

Equatorial Guinea

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General Climate

The republic of Equatorial Guinea is located on the western coast of Africa and includes a number of islands in the Gulf of Guinea, the largest of which is Bioko Island, to the north-west of the mainland. The continental mainland of Equatorial Guinea lies low at the coast, rising up into mountains and valleys further inland. At latitudes of 1-3°N the climate is typically equatorial with high temperatures, high humidity and heavy rainfall. Average temperatures range from 23 to 25°C, varying little with season, but decreasing with altitude in the inland regions. The main wet season lasts between April and October, when the West African Monsoon winds blow from the south-west, bringing moist air from the ocean. The wettest regions of Equatorial Guinea at these times are the coastal regions, receiving 250-400mm of rain per month, whilst regions further inland receive 150 to 250mm per month.

Recent Climate

Temperature

- Mean annual temperature has increased by 0.6°C since 1960, an average rate of 0.14°C per decade. The rate of increase is most rapid in FMA, at 0.17°C per decade.
- There are insufficient daily observations available from which to infer changes in daily temperature extremes.

Precipitation

- Mean annual rainfall over Equatorial Guinea has decreased at an average rate of 3.7mm per month (2.1%) per decade since 1960. Rainfall decreases have affected FMA rainfalls the most substantially, with decreases in the season at an average rate of 7.4mm per month (4.3%) per decade.

- There is not sufficient daily precipitation data available to determine trends in daily rainfall extremes.

Model Projections of Future Climate

Temperature

- The mean annual temperature is projected to increase by 0.9 to 2.5°C by the 2060s, and 1.3 to 4.1°C by the 2090s. The range of projections by the 2090s under any one emissions scenario is 1.5- 2°C.
- Model projections all indicate increases in the frequency of days and nights that are considered 'hot'¹ in current climate. The rate at which the frequency of hot days increases, however, varies considerably between models.
 - Annually, projections indicate that 'hot' days will occur on 27-77% of days by the 2060s, and 38-97% of days by the 2090s.
 - Nights that are considered 'hot' for the annual climate of 1970-99 are projected to occur on 38-94% of nights by the 2060s and 54-99% of nights by the 2090s.
- All projections indicate decreases in the frequency of days and nights that are considered 'cold'² in current climate. These events are expected to become exceedingly rare, and do not at all by the 2090s in most projections.

Precipitation

- Projections of mean annual rainfall averaged over the country from different models in the ensemble indicate a wide range of changes in precipitation for Equatorial Guinea. Projected changes range from -6 to +20% by the 2090s, with ensemble mean changes of +1 to +4%.
- Models are broadly consistent in projecting increases in ASO rainfall – projected changes range from -23% to +37%, with ensemble mean change of +10%.
- Models are broadly consistent in indicating increases in the proportion of total rainfall that falls in heavy³ events, even in seasons when mean rainfall does not increase. Annually, these changes range from -1% to +12%.
- Projections indicate that maximum 1- and 5-day rainfalls are also likely to increase in magnitude by as much as 26mm and 44mm respectively.

¹ 'Hot' day or 'hot' night is defined by the temperature exceeded on 10% of days or nights in current climate of that region and season.

² 'Cold' days or 'cold' nights are defined as the temperature below which 10% of days or nights are recorded in current climate of that region or season.

³ A 'Heavy' event is defined as a daily rainfall total which exceeds the threshold that is exceeded on 5% of rainy days in current the climate of that region and season.

Other Regional Climate Change Information

- The coastal lowlands of Equatorial Guinea may be vulnerable to sea-level rise. Sea-level in this region is projected by climate models to rise by the following levels⁴ by the 2090s, relative to 1980-1999 sea-level:
 - 0.13 to 0.43m under SRES B1
 - 0.16 to 0.53m under SRES A1B
 - 0.18 to 0.56m under SRES A2
- For further information on climate projections for Africa, see Christensen *et al.* (2007) IPCC Working Group I Report: '*The Physical Science Basis*', Chapter 11 (*Regional Climate projections*): Section 11.2 (*Africa*).

⁴ Taken from the IPCC Working group I (*The Physical Science Basis*): Chapter 10 (Global Climate Projections) (Meehl *et al.*, 2007). Regional sea-level projections are estimated by applying regional adjustments (Fig 10.32, p813) to projected global mean sea-level rise from 14 AR4 models.

Data Summary

	Observed Mean 1970-99	Observed Trend 1960-2006	Projected changes by the 2030s			Projected changes by the 2060s			Projected changes by the 2090s			
			Min	Median	Max	Min	Median	Max	Min	Median	Max	
Temperature												
	(°C)	(change in °C per decade)		Change in °C			Change in °C			Change in °C		
Annual	24.2	0.14*	A2	0.8	1.1	1.4	1.6	2.2	2.5	2.7	3.5	4.1
			A1B	0.8	1.2	1.4	1.4	2.1	2.4	2.1	2.8	3.6
			B1	0.5	0.9	1.1	0.9	1.5	1.8	1.3	1.9	2.3
NDJ	24.3	0.14*	A2	0.7	1.1	1.4	1.4	2.2	2.7	2.6	3.5	4.2
			A1B	0.6	1.2	1.4	1.4	2.1	2.6	2.1	2.9	3.6
			B1	0.5	1.0	1.2	0.9	1.5	1.7	1.2	1.9	2.4
FMA	25.1	0.17*	A2	0.8	1.1	1.5	1.5	2.3	2.8	2.5	3.6	4.3
			A1B	0.9	1.1	1.5	1.4	2.2	2.5	2.1	3.0	3.8
			B1	0.6	0.9	1.2	1.0	1.6	1.9	1.3	2.0	2.4
MJJ	23.9	0.13*	A2	0.8	1.1	1.7	1.7	2.3	2.7	2.7	3.5	4.0
			A1B	0.7	1.2	1.5	1.6	2.2	2.5	2.2	2.9	3.8
			B1	0.6	0.9	1.1	0.8	1.5	1.9	1.4	1.8	2.4
ASO	23.4	0.09*	A2	0.7	1.0	1.4	1.6	2.2	2.5	2.8	3.4	4.1
			A1B	0.7	1.2	1.5	1.4	2.0	2.4	2.0	2.7	3.6
			B1	0.5	1.0	1.2	0.9	1.4	1.9	1.3	1.8	2.3
Precipitation												
	(mm per month)	(change in mm per decade)		Change in mm per month			Change in mm per month			Change in mm per month		
Annual	177.0	-3.7*	A2	-6	0	12	-11	5	20	-12	2	33
			A1B	-9	3	10	-9	6	19	-13	9	34
			B1	-7	2	9	-7	1	11	-12	4	31
NDJ	134.0	-0.5	A2	-21	-3	13	-17	1	19	-31	1	45
			A1B	-13	1	20	-19	5	22	-38	10	37
			B1	-6	0	13	-25	2	17	-24	6	28
FMA	173.1	-7.4*	A2	-18	-2	10	-27	-4	27	-29	-1	31
			A1B	-14	0	17	-17	-1	32	-24	-1	32
			B1	-15	0	19	-19	-1	13	-27	-3	30
MJJ	155.9	-3.0	A2	-21	2	24	-13	0	30	-21	5	24
			A1B	-31	-2	19	-19	-1	25	-24	10	31
			B1	-16	0	16	-13	0	16	-16	3	39
ASO	246.7	-1.9	A2	-9	9	27	-5	12	68	-71	24	61
			A1B	-19	9	21	-33	12	43	-25	22	55
			B1	-26	4	21	1	8	22	-28	17	44
Precipitation (%)												
	(mm per month)	(change in % per decade)		% Change			% Change			% Change		
Annual	177.0	-2.1*	A2	-4	0	7	-7	3	12	-6	1	20
			A1B	-4	2	6	-4	4	11	-5	4	20
			B1	-3	1	5	-3	0	6	-5	4	18
NDJ	134.0	-0.4	A2	-16	-2	10	-10	0	13	-18	1	28
			A1B	-8	0	16	-11	4	15	-23	5	22
			B1	-5	0	8	-16	1	10	-14	5	22
FMA	173.1	-4.3*	A2	-9	-1	8	-23	-2	18	-25	0	22
			A1B	-7	0	11	-9	-1	20	-18	-1	23
			B1	-8	0	14	-11	-1	9	-14	-2	20
MJJ	155.9	-1.9	A2	-9	1	15	-8	0	18	-9	1	15
			A1B	-11	-1	8	-6	-1	15	-14	4	16
			B1	-7	0	10	-6	0	8	-10	1	19
ASO	246.7	-0.8	A2	-4	4	21	-1	6	32	-23	10	34
			A1B	-13	3	16	-11	5	34	-8	10	37
			B1	-8	2	13	0	4	13	-9	10	21

	Observed Mean	Observed Trend	Projected changes by the 2030s			Projected changes by the 2060s			Projected changes by the 2090s			
	1970-99	1960-2006	Min	Median	Max	Min	Median	Max	Min	Median	Max	
	% Frequency	Change in frequency per decade				Future % frequency			Future % frequency			
Frequency of Hot Days (TX90p)												
Annual	****	****	A2	****	****	****	45	54	75	65	81	97
			A1B	****	****	****	40	61	77	58	74	96
			B1	****	****	****	27	39	63	38	51	78
NDJ	****	****	A2	****	****	****	54	71	85	73	84	97
			A1B	****	****	****	54	70	85	67	80	97
			B1	****	****	****	36	58	74	51	68	86
FMA	****	****	A2	****	****	****	58	71	86	78	87	99
			A1B	****	****	****	58	71	89	71	83	99
			B1	****	****	****	34	56	77	56	71	87
MJJ	****	****	A2	****	****	****	57	75	91	74	95	99
			A1B	****	****	****	55	74	91	65	86	99
			B1	****	****	****	35	55	79	48	73	91
ASO	****	****	A2	****	****	****	52	78	91	64	94	99
			A1B	****	****	****	53	74	91	56	87	99
			B1	****	****	****	38	61	82	53	74	92
Frequency of Hot Nights (TN90p)												
Annual	****	****	A2	****	****	****	64	78	94	91	97	99
			A1B	****	****	****	54	80	94	81	92	99
			B1	****	****	****	38	52	86	54	73	95
NDJ	****	****	A2	****	****	****	67	82	96	87	96	99
			A1B	****	****	****	69	82	96	79	93	99
			B1	****	****	****	52	65	91	61	81	96
FMA	****	****	A2	****	****	****	69	85	98	95	98	99
			A1B	****	****	****	72	87	96	89	94	99
			B1	****	****	****	53	71	88	66	85	96
MJJ	****	****	A2	****	****	****	69	84	97	94	99	100
			A1B	****	****	****	70	81	98	88	96	99
			B1	****	****	****	48	67	94	65	75	97
ASO	****	****	A2	****	****	****	84	91	98	97	99	100
			A1B	****	****	****	84	93	99	93	98	99
			B1	****	****	****	63	69	96	77	86	99
Frequency of Cold Days (TX10p)												
Annual	****	****	A2	****	****	****	0	0	1	0	0	0
			A1B	****	****	****	0	0	1	0	0	0
			B1	****	****	****	0	1	2	0	0	1
NDJ	****	****	A2	****	****	****	0	0	2	0	0	0
			A1B	****	****	****	0	0	1	0	0	0
			B1	****	****	****	0	1	2	0	0	2
FMA	****	****	A2	****	****	****	0	1	1	0	0	0
			A1B	****	****	****	0	0	1	0	0	0
			B1	****	****	****	0	1	2	0	0	1
MJJ	****	****	A2	****	****	****	0	0	1	0	0	0
			A1B	****	****	****	0	0	1	0	0	0
			B1	****	****	****	0	1	1	0	0	1
ASO	****	****	A2	****	****	****	0	0	1	0	0	0
			A1B	****	****	****	0	0	1	0	0	0
			B1	****	****	****	0	1	2	0	0	1
Frequency of Cold Nights (TN10p)												
Annual	****	****	A2	****	****	****	0	0	1	0	0	0
			A1B	****	****	****	0	0	1	0	0	0
			B1	****	****	****	0	1	2	0	0	1
NDJ	****	****	A2	****	****	****	0	0	1	0	0	0
			A1B	****	****	****	0	0	1	0	0	0
			B1	****	****	****	0	1	2	0	0	1
FMA	****	****	A2	****	****	****	0	0	0	0	0	0
			A1B	****	****	****	0	0	1	0	0	0
			B1	****	****	****	0	1	2	0	0	1
MJJ	****	****	A2	****	****	****	0	0	0	0	0	0
			A1B	****	****	****	0	0	0	0	0	0
			B1	****	****	****	0	0	1	0	0	0
ASO	****	****	A2	****	****	****	0	0	0	0	0	0
			A1B	****	****	****	0	0	0	0	0	0
			B1	****	****	****	0	0	1	0	0	1

