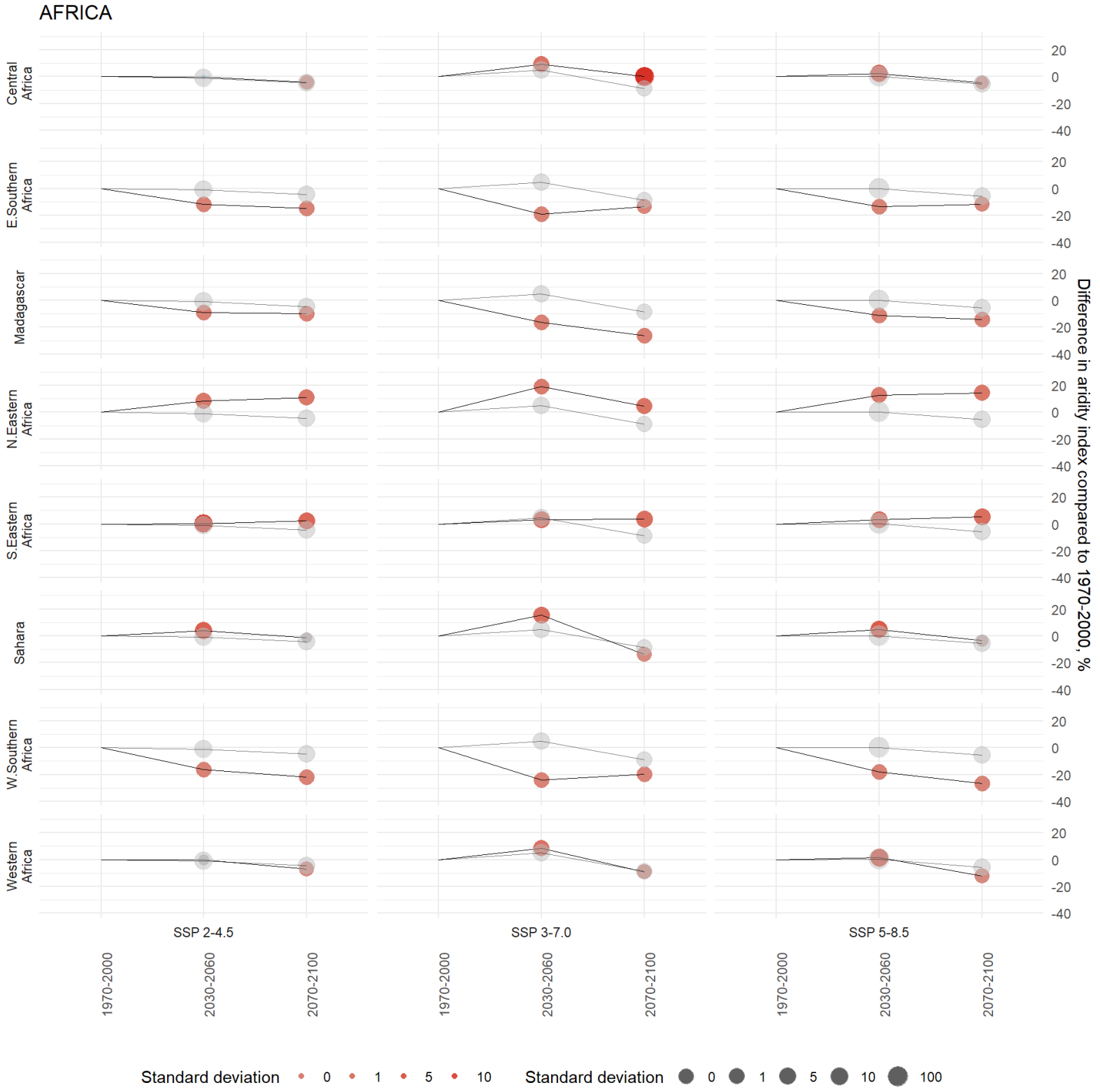
		SSP 2 – 4.5	SSP 3 – 7.0	SSP 5 – 8.5
Africa	Proportion in the reference period 1970-2000, in %	**64.9 ± 7.32**		
	Proportion for the period 2070-2100, in %	68.7 ± 7.8	68.4 ± 6.89	69.2 ± 12.58
	Change, in %	*3.8 ± 10.7 %*	*3.5 ± 10.1*	*4.3 ± 14.6*
Asia	Proportion in the reference period 1970-2000, in %	**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*

