UNDP Climate Change Country Profiles

Jamaica

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http://country-profiles.geog.ox.ac.uk

General Climate

Jamaica sits at a latitude of 18˚N and experiences the year-round warm, humid conditions associated with the Tropics. Seasonal mean temperatures range from 24-25˚C in the cooler months of December to February, to 27-28˚C in the warmer months of July and August. The wet season occurs through May to October, during which the island receives around 200-250mm per month.

Inter-annual variability in Jamaican climate is influenced strongly the El Nino Southern Oscillation (ENSO). El Niño episodes bring warmer and drier than average conditions between June and August and La Niña episodes bring colder and wetter conditions at this time. Jamaica also lies in the heart of the Atlantic hurricane belt, where Hurricanes occur throughout August, September and October. Heavy rainfall associated with cyclones and hurricanes contributes significantly to wet season rainfall totals. The occurrence of hurricanes is strongly linked to ENSO, with more frequent hurricane activity associated with La Niña events, and less frequent events in El Niño years.

Recent Climate Trends

Temperature

- Mean annual temperature has increased by around 0.6˚C since 1960, an average rate of 0.14˚C per decade.
- There is insufficient daily observational data to identify trends in daily temperature extremes.

Precipitation

- Mean rainfall over Jamaica has decreased in JJA and SON by 6.2 and 4.5 mm per month (4.4 and 2.0%) per decade respectively, but these trends are not statistically significant.

- There is insufficient available daily rainfall data for Jamaica to determine trends in daily rainfall extremes.

GCM Projections of Future Climate

Temperature

- The mean annual temperature is projected to increase by 0.6 to 2.3˚C by the 2060s, and 1.1 to 3.5 degrees by the 2090s. The range of projections by the 2090s under any one emissions scenario is around 1-2˚C.

- All projections indicate substantial increases in the frequency of days and nights that are considered 'hot'[1] in current climate.
    - Annually, projections indicate that 'hot' days are projected to occur on 27-73% of days by the 2060s, and 30-98% of days by the 2090s. Days considered 'hot' by current climate standards for their season are projected to increase most rapidly in JJA, occurring on 59-100% of days of the season by the 2090s.
    - Nights that are considered 'hot' for the annual climate of 1970-99 are projected to occur on 29-71% of nights by the 2060s and 40-97% of nights by the 2090s. Nights that are hot for each season are projected to increase most rapidly in JJA, occurring occur on 68-100% of nights in every season 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, occurring on 0-2% of days in the year by the 2090s, and not at all in projections from many of the models.

Precipitation

- Projections of mean annual rainfall from different models in the ensemble are consistent in indicating decreases in rainfall for Jamaica in JJA and MAM rainfall under the highest emissions scenario. Across all emissions scenarios, the range of changes is -72% to +12% for JJA and-59% to +51% by the 2090s. For the other seasons, projection range from increases to decreases, but ensemble median values are always negative. Annual projections vary between -65% to +22% by the 2090s with ensemble median values of -6 to -14%.

- The proportion of total rainfall that falls in heavy[3] events decreases in most model projections, showing changes of -19% to +9% by the 2090s.
- Maximum 1- and 5-day rainfalls in projections span a similar range of positive as negative changes, but ensemble median values tend to be negative.

[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.

Additional Regional Climate Change Information

- Tropical cyclones are poorly captured by GCMs and thus potential changes in intensity and tracks of tropical cyclones in the future are very uncertain. Whilst evidence indicates that tropical cyclones are likely to become, on the whole, more intense under a warmer climate as a result of higher sea-surface temperatures, there is great uncertainty in changes in frequency, and changes to storm tracks and their interactions with other features of climate variability (such as the El Niño Southern Oscillation) which introduces uncertainty at the regional scale (Christensen *et al*., 2007).
- Uncertainty in potential changes in tropical cyclone contributes to uncertainties in future wet-season rainfall. Potential increases in summer rainfall associated with tropical cyclone activity, which may not be captured in the GCM projections, may counteract the projected decreases in rainfall in the region (Christensen *et al*., 2007).
- Model simulations show wide disagreements in projected changes in the amplitude of future El Niño events, contributing to uncertainty in future climate variability in projections for this region.
- Jamaica is vulnerable to sea-level rise. Sea-level in this region is projected by climate models to rise by the following levels[4] 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 see Christensen *et al.* (2007) IPCC Working Group I Report: '*The Physical Science Basis'*, Chapter 11 *(Regional Climate projections*): Section 11.6 *(South and Central America*).

[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*		
			0.6	**1.0**	1.2	1.4	**1.9**	2.2	2.5	**3.0**	3.5
Annual	26	0.14*	0.5	**1.1**	1.3	1.0	**1.9**	2.3	1.6	**2.6**	3.2
			0.3	**0.8**	1.0	0.6	**1.4**	1.6	1.1	**1.5**	2.2
			0.6	**0.9**	1.2	1.3	**1.8**	2.0	2.3	**2.9**	3.5
DJF	24.8	0.15*	0.4	**1.0**	1.3	1.0	**1.8**	2.2	1.4	**2.4**	3.2
			0.3	**0.8**	1.1	0.6	**1.3**	1.6	1.1	**1.5**	2.1
			0.6	**0.9**	1.2	1.3	**1.8**	2.1	2.4	**3.0**	3.3
MAM	25.6	0.11*	0.4	**1.0**	1.3	0.8	**1.8**	2.2	1.4	**2.5**	3.0
			0.2	**0.8**	1.0	0.6	**1.2**	1.5	1.0	**1.6**	2.1
			0.6	**1.0**	1.3	1.4	**2.0**	2.4	2.5	**3.2**	3.7
JJA	27.1	0.16*	0.5	**1.1**	1.5	1.0	**1.9**	2.4	1.7	**2.6**	3.1
			0.3	**0.9**	1.2	0.6	**1.4**	1.7	1.2	**1.6**	2.3
			0.7	**1.0**	1.2	1.3	**2.0**	2.3	2.5	**3.1**	3.7
SON	26.5	0.17*	0.6	**1.1**	1.3	1.1	**1.9**	2.4	1.8	**2.6**	3.3
			0.5	**0.8**	1.1	0.7	**1.4**	1.7	1.3	**1.5**	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*		
			-24	**-3**	12	-30	**-7**	5	-44	**-12**	2
Annual	155.2	-2.4	-21	**-5**	10	-34	**-6**	9	-27	**-8**	6
			-13	**-1**	13	-20	**-3**	8	-20	**-6**	13
			-12	**0**	10	-13	**-2**	15	-19	**-1**	14
DJF	107.2	0.2	-10	**-4**	5	-16	**-2**	8	-15	**-2**	21
			-9	**0**	27	-14	**-3**	8	-11	**-1**	13
			-10	**-2**	23	-15	**-4**	1	-20	**-5**	0
MAM	142.4	1.8	-13	**-1**	13	-14	**-4**	7	-20	**-6**	4
			-8	**0**	28	-12	**-3**	14	-13	**-3**	9
			-39	**-9**	18	-49	**-25**	-3	-74	**-36**	-5
JJA	141.0	-6.2	-26	**-10**	4	-57	**-18**	-5	-51	**-26**	-3
			-17	**-7**	16	-32	**-4**	13	-32	**-19**	7
			-34	**-4**	34	-44	**-5**	32	-64	**-3**	29
SON	227.6	-4.5	-39	**-2**	43	-50	**0**	37	-33	**-5**	28
			-22	**0**	19	-30	**1**	31	-33	**-6**	45
Precipitation (%)											
	(mm per month)	*(change in % per decade)*	*% Change*			*% Change*			*% Change*		
			-35	**-3**	17	-45	**-10**	9	-65	**-14**	3
Annual	155.2	-1.6	-32	**-7**	9	-51	**-7**	15	-36	**-13**	11
			-20	**-2**	10	-34	**-5**	9	-30	**-6**	22
			-31	**1**	25	-37	**-3**	18	-52	**-4**	26
DJF	107.2	0.2	-28	**-7**	7	-45	**-5**	17	-33	**-4**	30
			-21	**0**	33	-28	**-7**	12	-24	**-2**	20
			-33	**-5**	38	-49	**-9**	4	-59	**-24**	0
MAM	142.4	1.3	-36	**-3**	22	-46	**-9**	26	-40	**-23**	5
			-20	**-2**	47	-43	**-6**	28	-35	**-10**	51
			-38	**-13**	22	-59	**-20**	-5	-72	**-32**	-3
JJA	141.0	-4.4	-36	**-14**	2	-55	**-19**	-9	-72	**-23**	-9
			-28	**-8**	15	-56	**-7**	7	-65	**-16**	12
			-35	**-3**	29	-46	**-5**	39	-66	**-4**	24
SON	227.6	-2	-40	**-2**	34	-51	**0**	31	-34	**-2**	25
			-23	**0**	15	-31	**0**	19	-36	**-7**	38