	Observed Mean 1970-99	Observed Trend 1960-2006	Projected changes by the 2030s			Projected changes by the 2060s			Projected changes by the 2090s			
			Min	Median	Max	Min	Median	Max	Min	Median	Max	
% total rainfall falling in Heavy Events (R95pct)												
	%	Change in % per decade				Change in %			Change in %			
Annual	****	****	A2	****	****	****	0	3	8	-1	4	12
			A1B	****	****	****	-2	3	9	0	4	12
			B1	****	****	****	-1	1	5	0	3	8
NDJ	****	****	A2	****	****	****	-2	2	9	-2	7	11
			A1B	****	****	****	-7	3	9	-2	5	10
			B1	****	****	****	-7	1	8	-7	4	10
FMA	****	****	A2	****	****	****	-1	1	7	0	2	15
			A1B	****	****	****	-1	1	11	-3	2	8
			B1	****	****	****	-4	1	4	-4	2	8
MJJ	****	****	A2	****	****	****	-4	0	10	-3	4	12
			A1B	****	****	****	-1	2	9	-5	4	15
			B1	****	****	****	-5	1	8	-2	2	12
ASO	****	****	A2	****	****	****	0	4	10	-2	5	12
			A1B	****	****	****	0	4	9	0	4	14
			B1	****	****	****	-1	2	6	0	5	10
Maximum 1-day rainfall (RX1day)												
	mm	Change in mm per decade				Change in mm			Change in mm			
Annual	****	****	A2	****	****	****	-4	2	22	-3	3	26
			A1B	****	****	****	-7	1	16	-1	4	26
			B1	****	****	****	-1	1	11	-1	2	21
NDJ	****	****	A2	****	****	****	-4	0	12	-3	4	24
			A1B	****	****	****	-8	1	7	-4	2	15
			B1	****	****	****	-6	0	11	-9	1	13
FMA	****	****	A2	****	****	****	-2	1	17	-1	1	6
			A1B	****	****	****	-2	0	21	-3	1	10
			B1	****	****	****	-6	0	2	-4	0	25
MJJ	****	****	A2	****	****	****	-4	0	15	-3	2	13
			A1B	****	****	****	-3	0	11	-6	1	15
			B1	****	****	****	-5	1	9	-6	0	14
ASO	****	****	A2	****	****	****	-2	2	9	-3	2	23
			A1B	****	****	****	0	1	10	0	2	20
			B1	****	****	****	-1	0	8	-1	1	9
Maximum 5-day Rainfall (RX5day)												
	mm	Change in mm per decade				Change in mm			Change in mm			
Annual	****	****	A2	****	****	****	-11	4	39	-11	14	41
			A1B	****	****	****	-17	4	27	-4	7	44
			B1	****	****	****	-15	2	14	-5	7	50
NDJ	****	****	A2	****	****	****	-13	3	26	-8	7	46
			A1B	****	****	****	-25	3	15	-21	6	24
			B1	****	****	****	-16	0	17	-24	5	19
FMA	****	****	A2	****	****	****	-6	3	35	-3	2	15
			A1B	****	****	****	-6	0	45	-9	1	22
			B1	****	****	****	-14	2	5	-10	2	37
MJJ	****	****	A2	****	****	****	-8	0	27	-14	4	22
			A1B	****	****	****	-9	0	20	-16	3	32
			B1	****	****	****	-8	1	10	-7	0	46
ASO	****	****	A2	****	****	****	-11	5	16	-18	8	25
			A1B	****	****	****	-1	4	14	-2	7	21
			B1	****	****	****	-2	2	8	-1	6	17

* indicates trend is statistically significant at 95% confidence

**** indicates data are not available

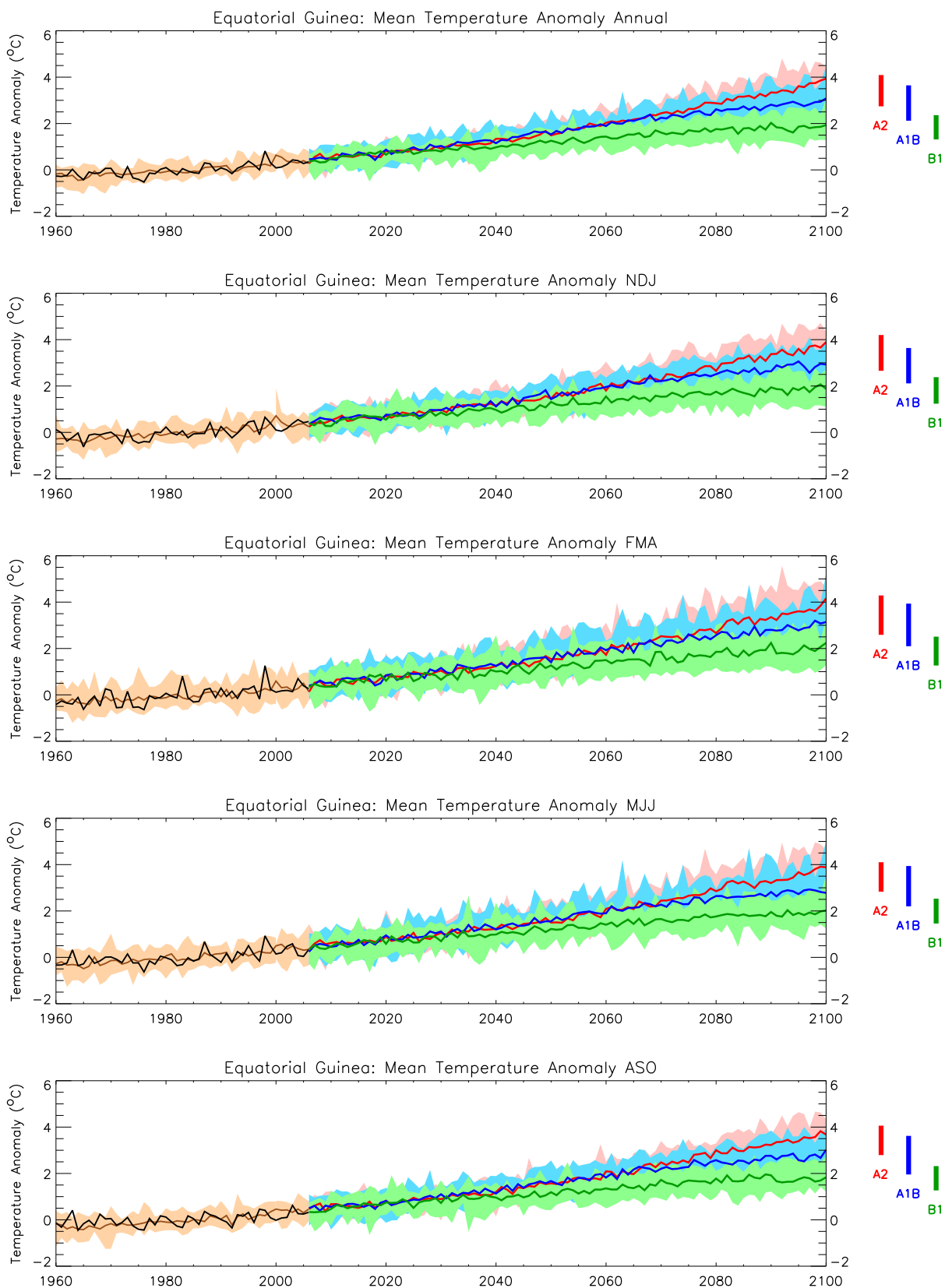


Figure 1: Trends in annual and seasonal mean temperature for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. Black curves show the mean of observed data from 1960 to 2006, Brown curves show the median (solid line) and range (shading) of model simulations of recent climate across an ensemble of 15 models. Coloured lines from 2006 onwards show the median (solid line) and range (shading) of the ensemble projections of climate under three emissions scenarios. Coloured bars on the right-hand side of the projections summarise the range of mean 2090-2100 climates simulated by the 15 models for each emissions scenario.

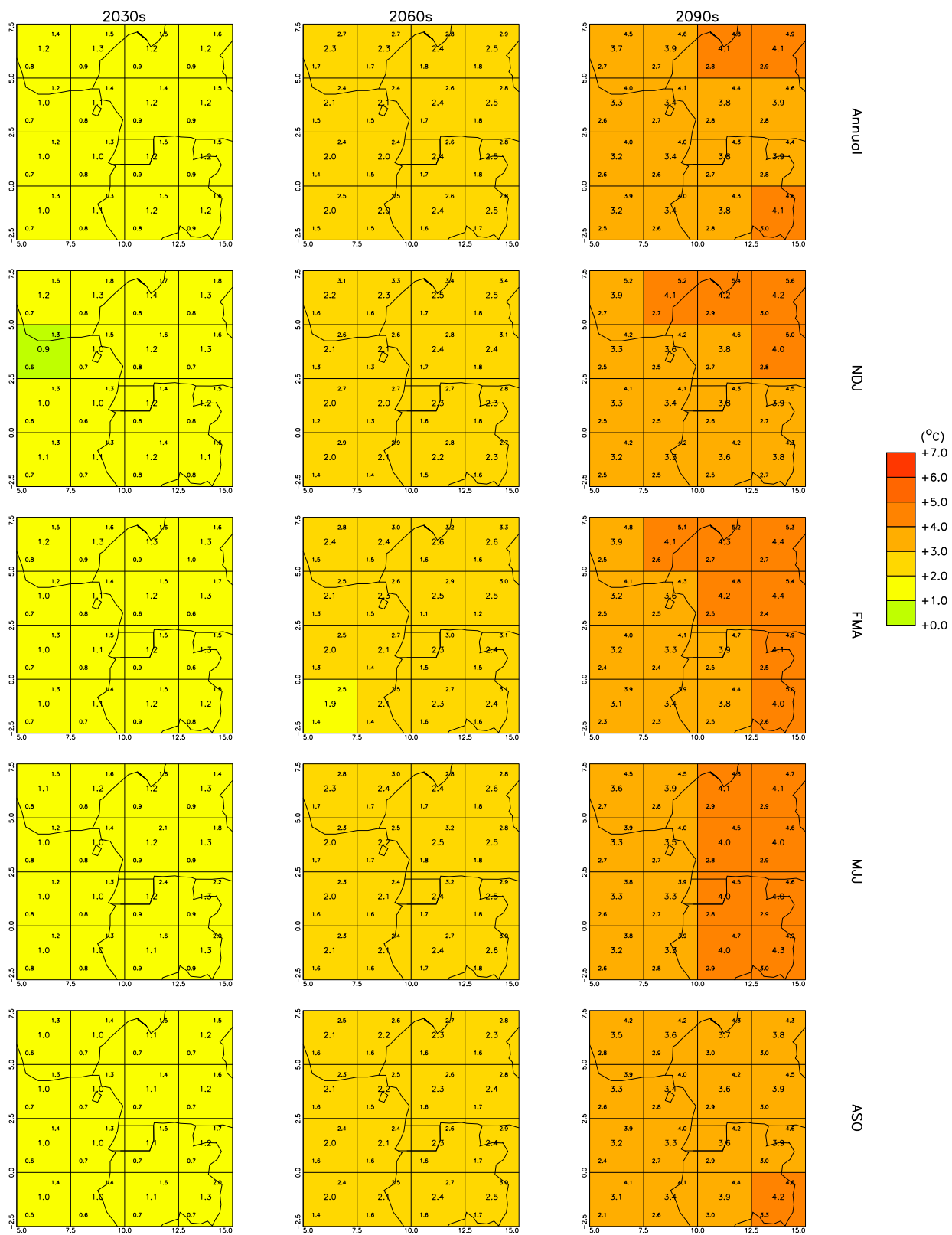


Figure 2: Spatial patterns of projected change in mean annual and seasonal temperature for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. In each grid box, the central value gives the ensemble median and the values in the upper and lower corners give the ensemble maximum and minimum.