T2. 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

S10. Percent change of Aridity index in Africa

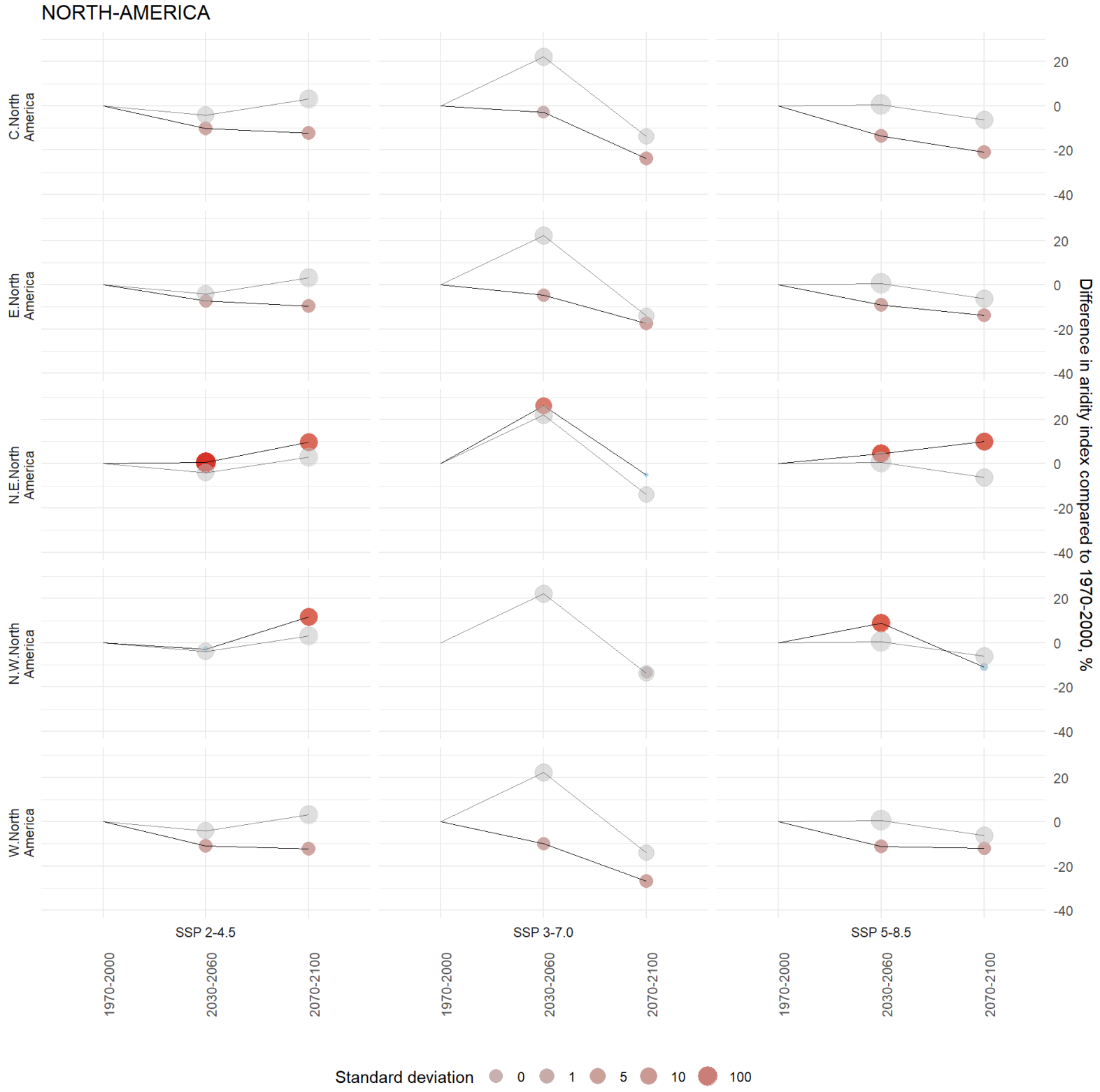


T3. Proportion of aridity categories by period, model and continent

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