	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
	% Frequency	Change in frequency per decade				Future % frequency			Future % frequency		
Frequency of Hot Days (TX90p)											
			****	****	****	32	**51**	73	49	**78**	98
Annual	****	****	****	****	****	36	**53**	68	41	**71**	96
			****	****	****	27	**42**	53	30	**52**	66
			****	****	****	52	**78**	92	84	**98**	100
DJF	****	****	****	****	****	56	**82**	91	73	**96**	99
			****	****	****	34	**63**	79	58	**76**	93
			****	****	****	39	**76**	97	70	**96**	99
MAM	****	****	****	****	****	46	**81**	98	61	**94**	100
			****	****	****	32	**59**	96	37	**76**	99
			****	****	****	67	**85**	95	89	**99**	100
JJA	****	****	****	****	****	72	**86**	93	79	**97**	99
			****	****	****	43	**73**	80	59	**84**	96
			****	****	****	30	**86**	99	58	**98**	100
SON	****	****	****	****	****	33	**79**	99	42	**97**	99
			****	****	****	22	**66**	94	32	**85**	98
Frequency of Hot Nights (TN90p)											
			****	****	****	45	**51**	71	65	**79**	97
Annual	****	****	****	****	****	41	**56**	67	54	**72**	94
			****	****	****	29	**46**	52	40	**54**	64
			****	****	****	51	**73**	90	87	**96**	99
DJF	****	****	****	****	****	49	**78**	88	79	**93**	98
			****	****	****	29	**60**	78	54	**73**	90
			****	****	****	54	**71**	95	90	**95**	99
MAM	****	****	****	****	****	45	**77**	96	78	**92**	99
			****	****	****	27	**58**	92	49	**76**	99
			****	****	****	73	**87**	95	96	**99**	100
JJA	****	****	****	****	****	68	**91**	93	91	**97**	99
			****	****	****	40	**76**	85	68	**88**	97
			****	****	****	74	**84**	98	93	**98**	100
SON	****	****	****	****	****	75	**88**	98	86	**97**	99
			****	****	****	51	**71**	92	70	**91**	96
Frequency of Cold Days (TX10p)											
			****	****	****	0	**0**	3	0	**0**	0
Annual	****	****	****	****	****	0	**0**	2	0	**0**	1
			****	****	****	0	**1**	3	0	**1**	2
			****	****	****	0	**0**	3	0	**0**	0
DJF	****	****	****	****	****	0	**0**	1	0	**0**	1
			****	****	****	0	**1**	2	0	**1**	2
			****	****	****	0	**0**	3	0	**0**	0
MAM	****	****	****	****	****	0	**0**	3	0	**0**	1
			****	****	****	0	**0**	4	0	**0**	2
			****	****	****	0	**0**	1	0	**0**	0
JJA	****	****	****	****	****	0	**0**	0	0	**0**	2
			****	****	****	0	**0**	2	0	**0**	3
			****	****	****	0	**0**	1	0	**0**	0
SON	****	****	****	****	****	0	**0**	1	0	**0**	0
			****	****	****	0	**0**	4	0	**0**	2
Frequency of Cold Nights (TN10p)											
			****	****	****	0	**0**	2	0	**0**	0
Annual	****	****	****	****	****	0	**1**	2	0	**0**	1
			****	****	****	0	**2**	3	0	**1**	2
			****	****	****	0	**0**	3	0	**0**	0
DJF	****	****	****	****	****	0	**0**	2	0	**0**	1
			****	****	****	0	**1**	4	0	**1**	2
			****	****	****	0	**0**	2	0	**0**	0
MAM	****	****	****	****	****	0	**0**	2	0	**0**	0
			****	****	****	0	**1**	3	0	**0**	2
			****	****	****	0	**0**	0	0	**0**	0
JJA	****	****	****	****	****	0	**0**	0	0	**0**	0
			****	****	****	0	**0**	3	0	**0**	0
			****	****	****	0	**0**	1	0	**0**	0
SON	****	****	****	****	****	0	**0**	2	0	**0**	0
			****	****	****	0	**0**	2	0	**0**	1

	Observed Mean 1970-99	Observed Trend 1960-2006	Projected changes by the 2030s Min	Median	Max	Projected changes by the 2060s Min	Median	Max	Projected changes by the 2090s Min	Median	Max
% total rainfall falling in Heavy Events (R95pct)											
	%	*Change in % per decade*				*Change in %*			*Change in %*		
			****	****	****	-11	**0**	6	-19	**-1**	7
Annual	****	****	****	****	****	-13	**0**	4	-13	**-1**	5
			****	****	****	-14	**0**	6	-8	**-2**	9
			****	****	****	-14	**-1**	12	-16	**-3**	13
DJF	****	****	****	****	****	-13	**0**	11	-14	**-5**	11
			****	****	****	-12	**-2**	7	-15	**2**	8
			****	****	****	-16	**-4**	2	-25	**-10**	4
MAM	****	****	****	****	****	-24	**-5**	3	-18	**-8**	2
			****	****	****	-13	**-6**	8	-15	**-1**	11
			****	****	****	-19	**-1**	5	-25	**-8**	8
JJA	****	****	****	****	****	-13	**-4**	4	-20	**-6**	8
			****	****	****	-18	**0**	6	-19	**-4**	12
			****	****	****	-11	**-1**	6	-17	**0**	8
SON	****	****	****	****	****	-12	**-1**	6	-13	**0**	8
			****	****	****	-10	**0**	8	-15	**0**	4
Maximum 1-day rainfall (RX1day)											
	mm	*Change in mm per decade*				*Change in mm*			*Change in mm*		
			****	****	****	-9	**0**	9	-10	**0**	11
Annual	****	****	****	****	****	-4	**0**	6	-5	**0**	14
			****	****	****	-6	**1**	7	-9	**0**	6
			****	****	****	-5	**0**	6	-4	**0**	4
DJF	****	****	****	****	****	-4	**0**	8	-3	**-1**	6
			****	****	****	-2	**-1**	3	-4	**0**	2
			****	****	****	-5	**0**	2	-8	**-2**	5
MAM	****	****	****	****	****	-4	**-1**	3	-5	**-1**	5
			****	****	****	-6	**0**	2	-7	**0**	4
			****	****	****	-7	**-1**	4	-7	**-2**	5
JJA	****	****	****	****	****	-5	**-2**	7	-6	**-1**	6
			****	****	****	-7	**0**	5	-11	**-1**	2
			****	****	****	-7	**0**	8	-8	**0**	12
SON	****	****	****	****	****	-9	**0**	7	-7	**0**	8
			****	****	****	-4	**0**	5	-3	**0**	4
Maximum 5-day Rainfall (RX5day)											
	mm	*Change in mm per decade*				*Change in mm*			*Change in mm*		
			****	****	****	-18	**-1**	18	-29	**-3**	23
Annual	****	****	****	****	****	-22	**-3**	11	-19	**-4**	19
			****	****	****	-15	**0**	21	-25	**-1**	25
			****	****	****	-10	**0**	16	-12	**-1**	9
DJF	****	****	****	****	****	-10	**0**	27	-10	**-3**	14
			****	****	****	-7	**-2**	4	-11	**0**	5
			****	****	****	-11	**-4**	10	-16	**-7**	18
MAM	****	****	****	****	****	-9	**-4**	11	-10	**-4**	9
			****	****	****	-15	**-2**	11	-13	**0**	13
			****	****	****	-16	**-3**	9	-23	**-9**	7
JJA	****	****	****	****	****	-16	**-8**	10	-21	**-7**	4
			****	****	****	-16	**-3**	19	-25	**-7**	5
			****	****	****	-20	**-1**	14	-32	**-2**	27
SON	****	****	****	****	****	-25	**0**	15	-26	**-1**	16
			****	****	****	-12	**0**	18	-17	**-1**	20

* indicates trend is statistically significant at 95% confidence

**** indicates data are not available

Bracketed trend values for extremes indices indicate values for the closest seasons that data is available. See documentation.