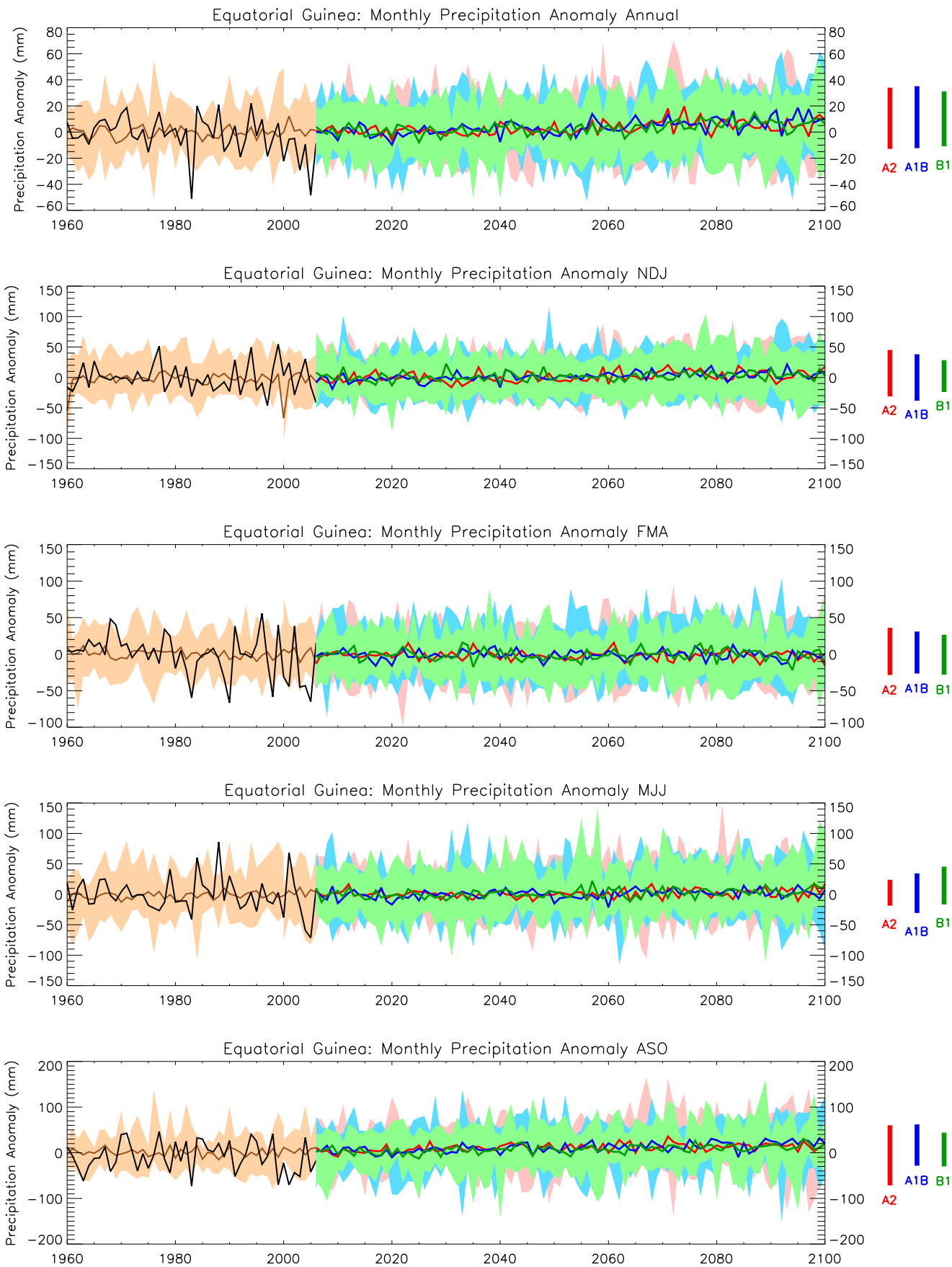


Figure 3: Trends in monthly precipitation for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

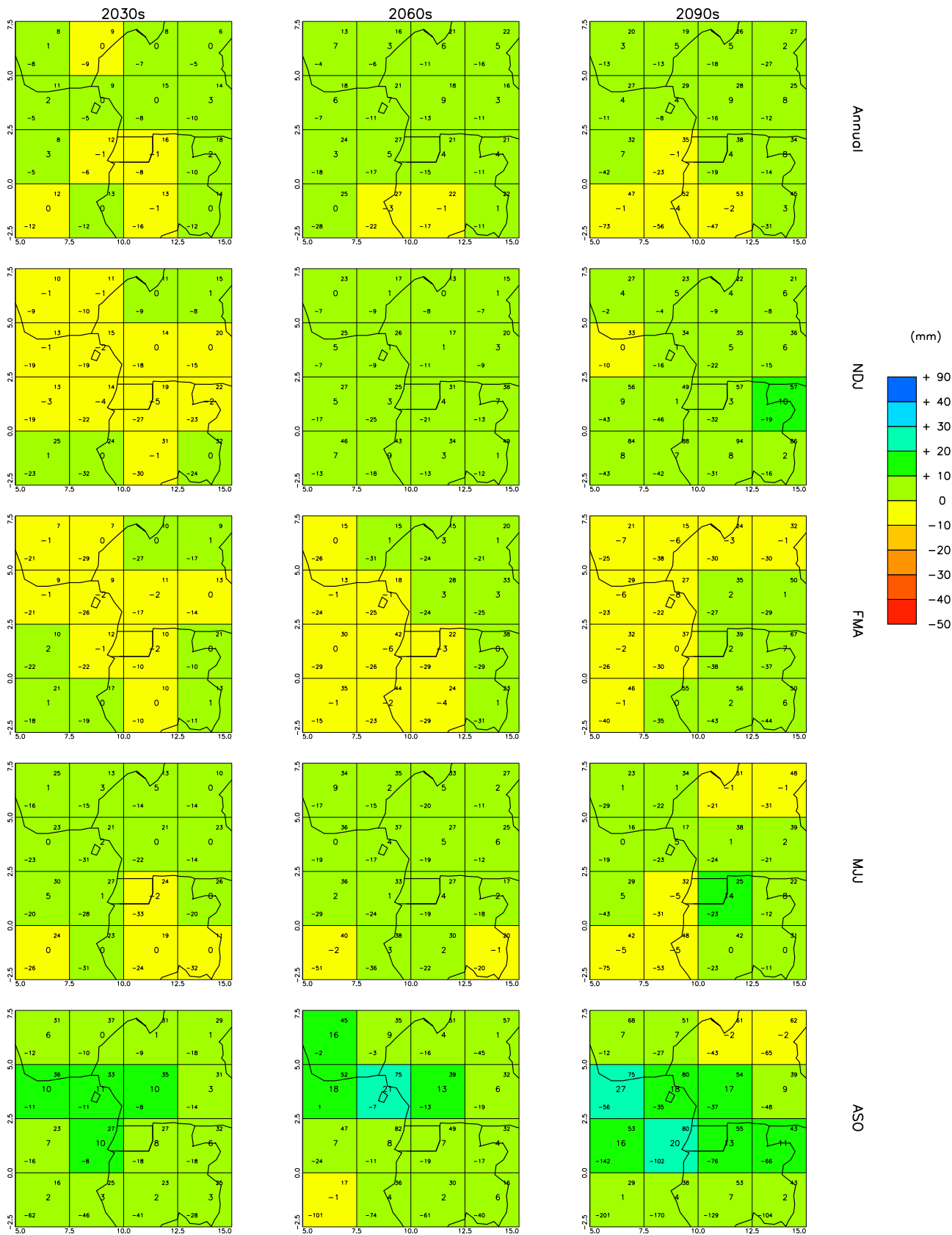


Figure 4: Spatial patterns of projected change in monthly precipitation for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. See Figure 2 for details.

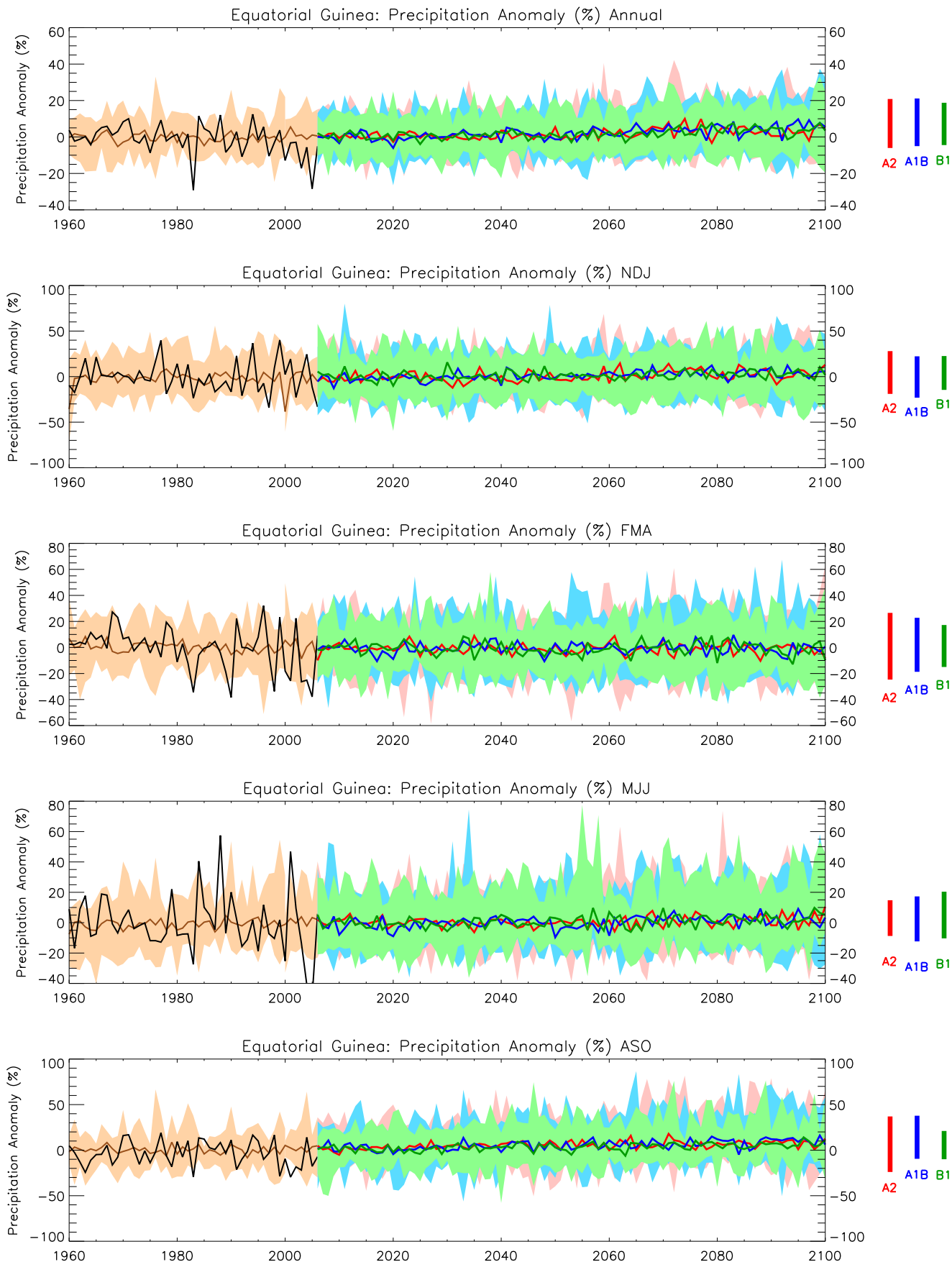


Figure 5: Trends in monthly precipitation for the recent past and projected future. All values shown are percentage anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