S11. Percent change of Aridity index in North America

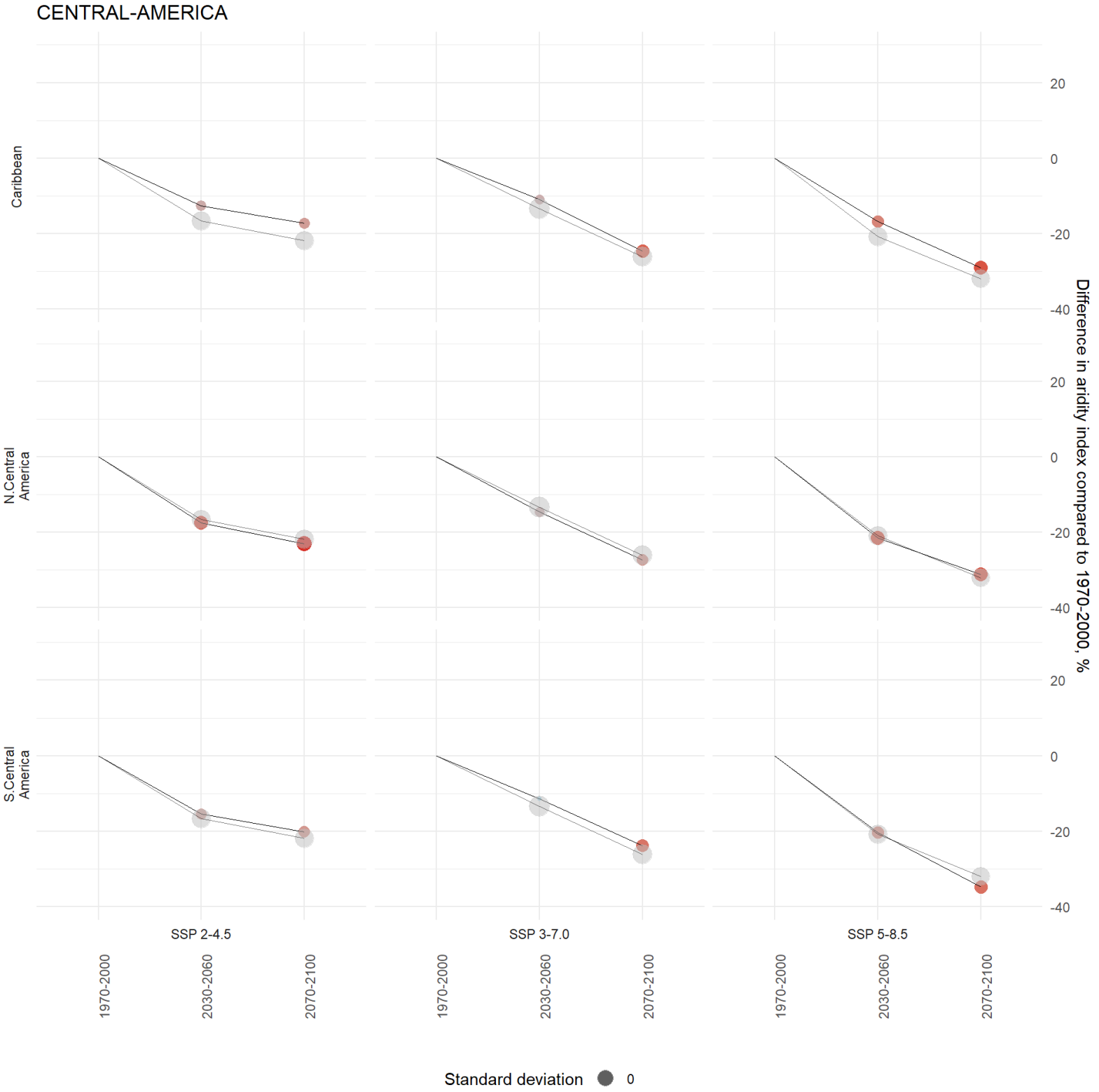


T4. Proportion of aridity categories by period, model and continent

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