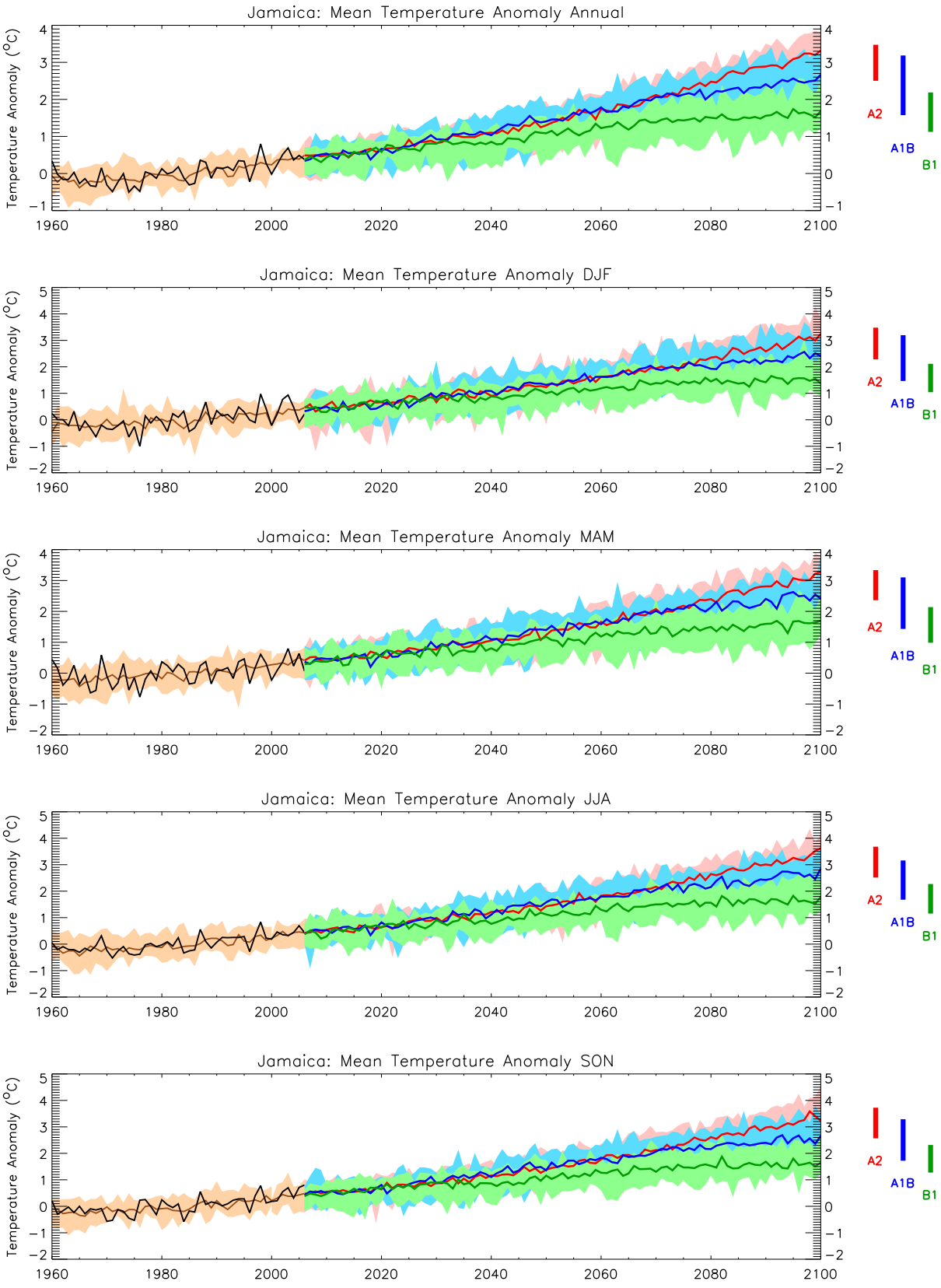

Figure 1: Trends in annual and seasonal mean temperature for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. Black curves show the mean of observed data from 1960 to 2006, Brown curves show the median (solid line) and range (shading) of model 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.

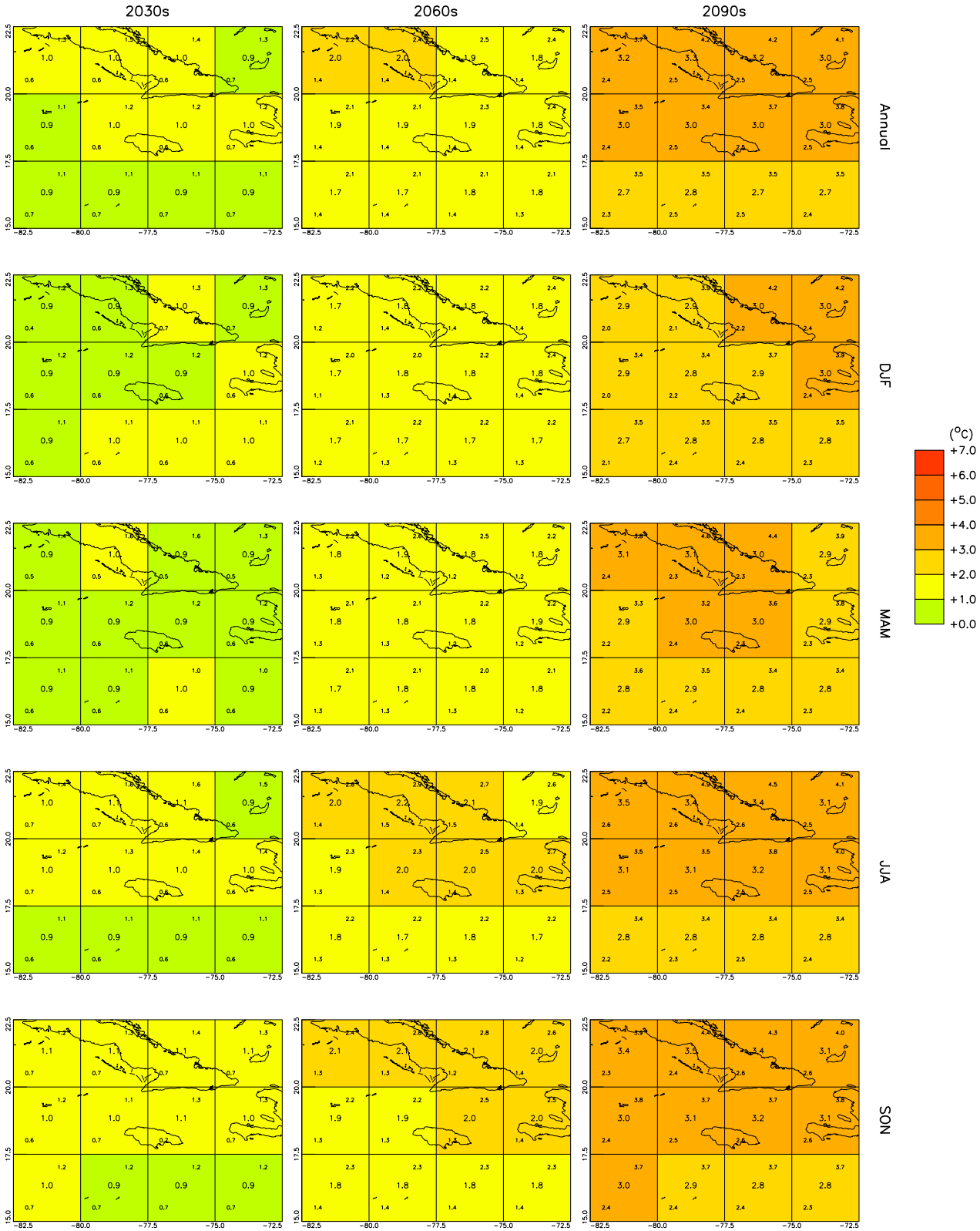

Figure 2: Spatial patterns of projected change in mean annual and seasonal temperature for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. In each grid box, the central value gives the ensemble median and the values in the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

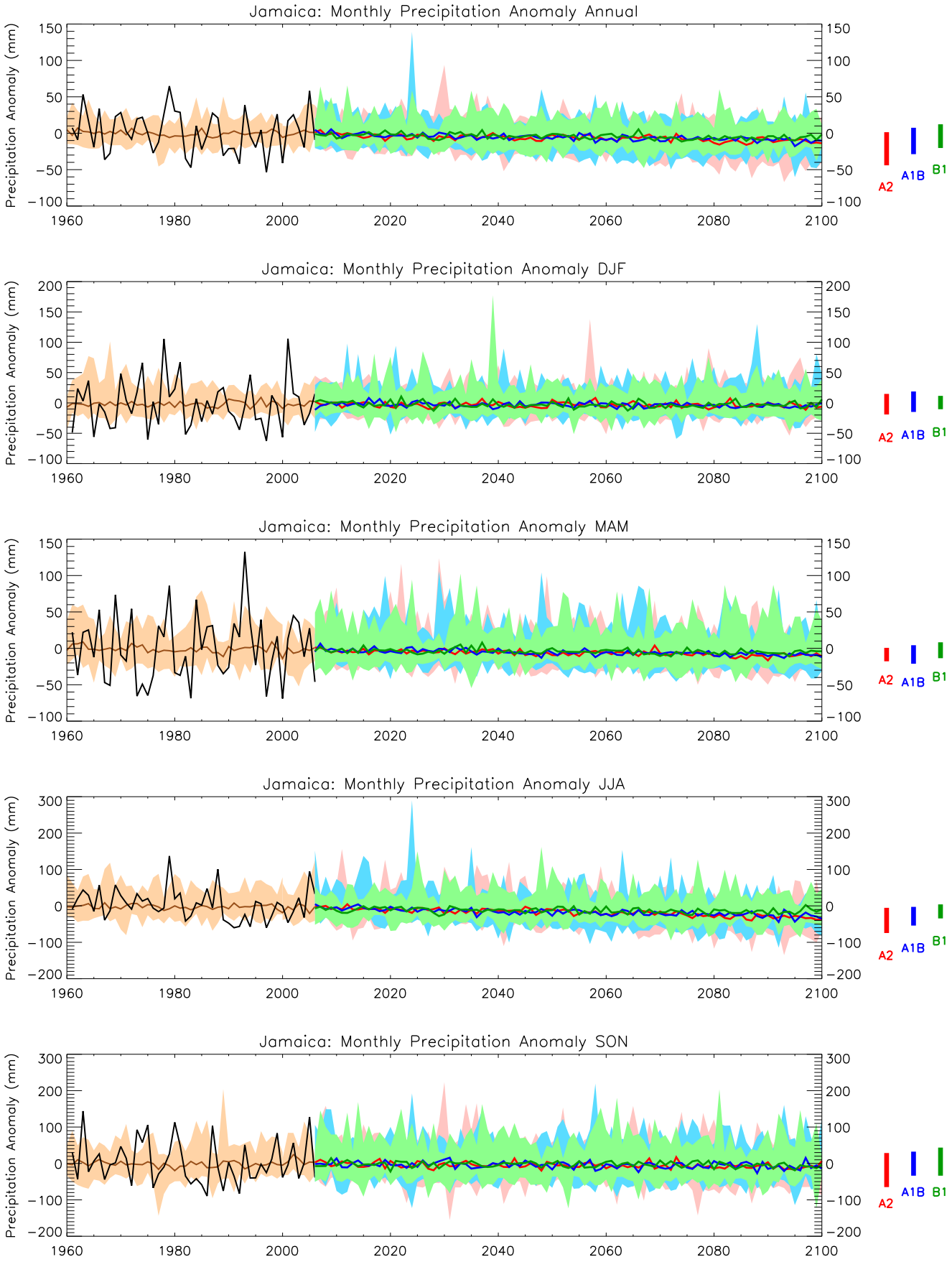

Figure 3: Trends in monthly precipitation for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