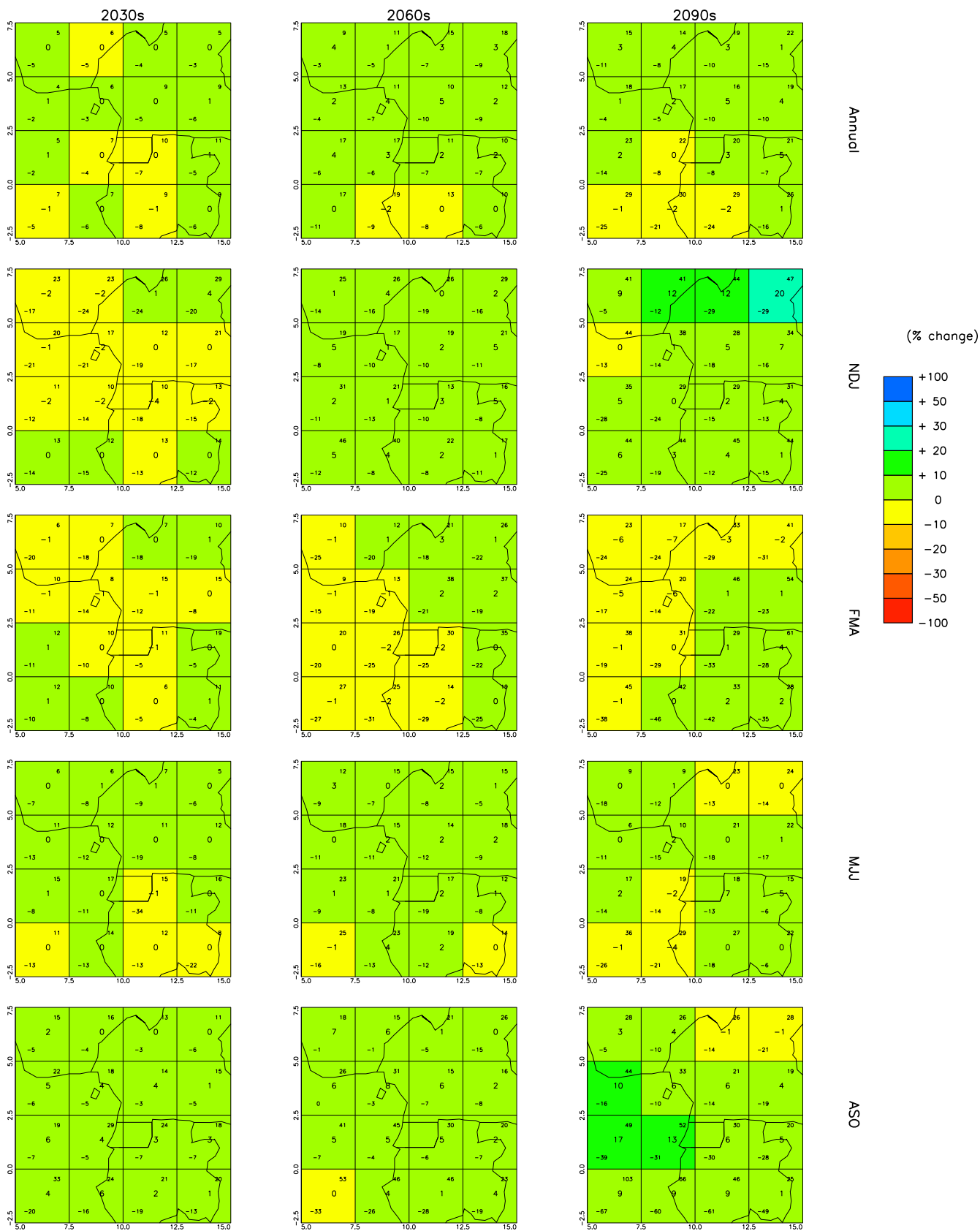


Figure 6: Spatial patterns of projected change in monthly precipitation for 10-year periods in the future under the SRES A2 scenario. All values are percentage anomalies relative to the mean climate of 1970-1999. See Figure 2 for details.

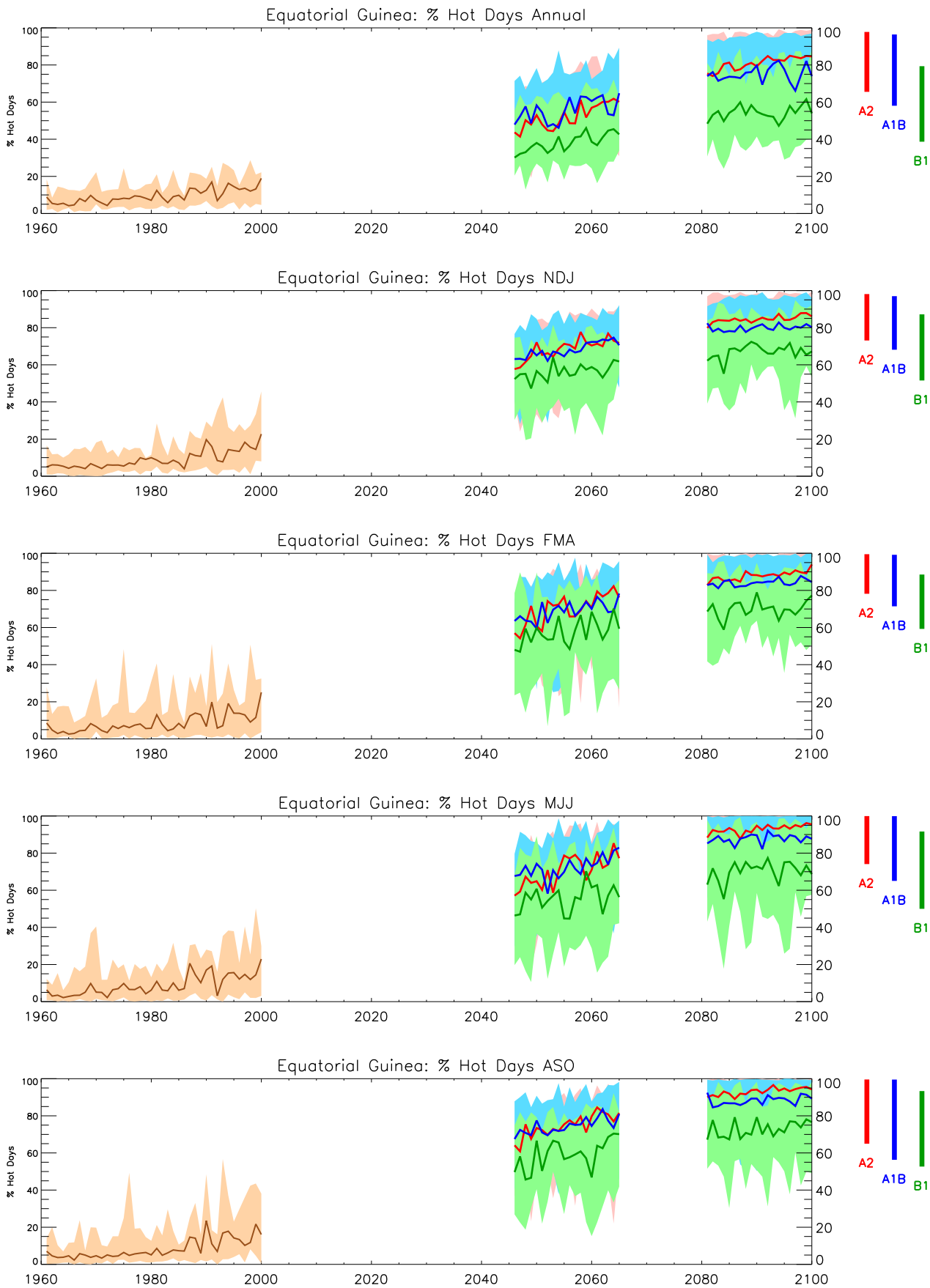


Figure 7: Trends in Hot-day frequency for the recent past and projected future. See Figure 1 for details.

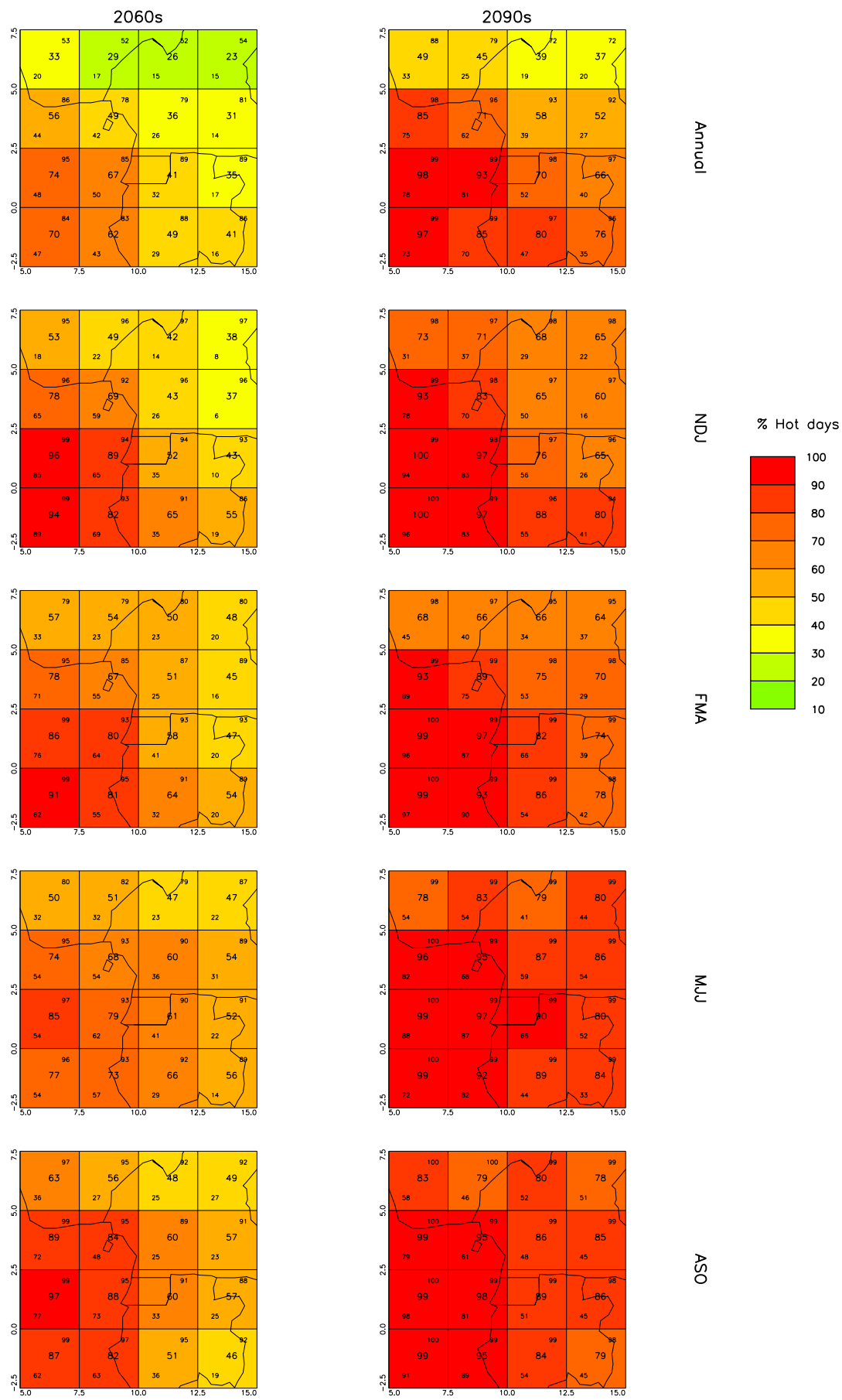


Figure 8: Spatial patterns of projected change in Hot-day frequency for 10-year periods in the future under the SRES A2 scenario. See Figure 2 for details.