S12. Percent change of Aridity index in Central America

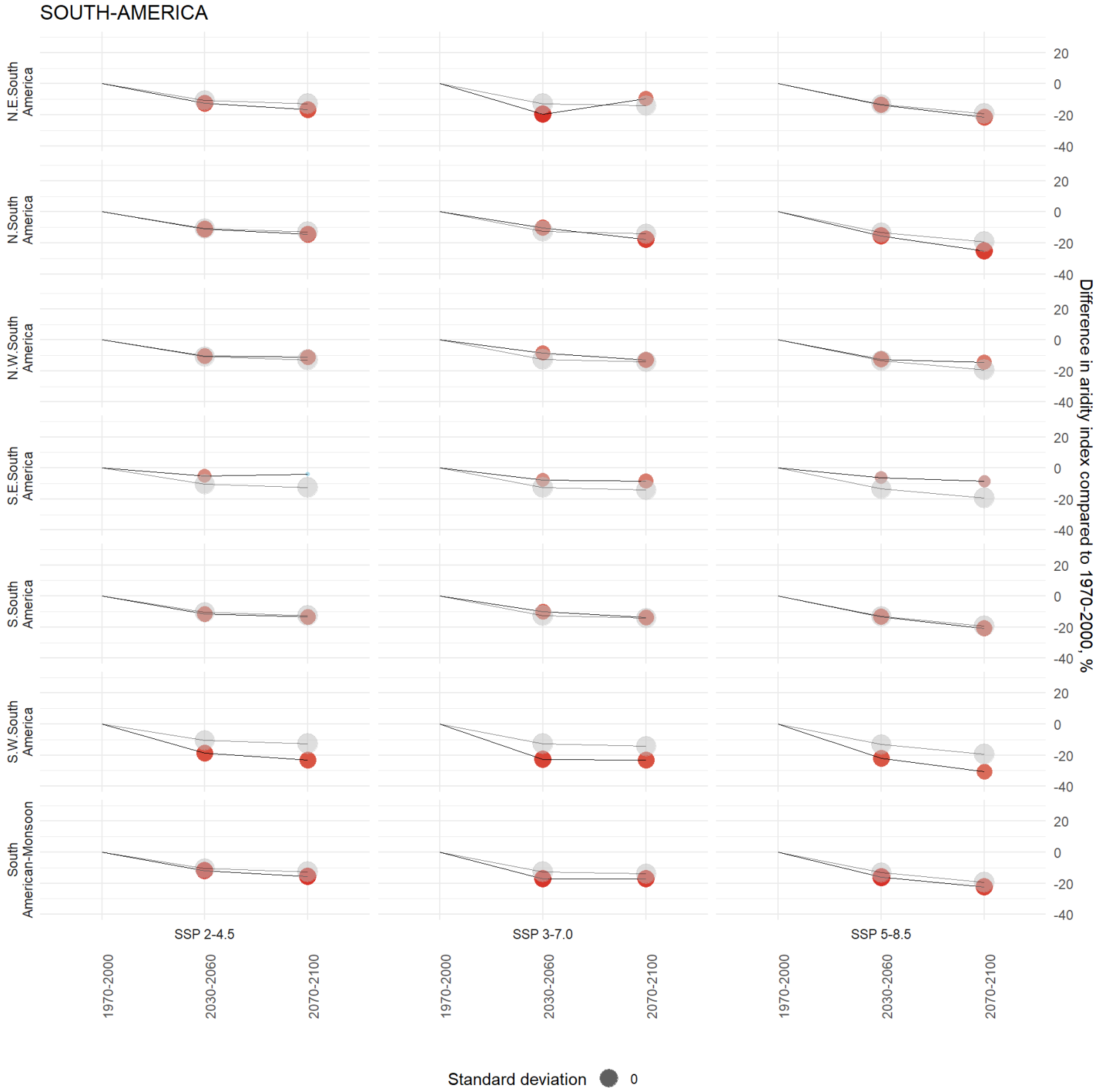


T5. Proportion of aridity categories by period, model and continent

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