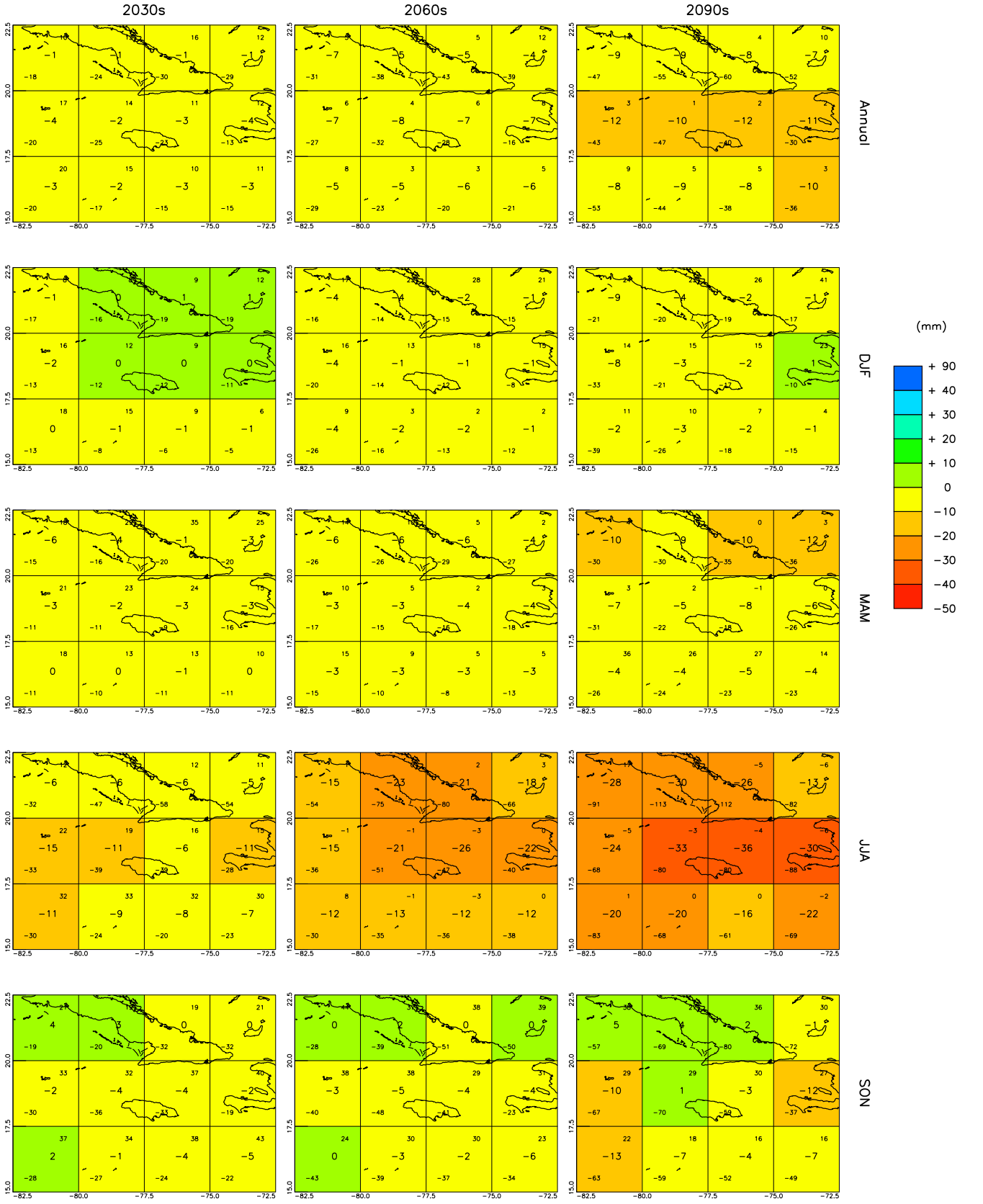

Figure 4: Spatial patterns of projected change in monthly precipitation for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999.See Figure 2 for details.

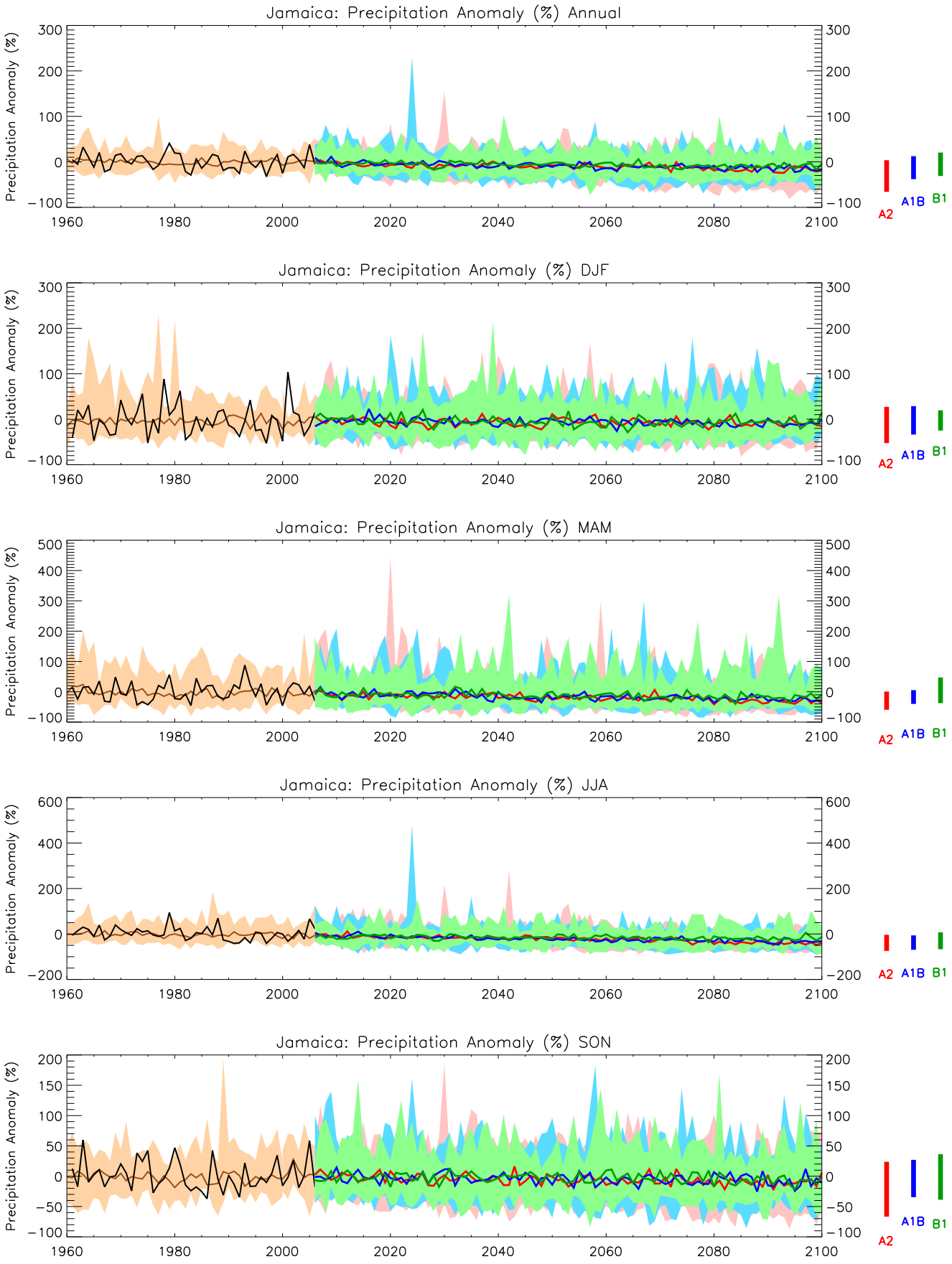

Figure 5: Trends in monthly precipitation for the recent past and projected future. All values shown are percentage anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