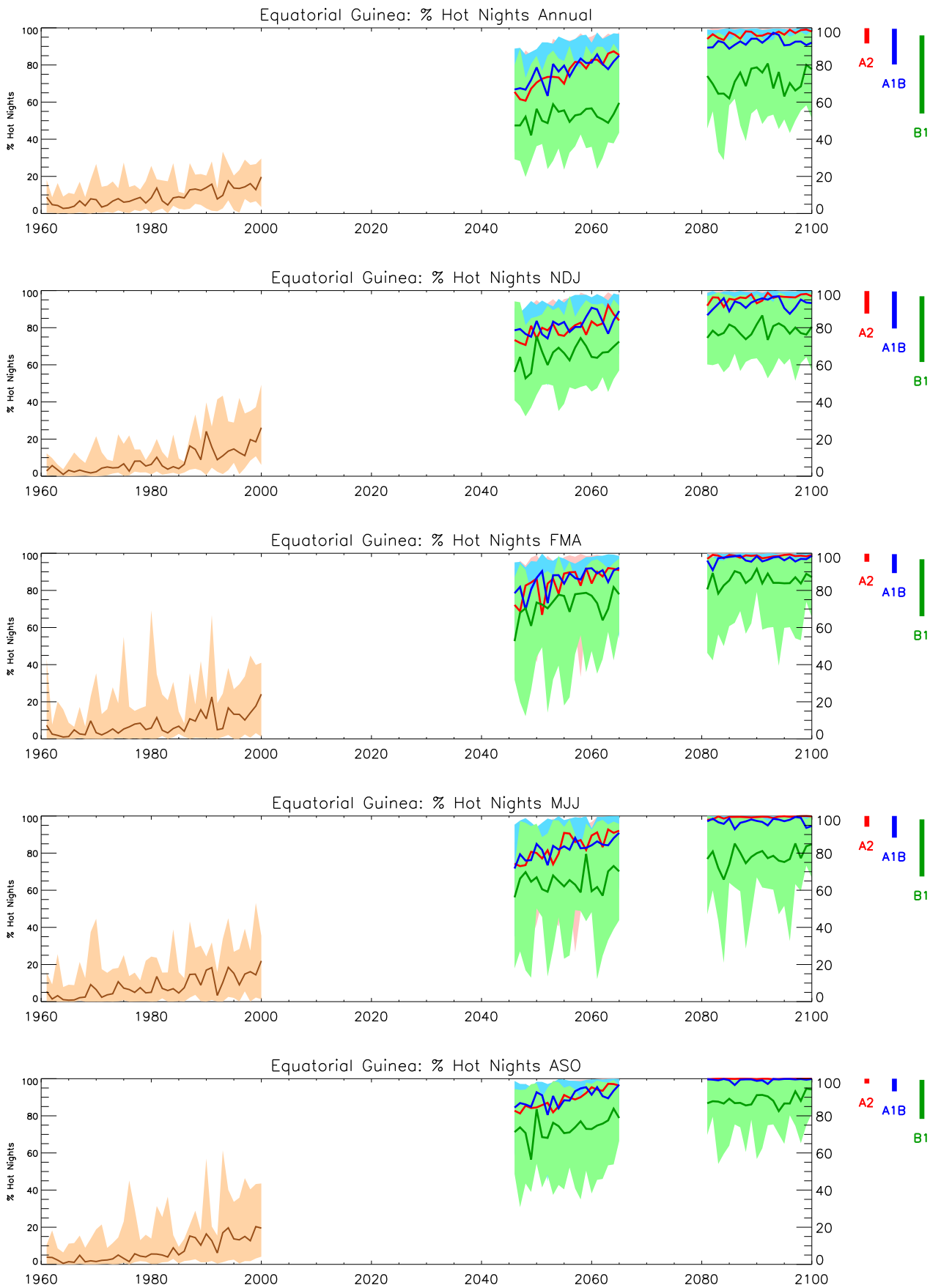


Figure 9: Trends in hot-night frequency for the recent past and projected future. See Figure 1 for details.

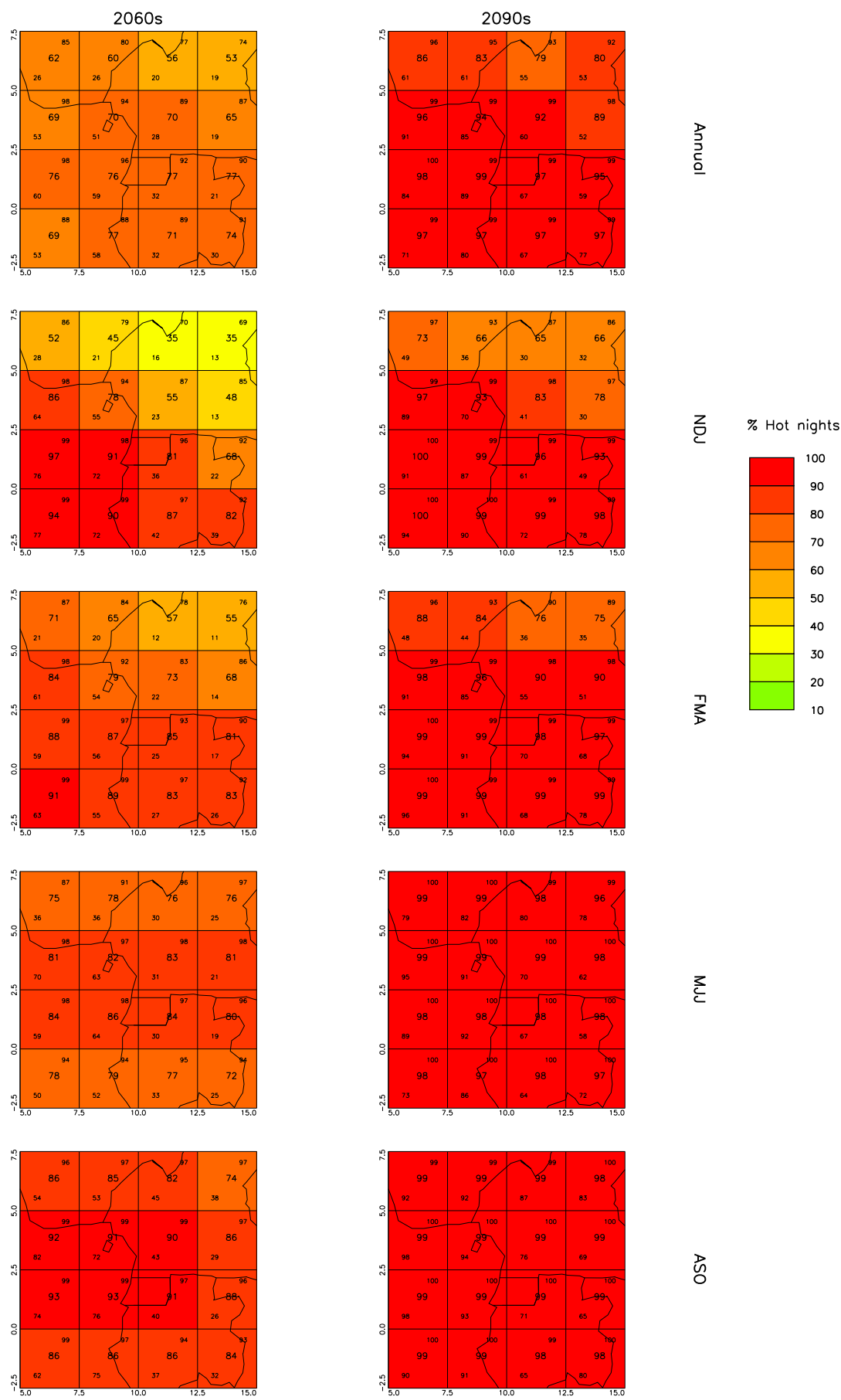


Figure 10: Spatial patterns of projected change in hot-night frequency for 10-year periods in the future under the SRES A2 scenario. See Figure 2 for details.

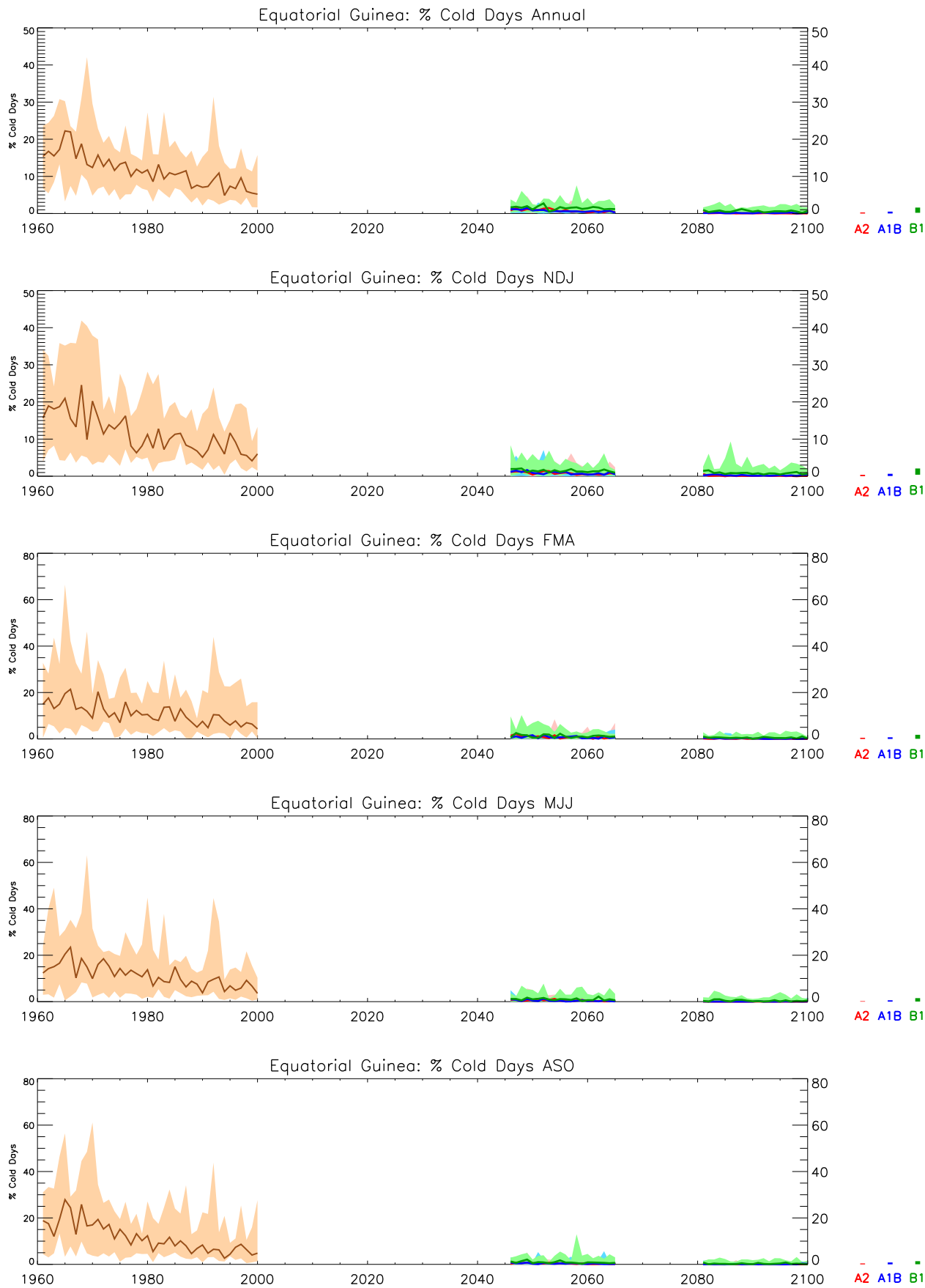


Figure 11: Trends in cold-day frequency for the recent past and projected future. See Figure 1 for details.