S13. Percent change of Aridity index in South America

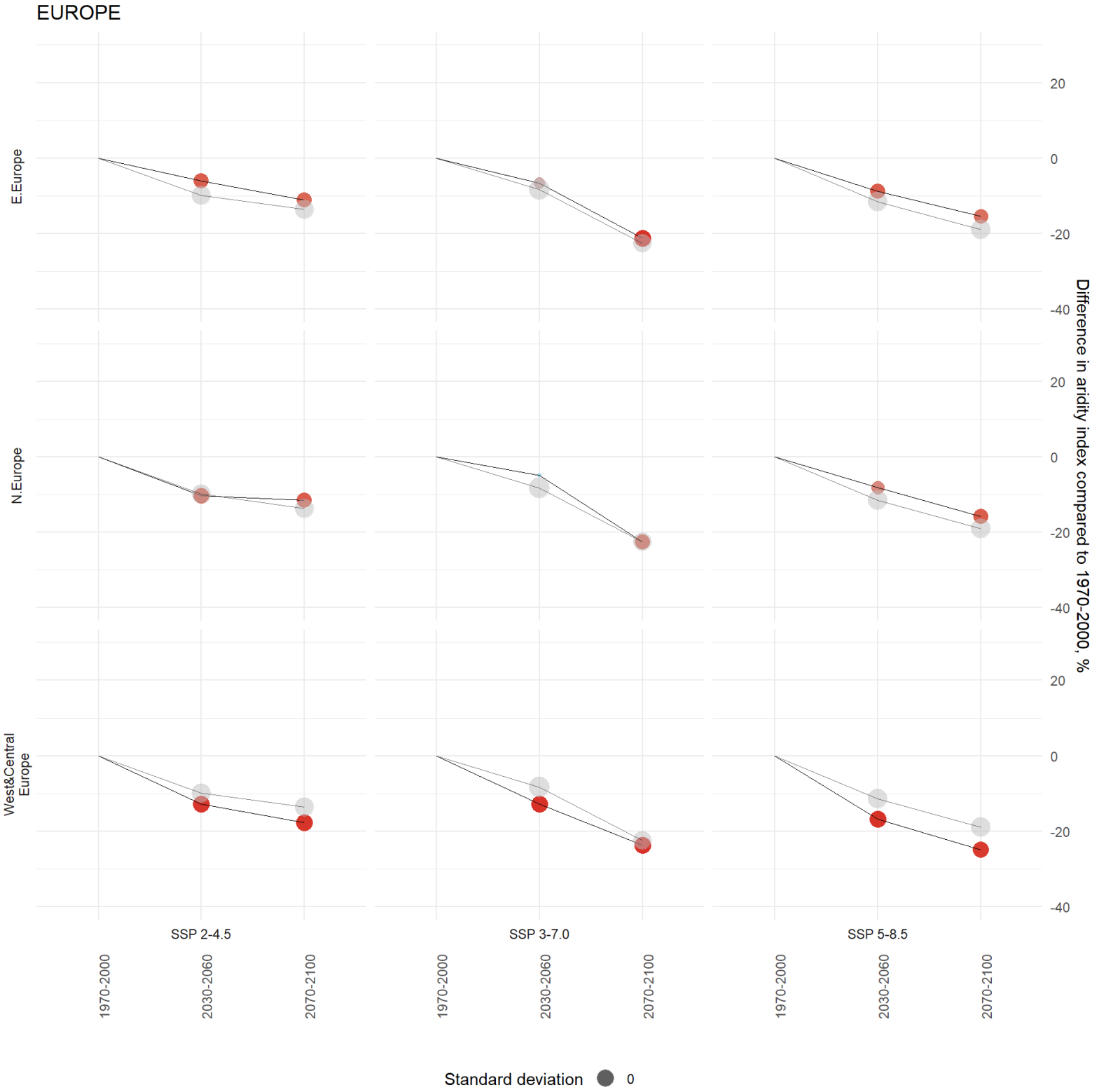


T6. Proportion of aridity categories by period, model and continent

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

S14. Percent change of Aridity index in Europe