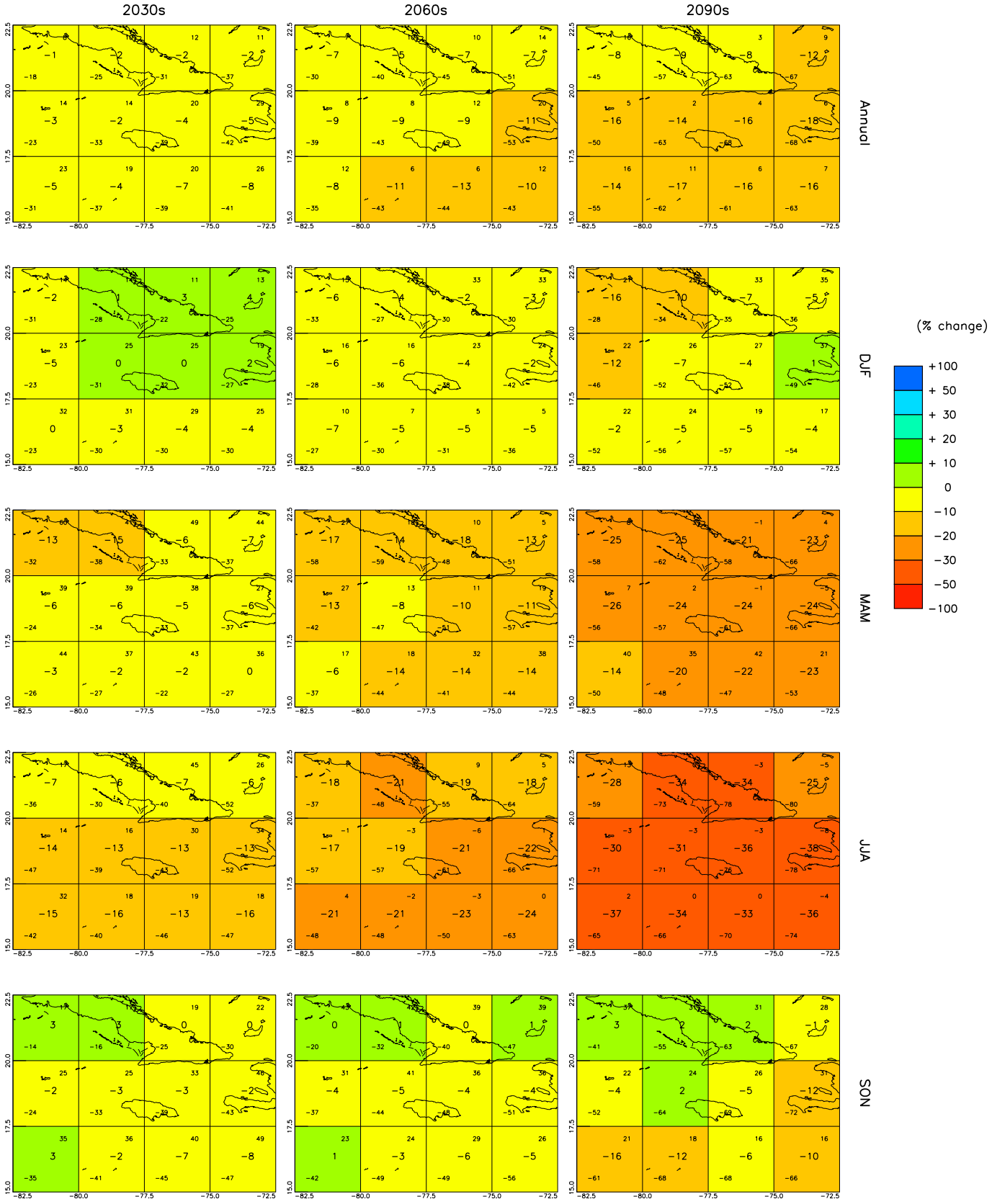

Figure 6: Spatial patterns of projected change in monthly precipitation for 10-year periods in the future under the SRES A2 scenario. All values are percentage anomalies relative to the mean climate of 1970-1999.See Figure 2 for details.

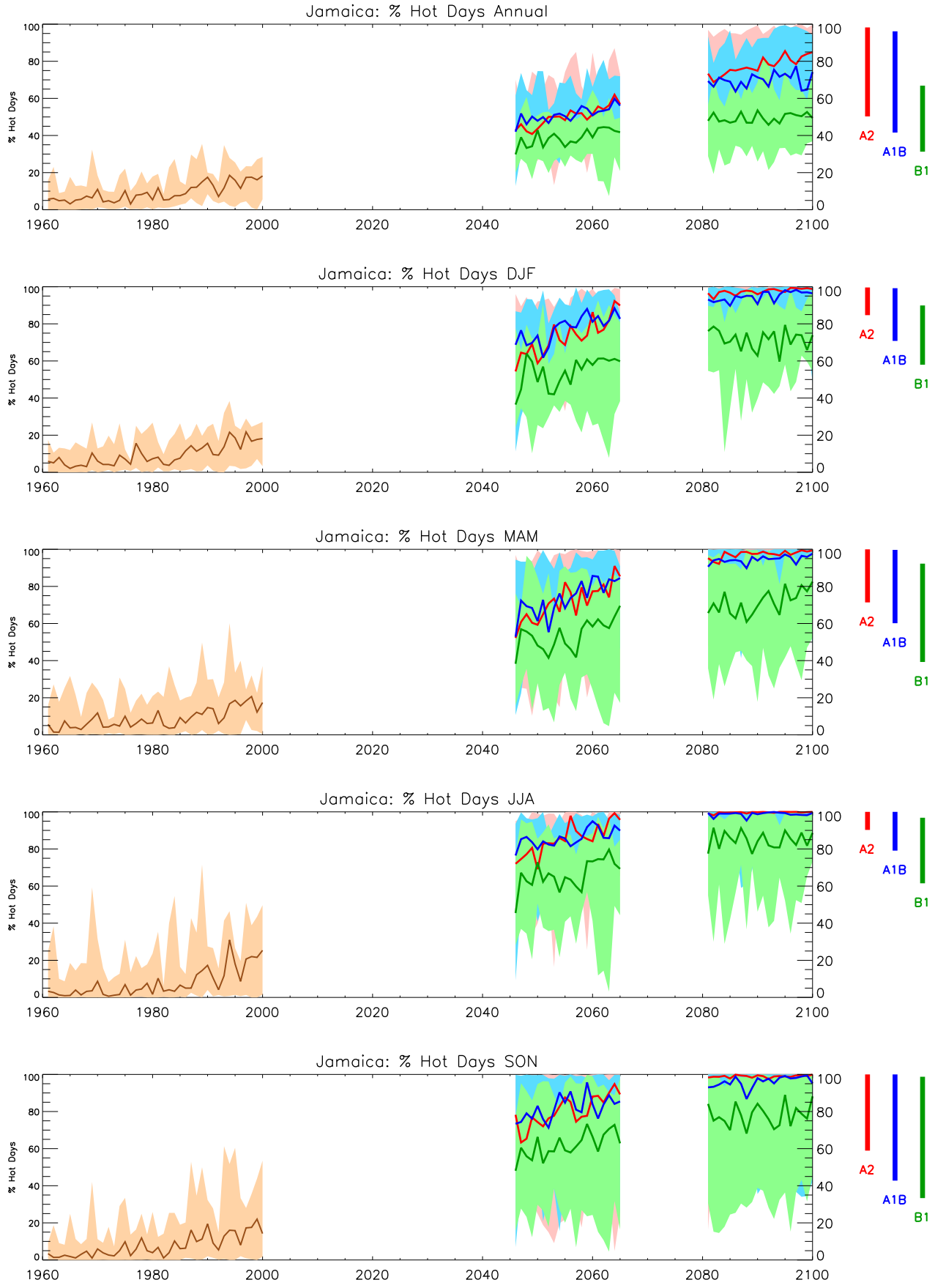

Figure 7: Trends in Hot-day frequency for the recent past and projected future. See Figure 1 for details.

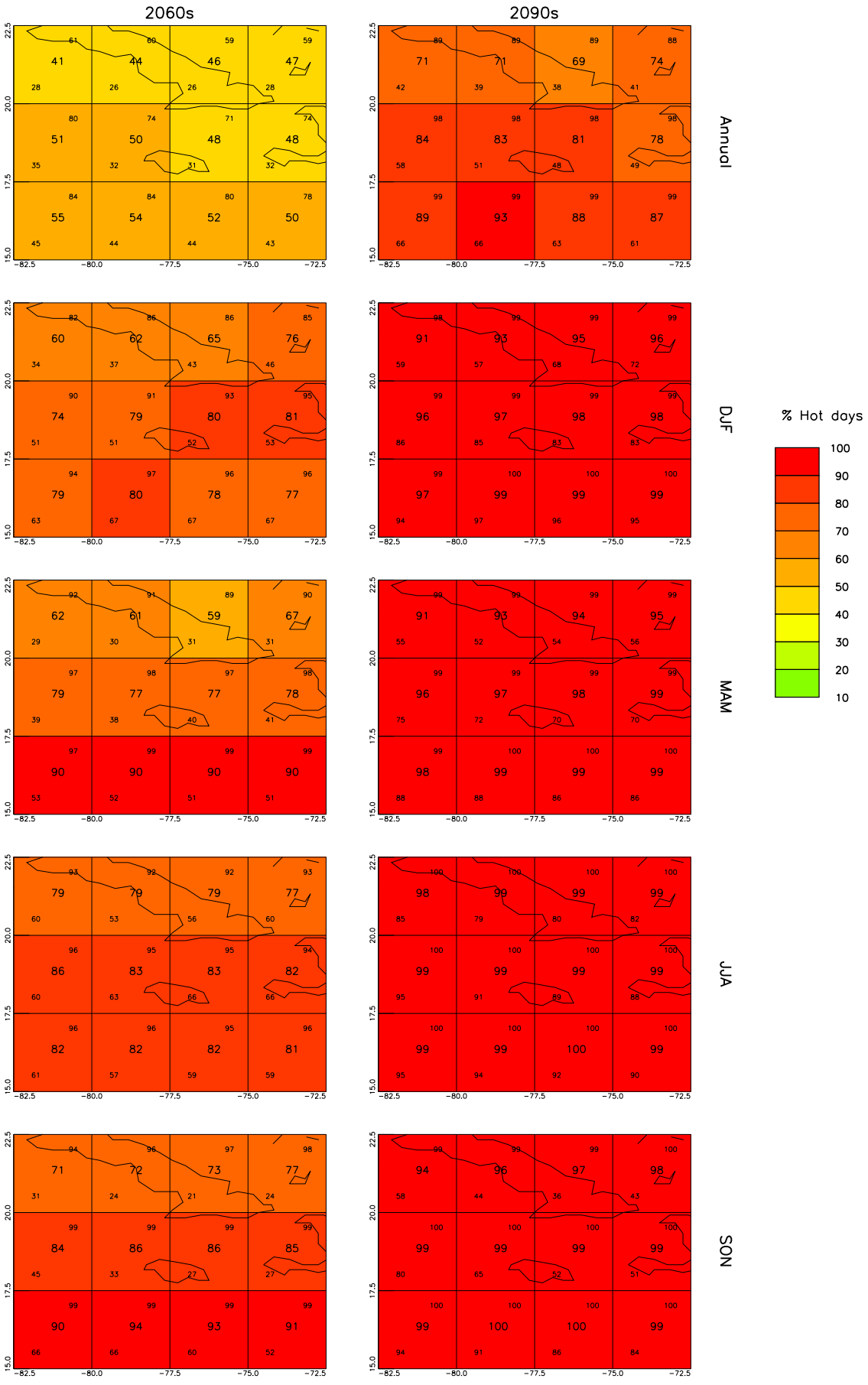

Figure 8: Spatial patterns of projected change in Hot-day frequency for 10-year periods in the future under the SRES A2 scenario. See Figure 2 for details.