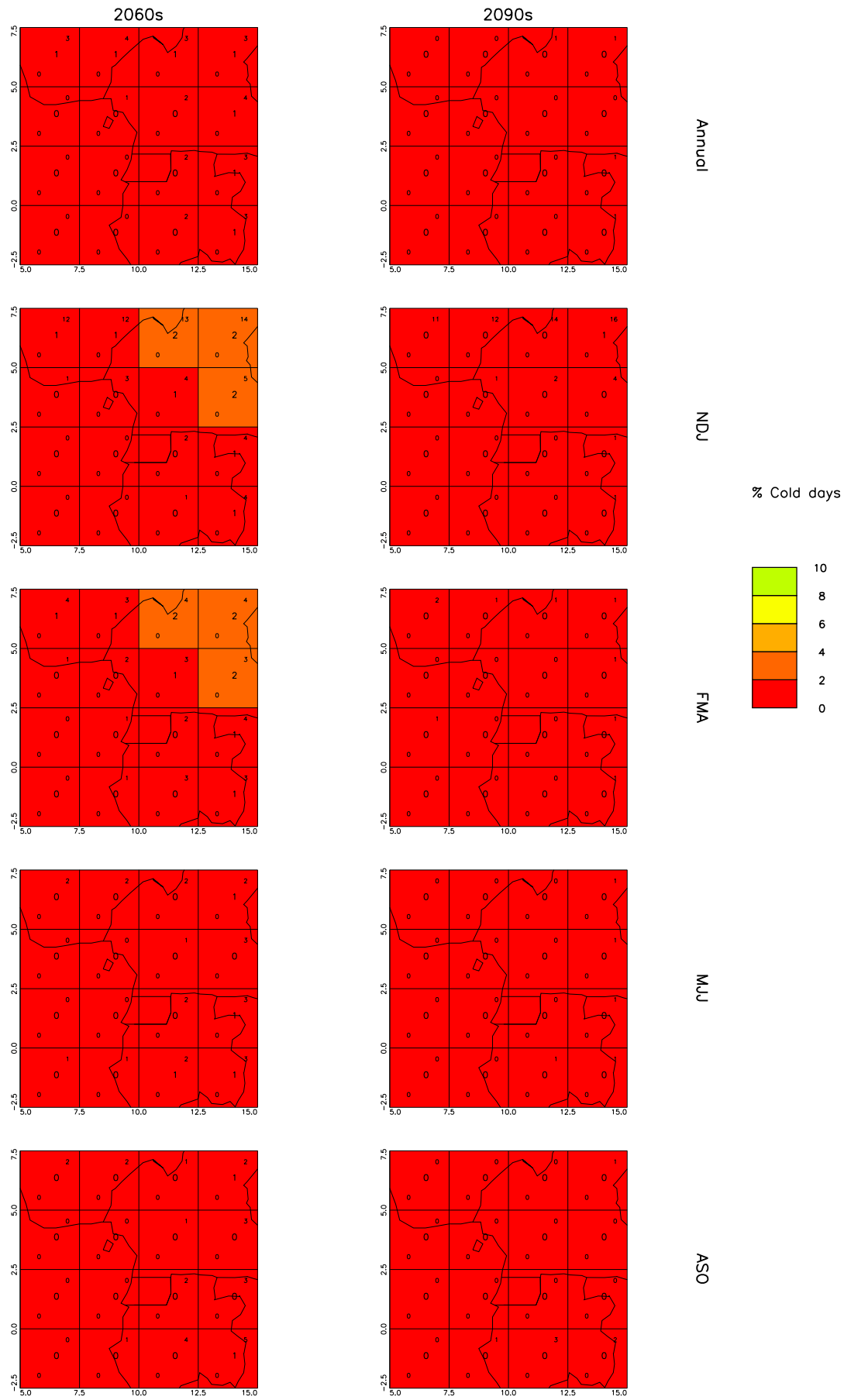


Figure 12: Spatial patterns of projected change in cold-day frequency for 10-year periods in the future under the SRES A2 scenario. See Figure 2 for details.

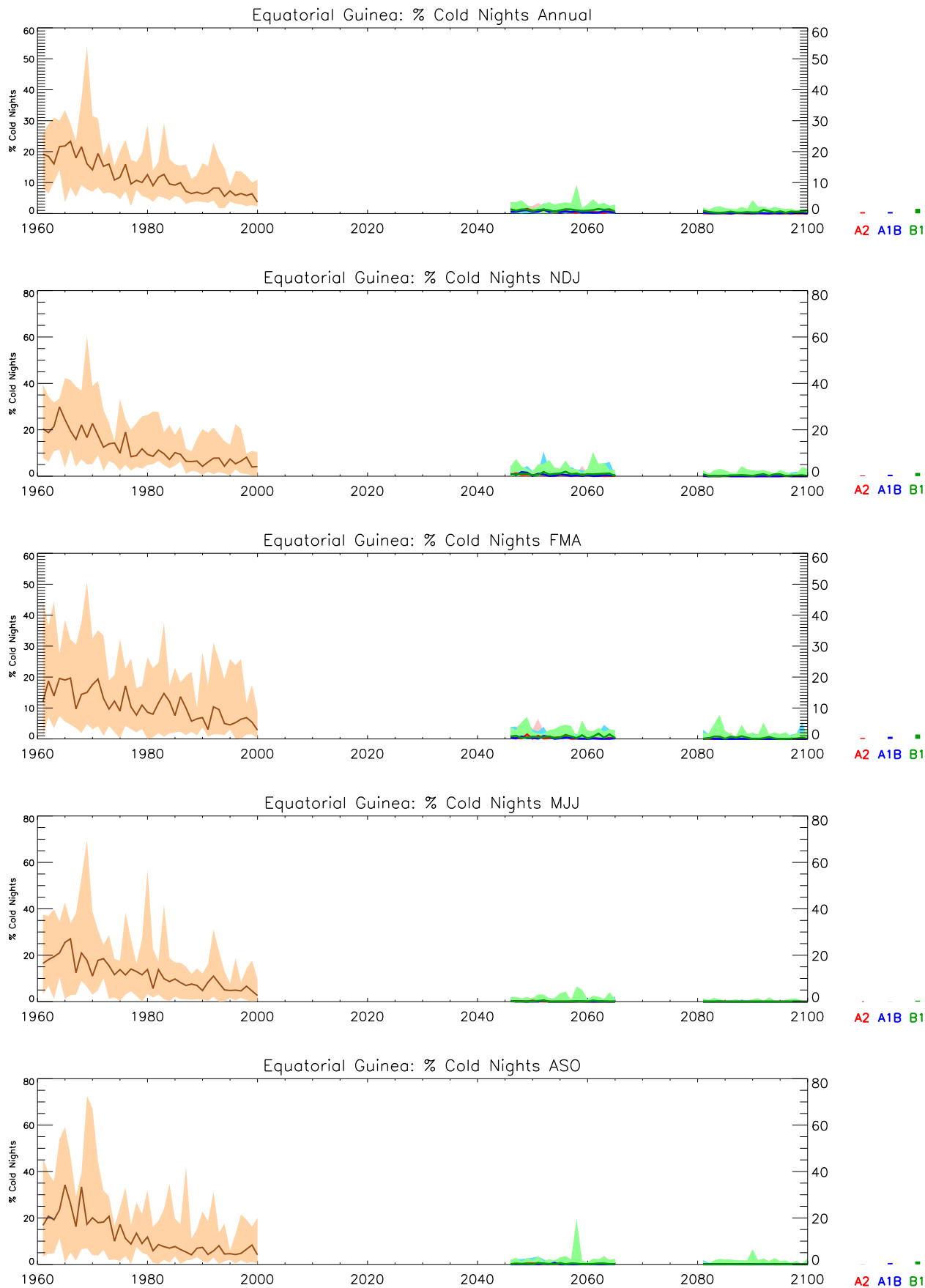


Figure 13: Trends in cold-night frequency for the recent past and projected future. See Figure 1 for details.

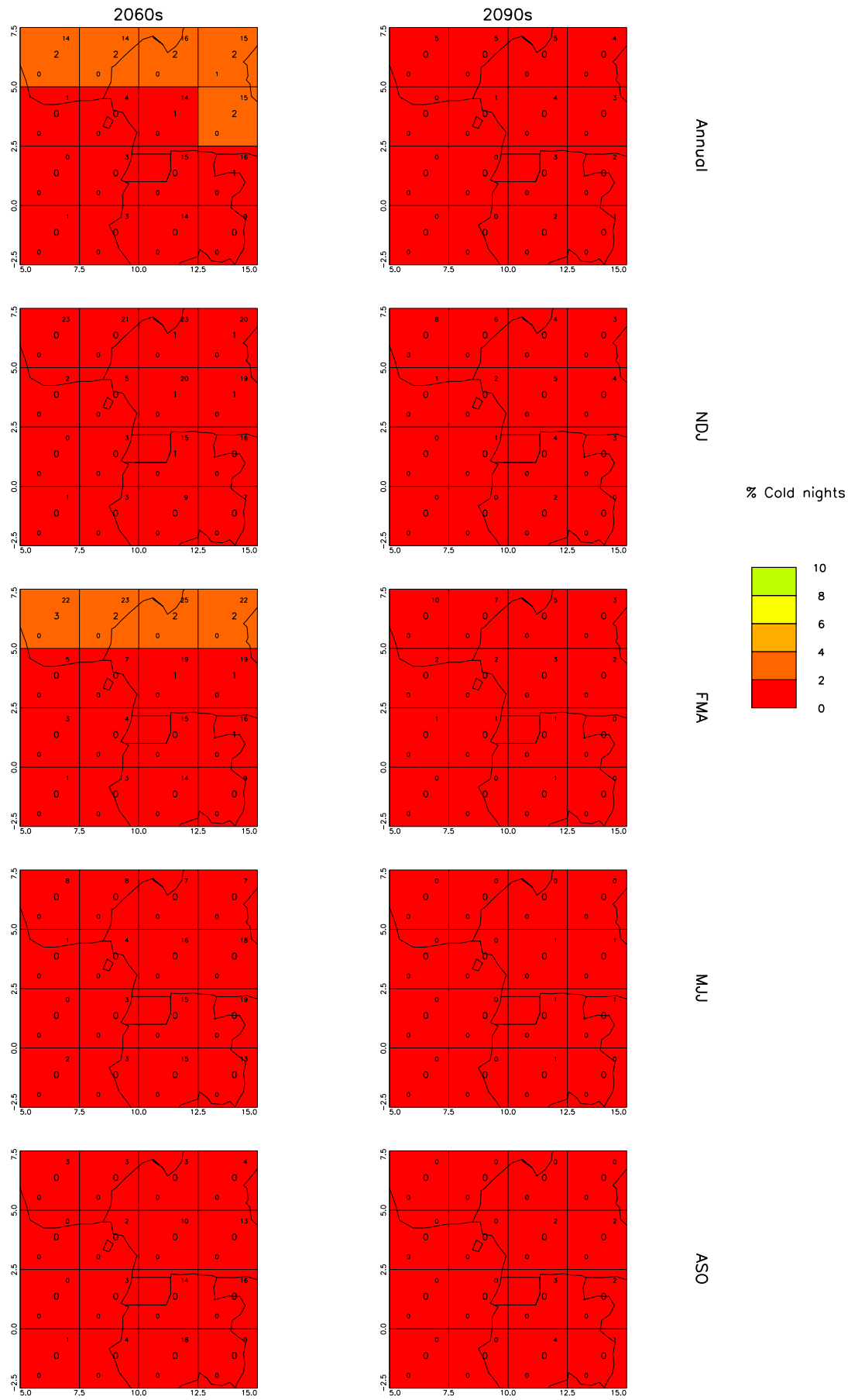


Figure 14: Spatial patterns of projected change in cold-night frequency for 10-year periods in the future under the SRES A2 scenario. See Figure 2 for details.