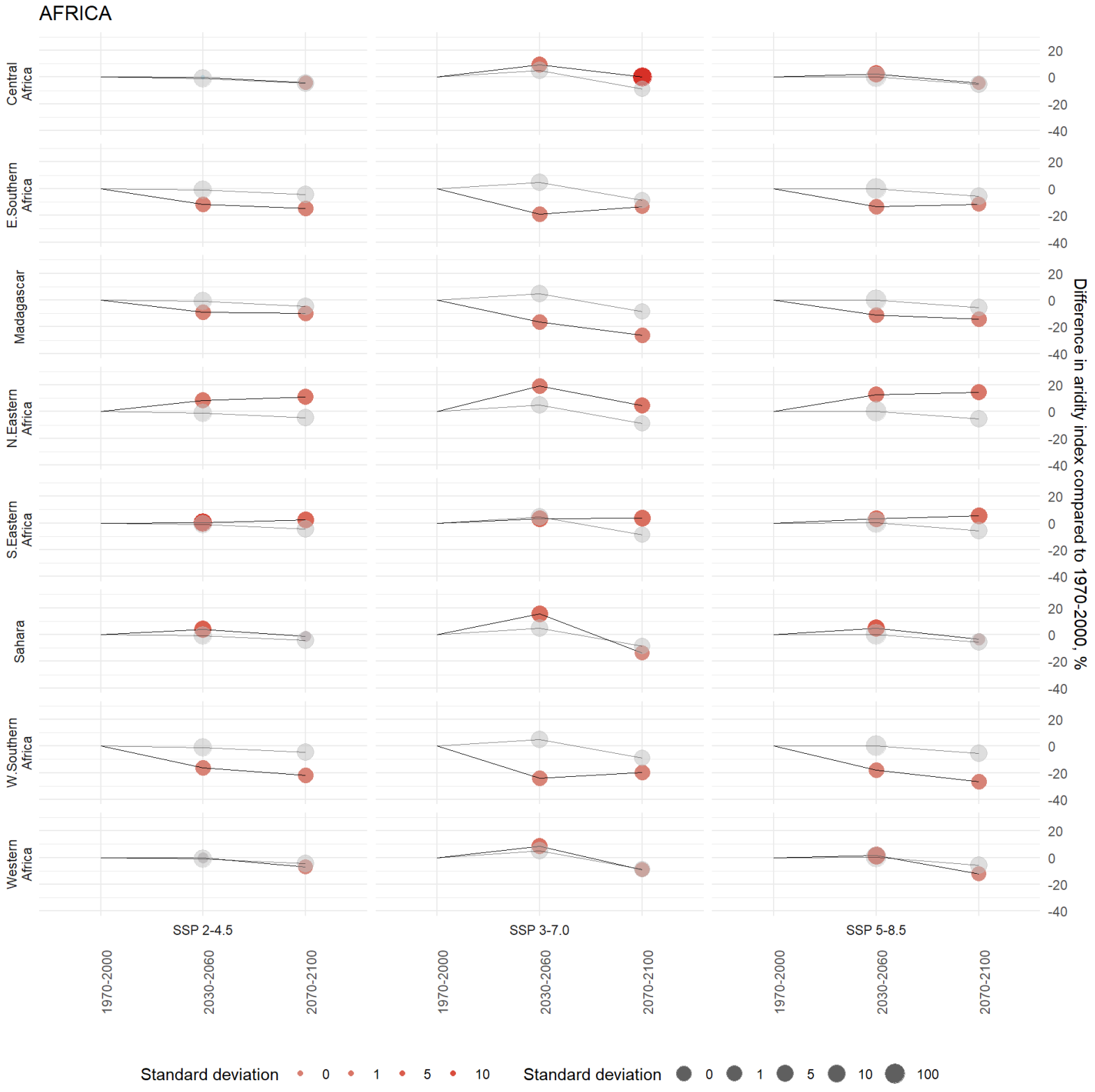


T7. Proportion of aridity categories by period, model and continent

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

S15. Percent change of Aridity index in Europe

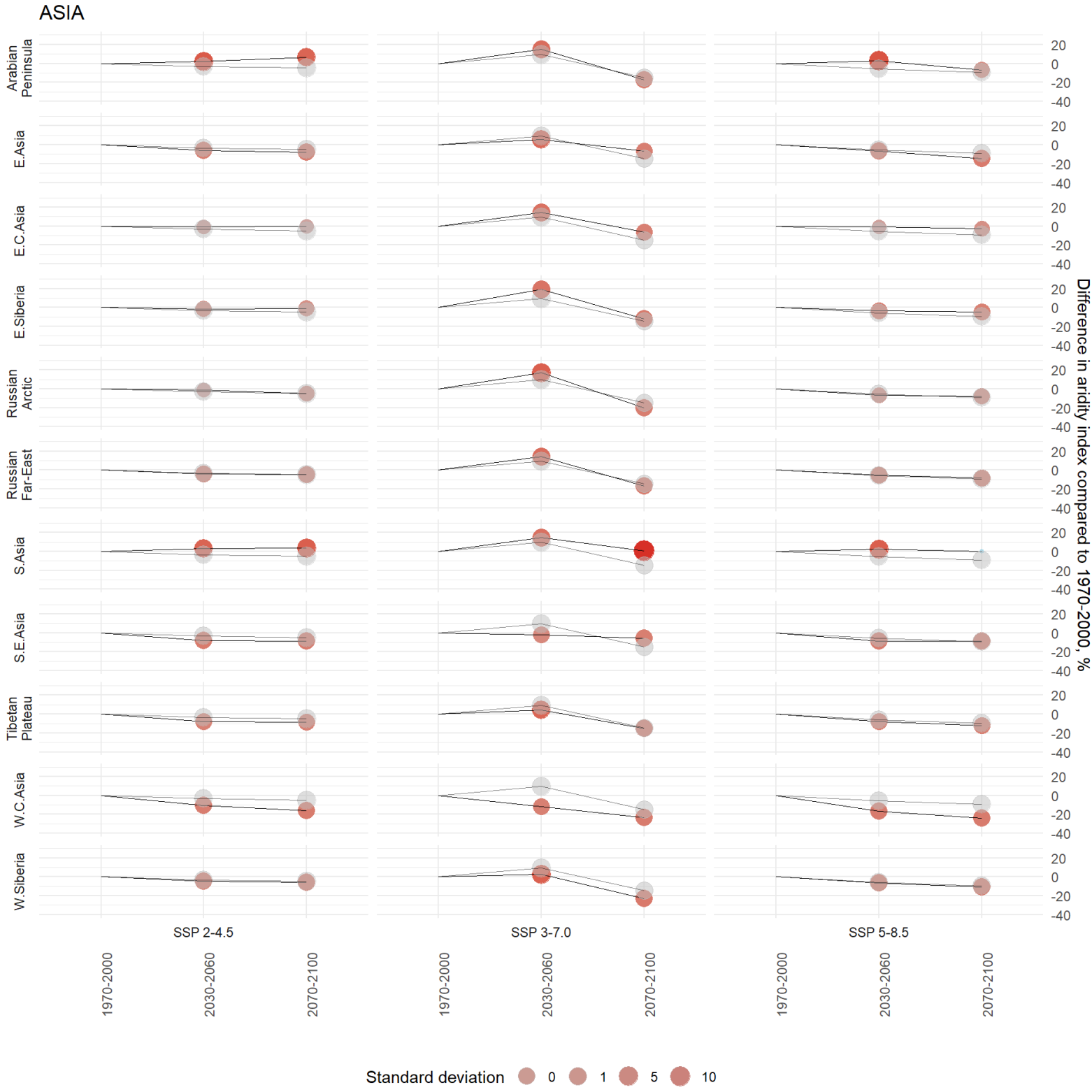