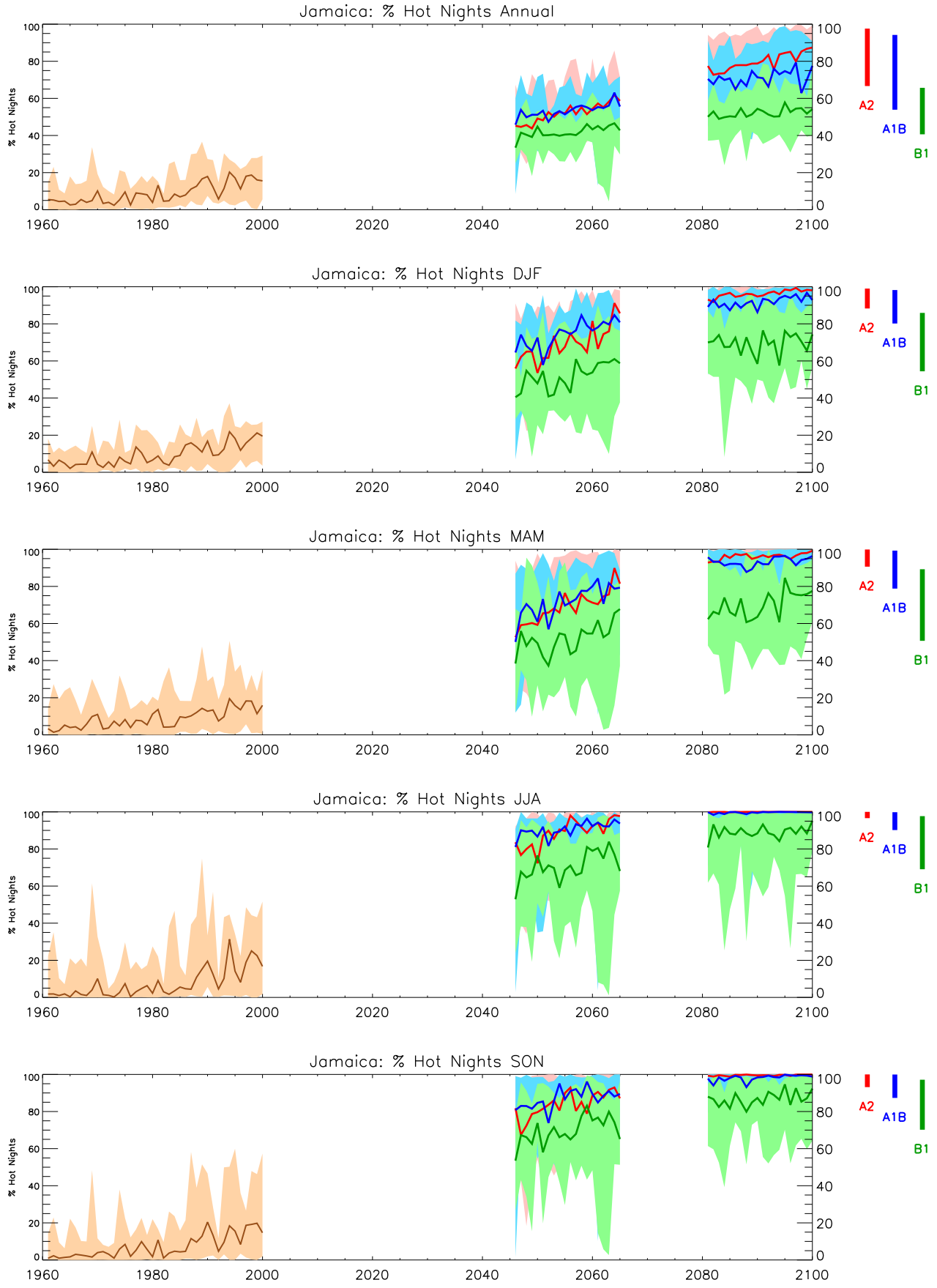

Figure 9: Trends in hot-night frequency for the recent past and projected future. See Figure 1 for details.

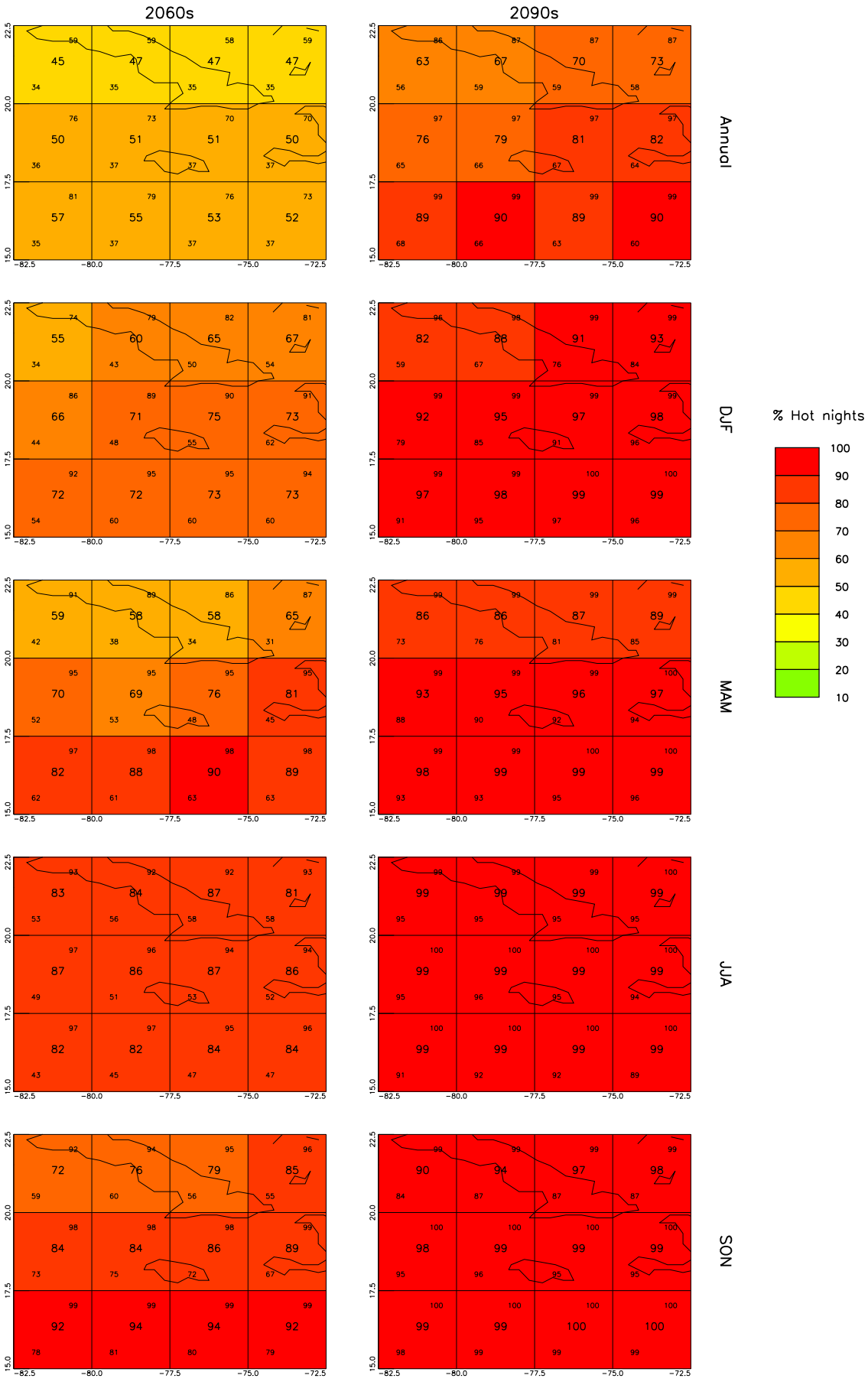

Figure 10: Spatial patterns of projected change in hot-night frequency for 10-year periods in the future under the SRES A2 scenario. See Figure 2 for details.