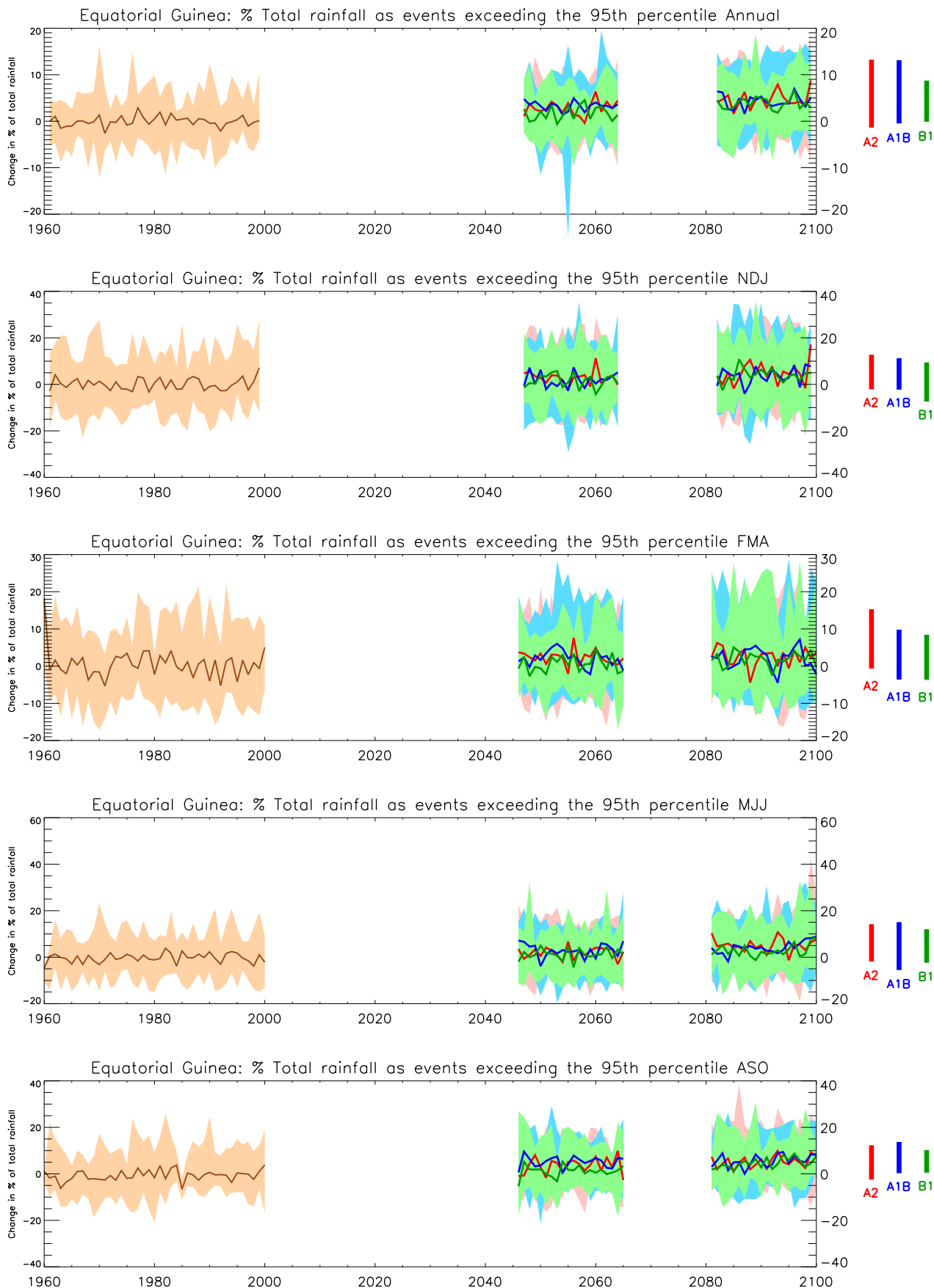


Figure 15: Trends in the proportion of precipitation falling in 'heavy' events for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

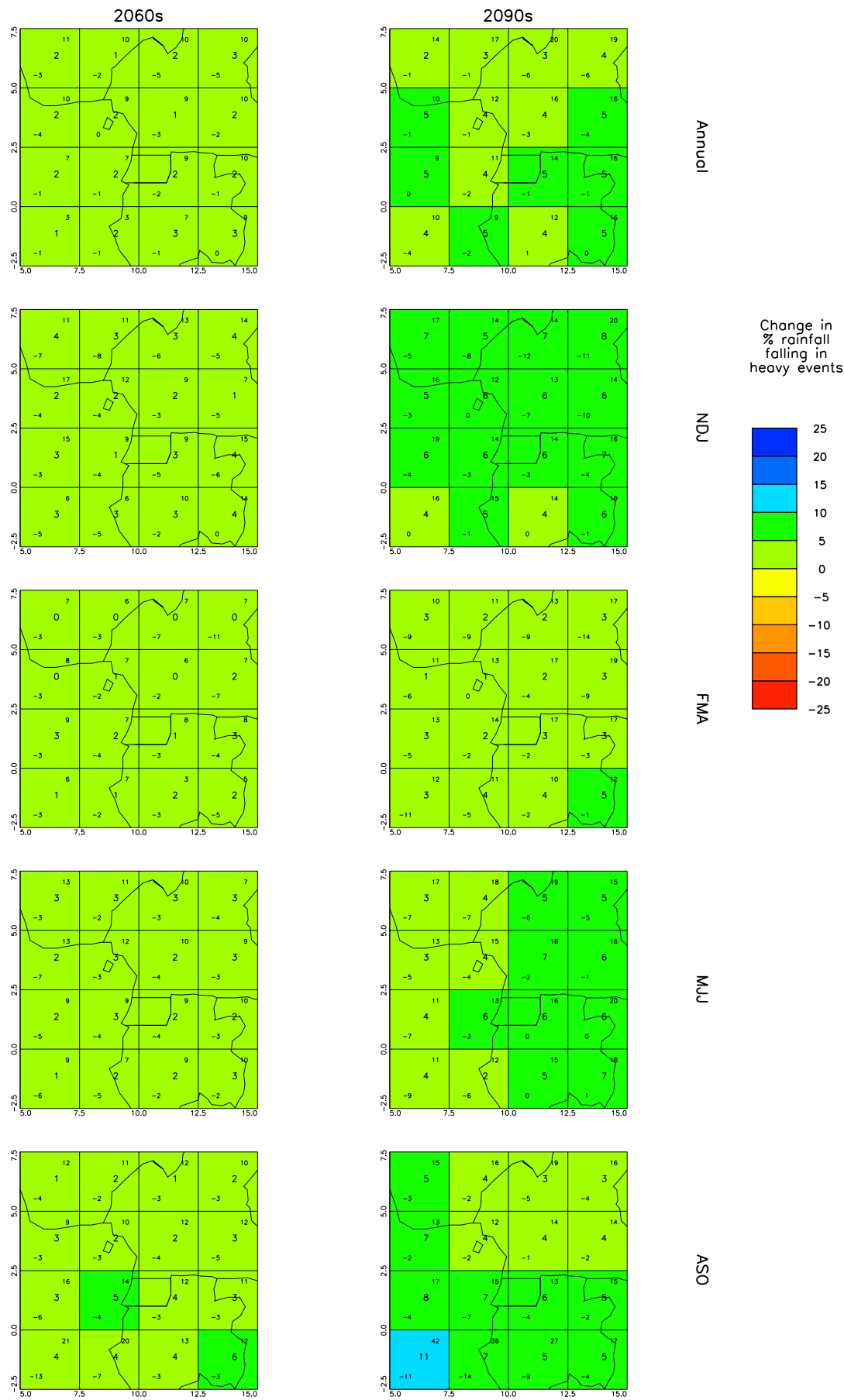


Figure 16: Spatial patterns of projected change in the proportion of precipitation falling in 'heavy' events for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. See Figure 2 for details.

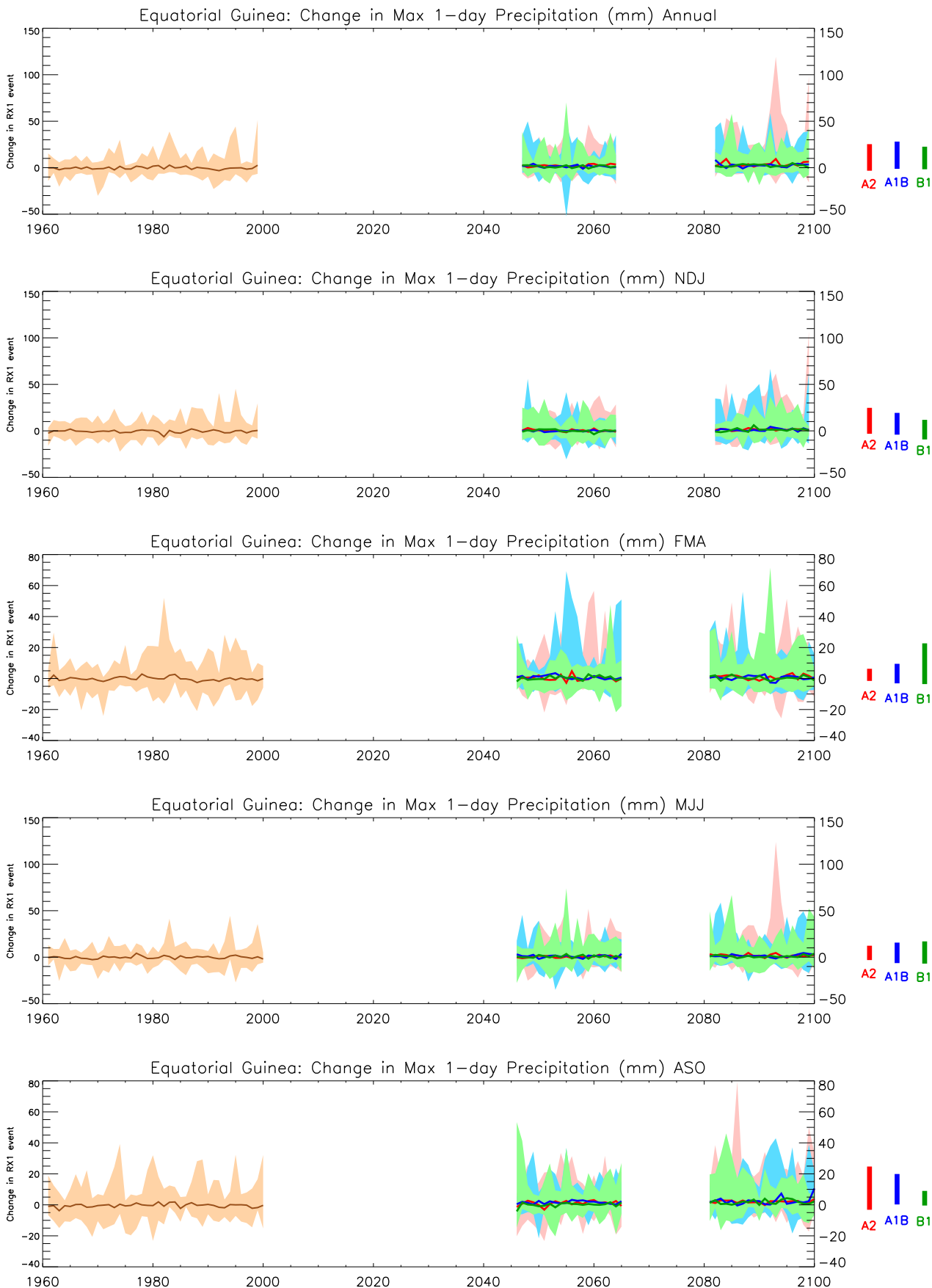


Figure 17: Trends in maximum 1-day rainfall for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