T9. Proportion of aridity categories by period, model and continent

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

S16. Percent change of Aridity index in Asia

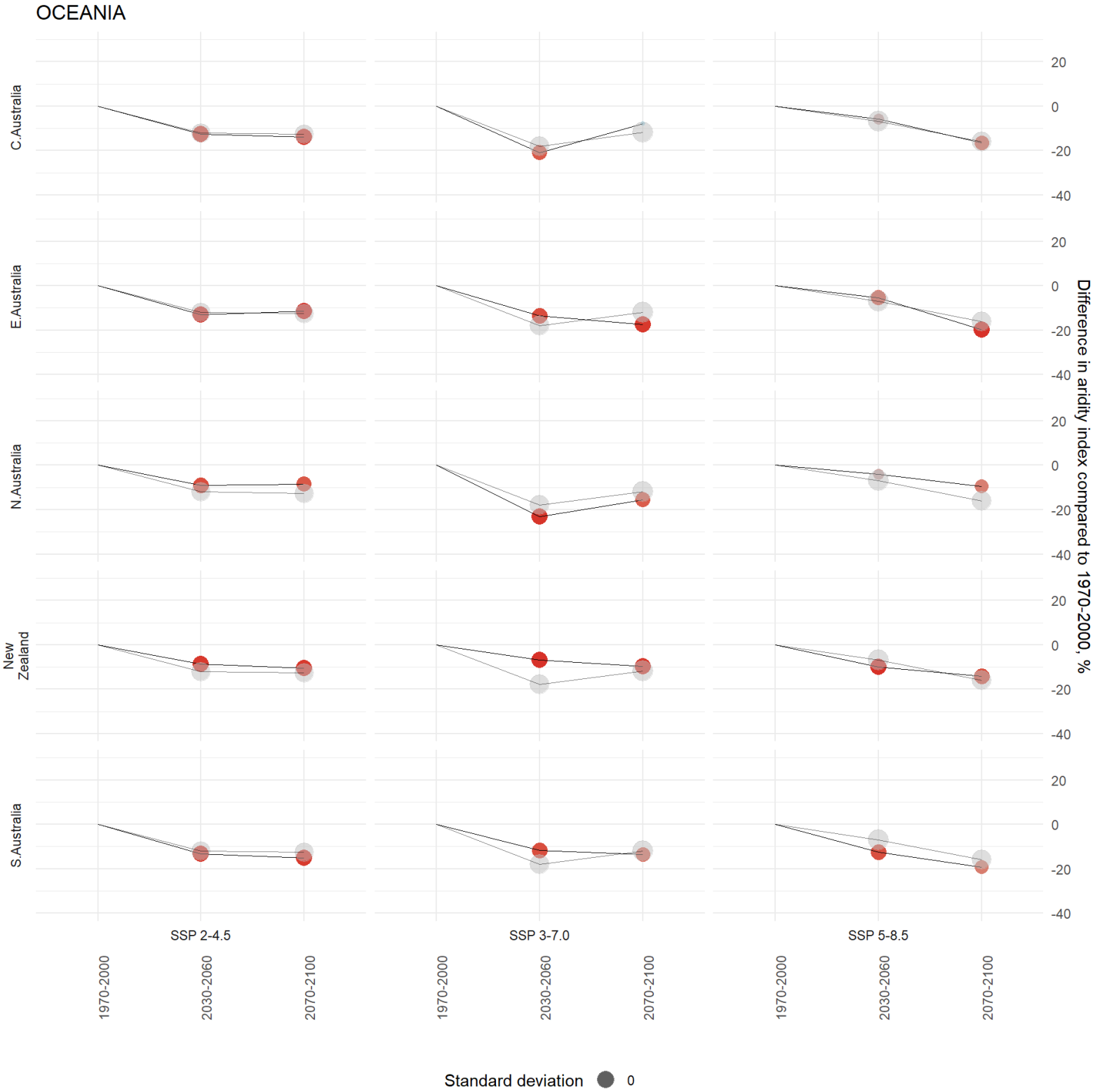
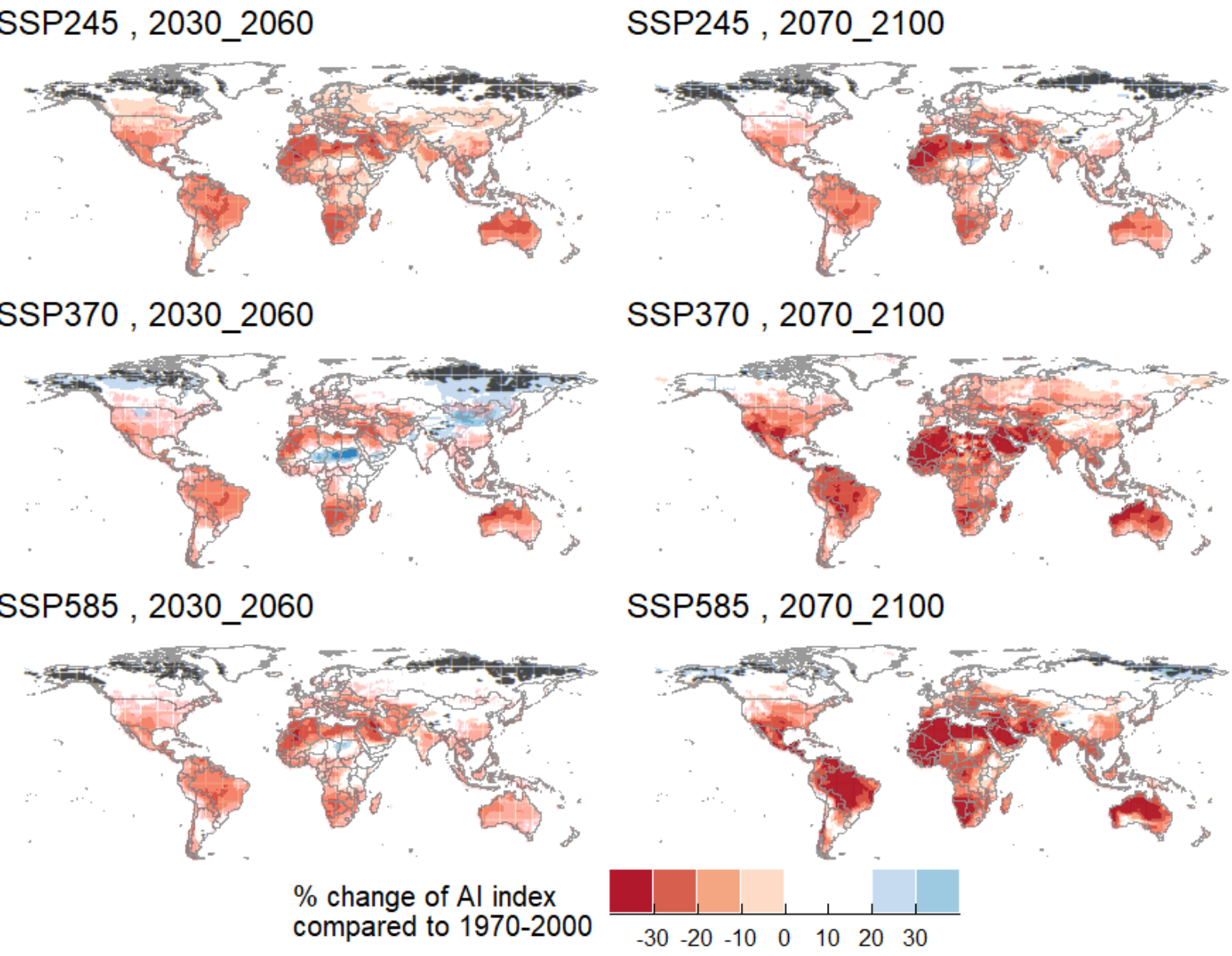


T10. Proportion of aridity categories by period, model and continent

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

S17. Percent change of Aridity index in Oceania



S17. AI changes when using Thornthwaite aridity index