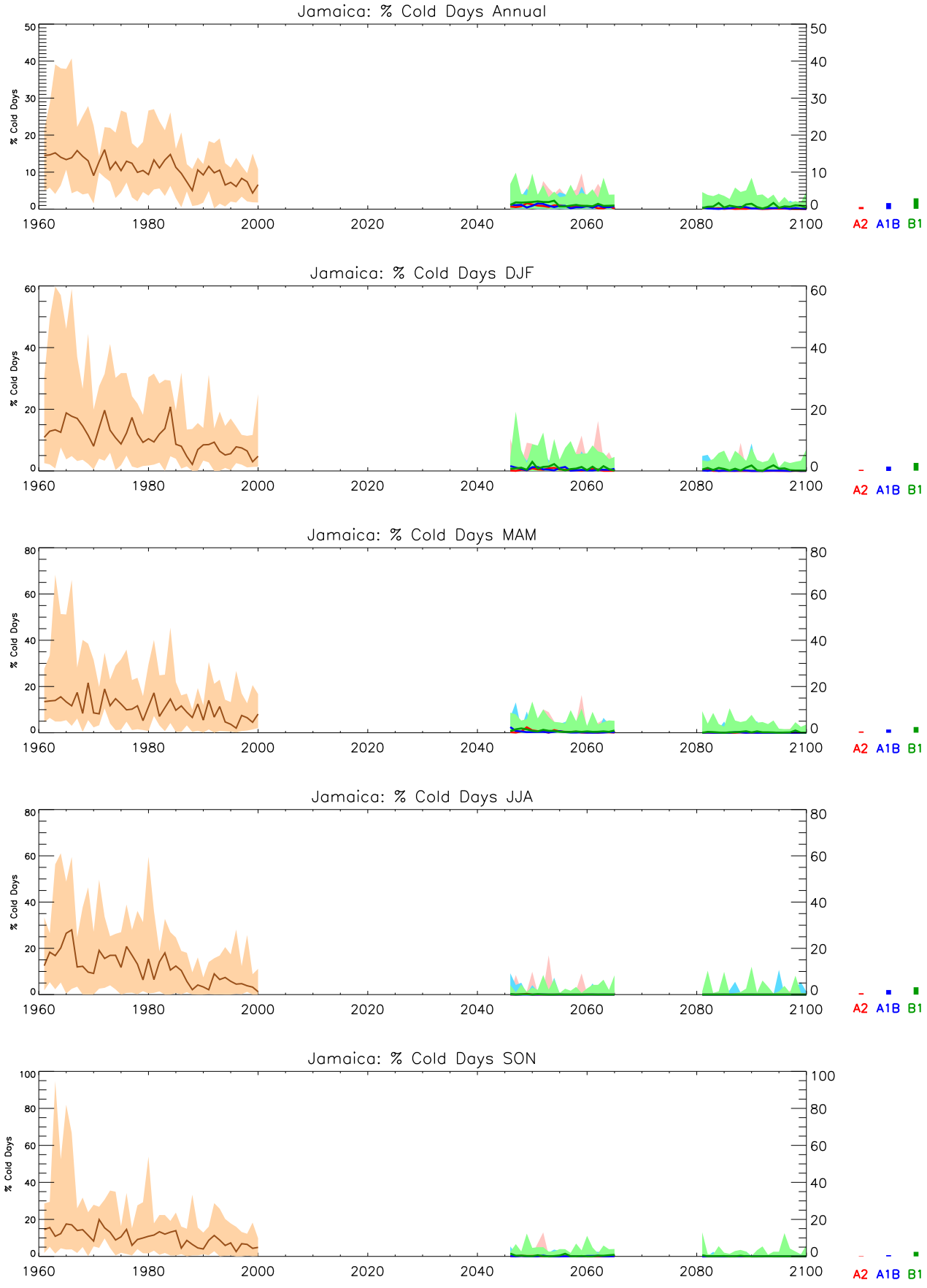

Figure 11: Trends in cold-day frequency for the recent past and projected future. See Figure 1 for details.

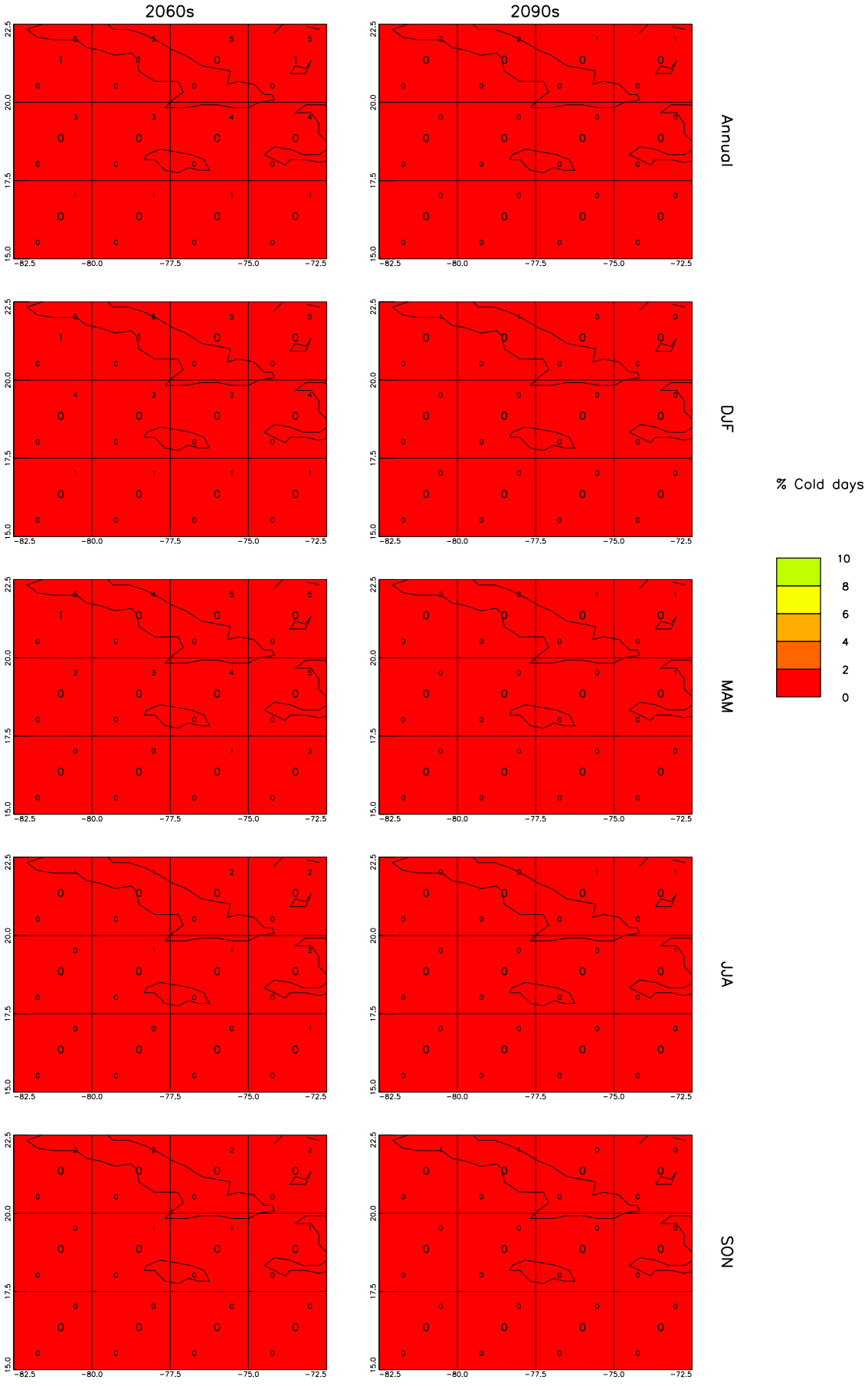

Figure 12: Spatial patterns of projected change in cold-day frequency for 10-year periods in the future under the SRES A2 scenario. See Figure 2 for details.