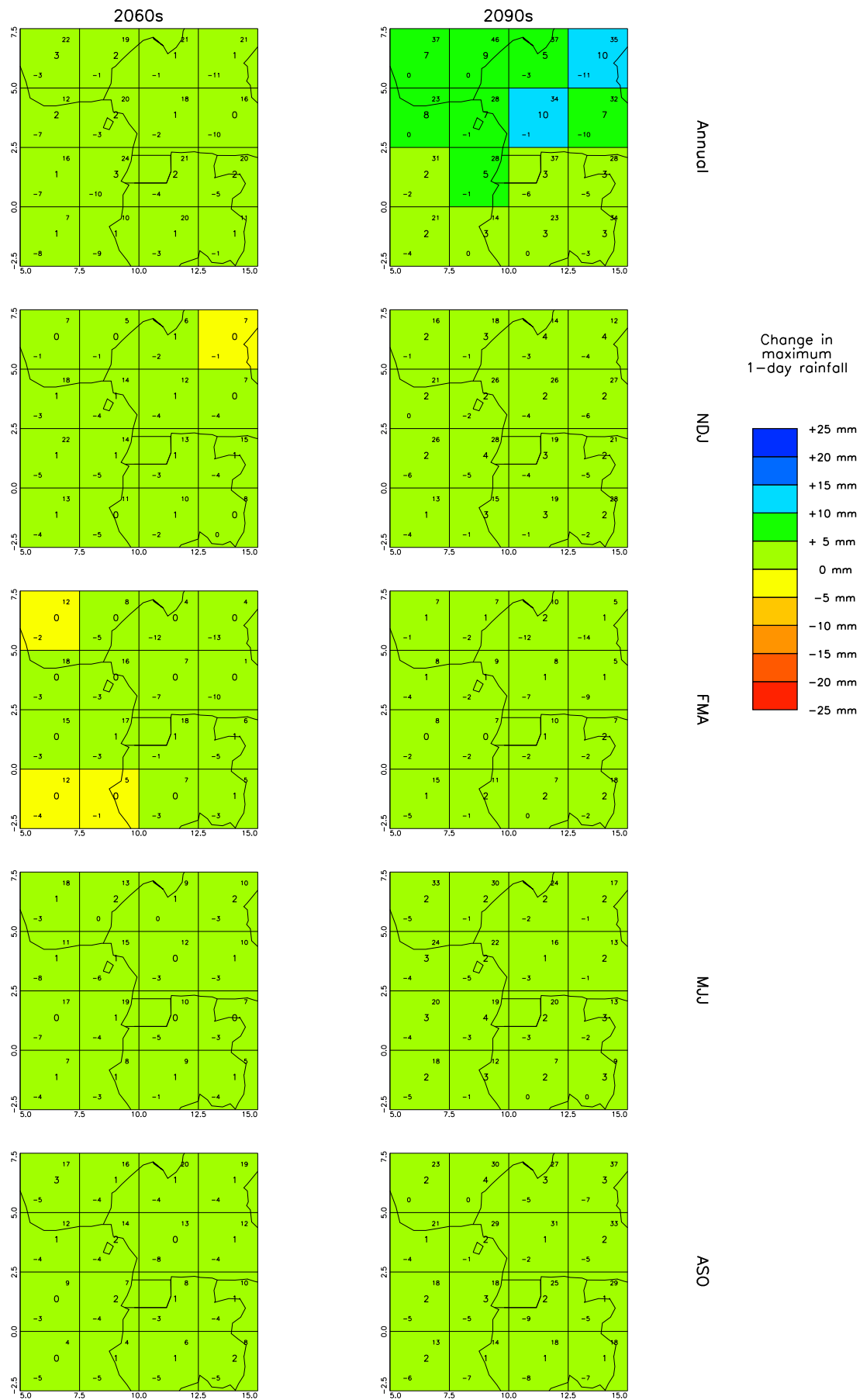


Figure 18: Spatial patterns of maximum 1-day rainfall for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. See Figure 2 for details.

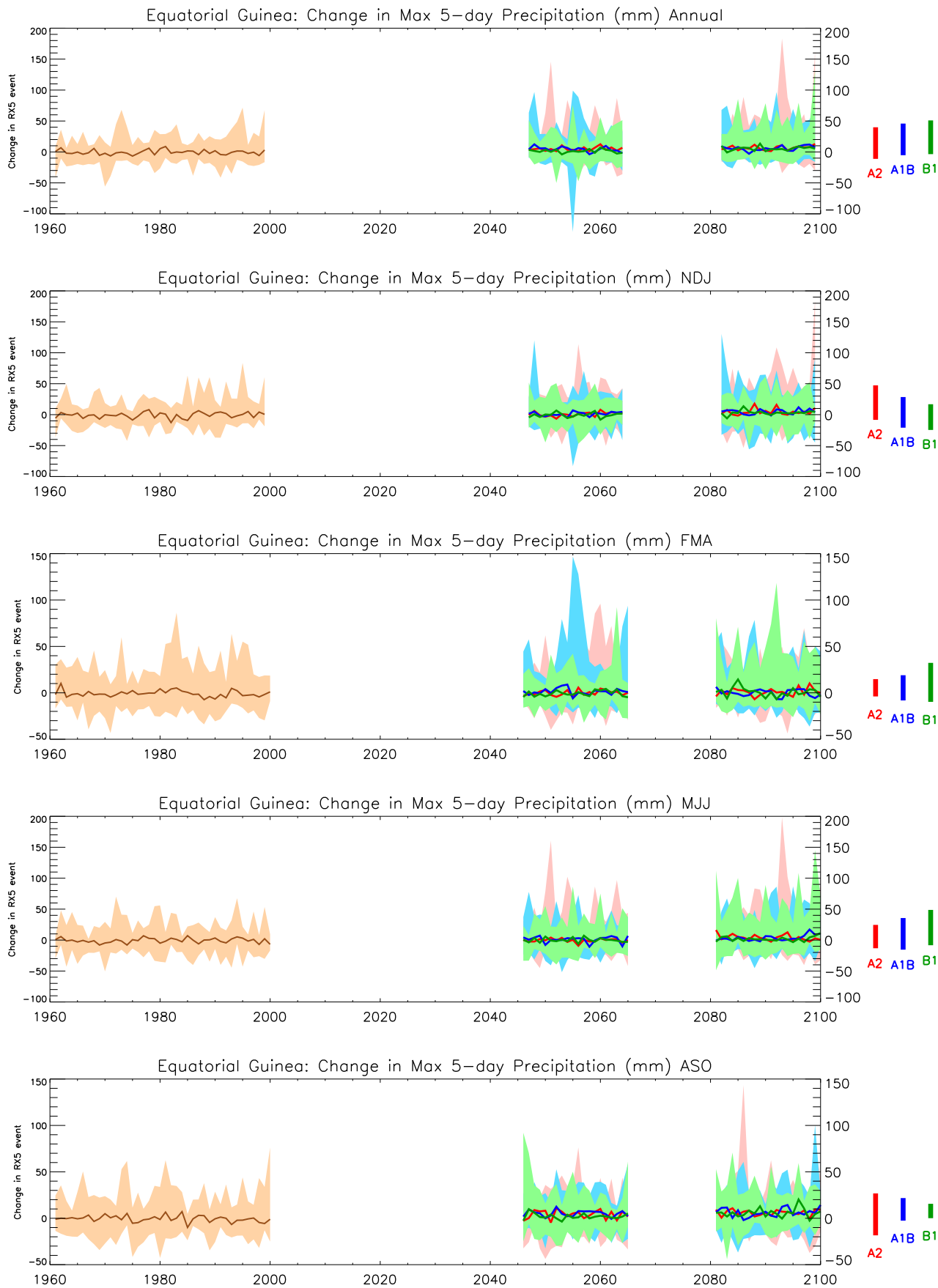


Figure 19: Trends in maximum 5-day rainfall for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

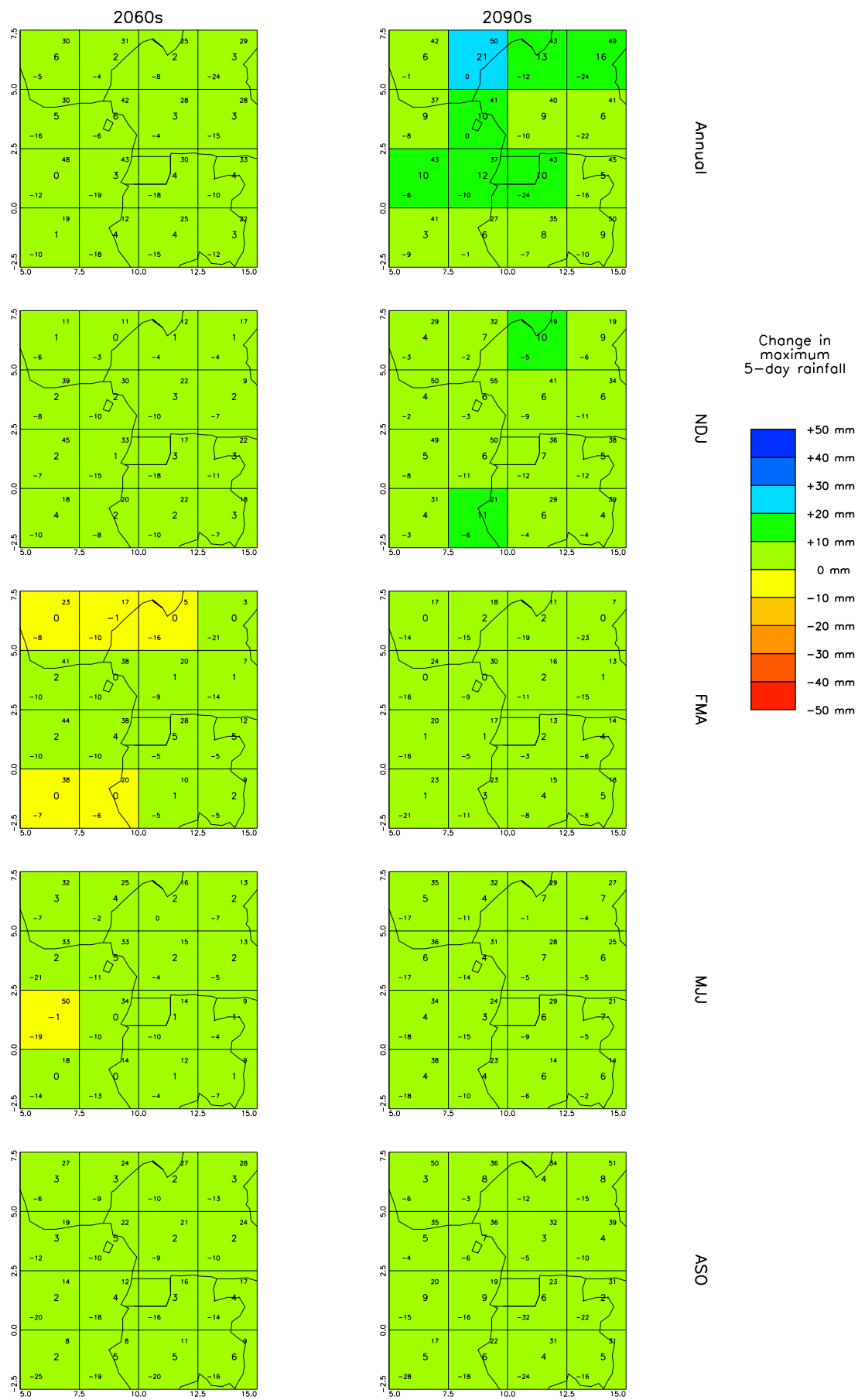


Figure 20: Spatial patterns of projected change in maximum 5-day rainfall for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. See Figure 2 for details.