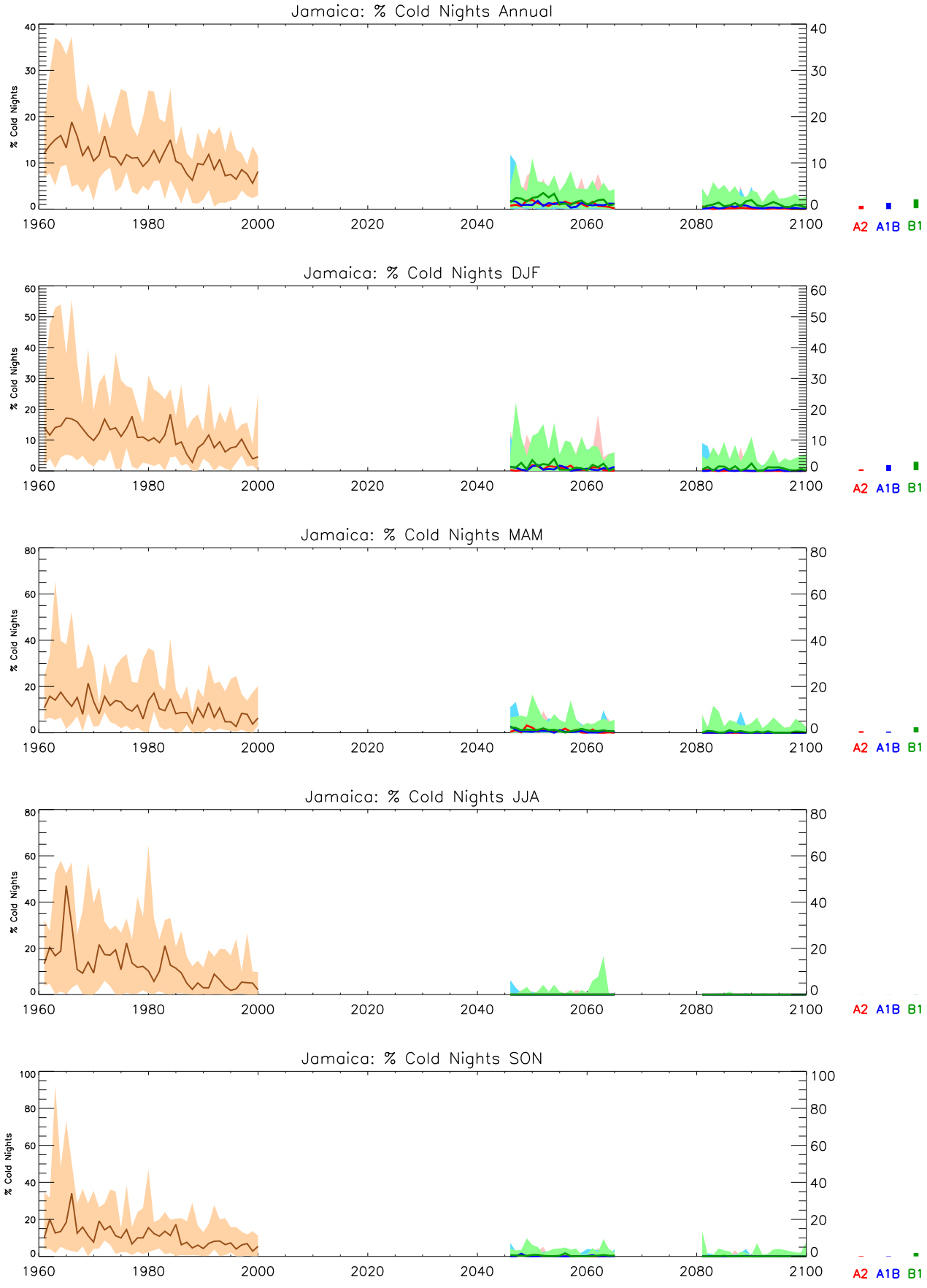

Figure 13: Trends in cold-night frequency for the recent past and projected future. See Figure 1 for details.

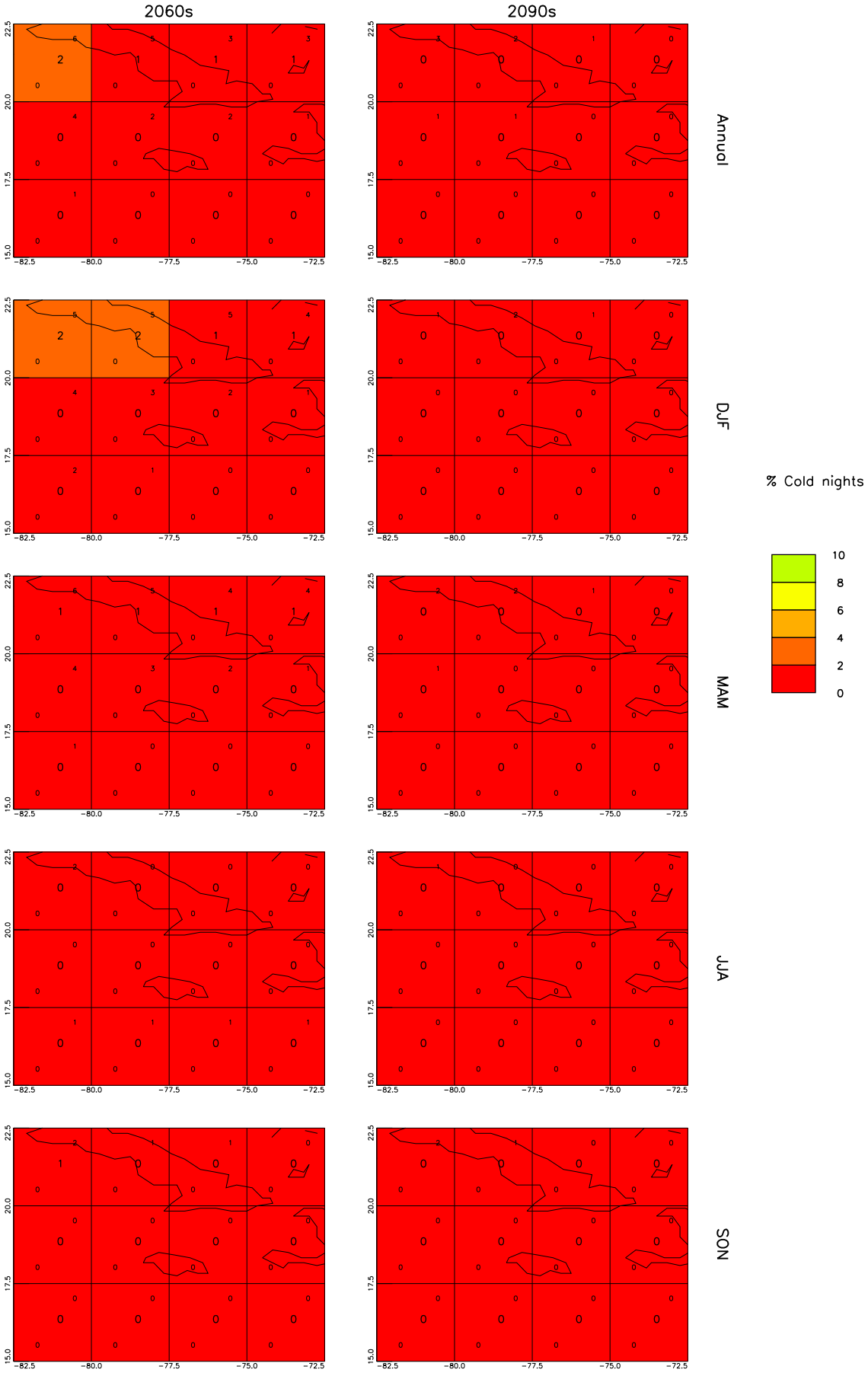

Figure 14: Spatial patterns of projected change in cold-night frequency for 10-year periods in the future under the SRES A2 scenario. See Figure 2 for details.

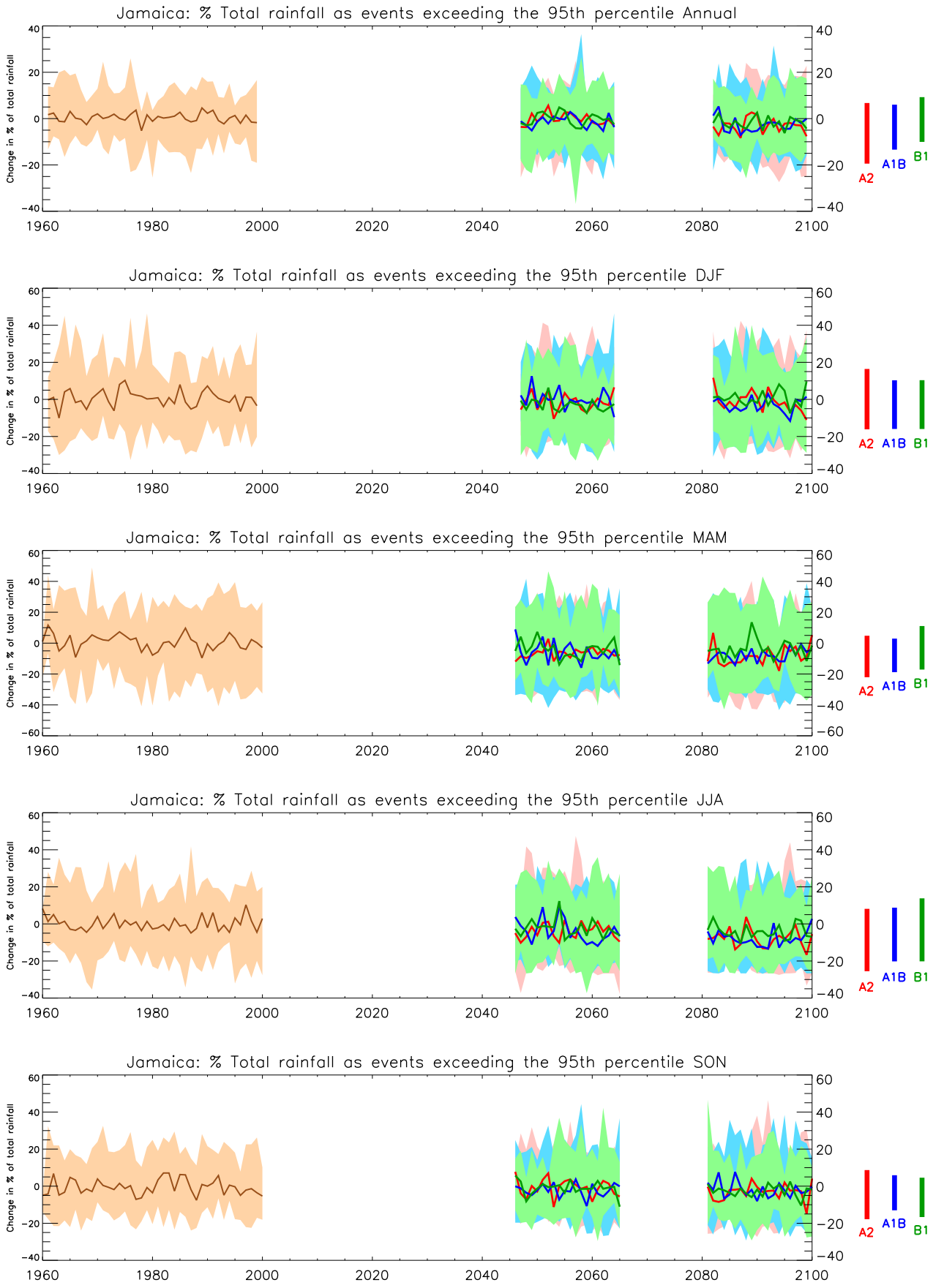

Figure 15: Trends in the proportion of precipitation falling in 'heavy' events for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

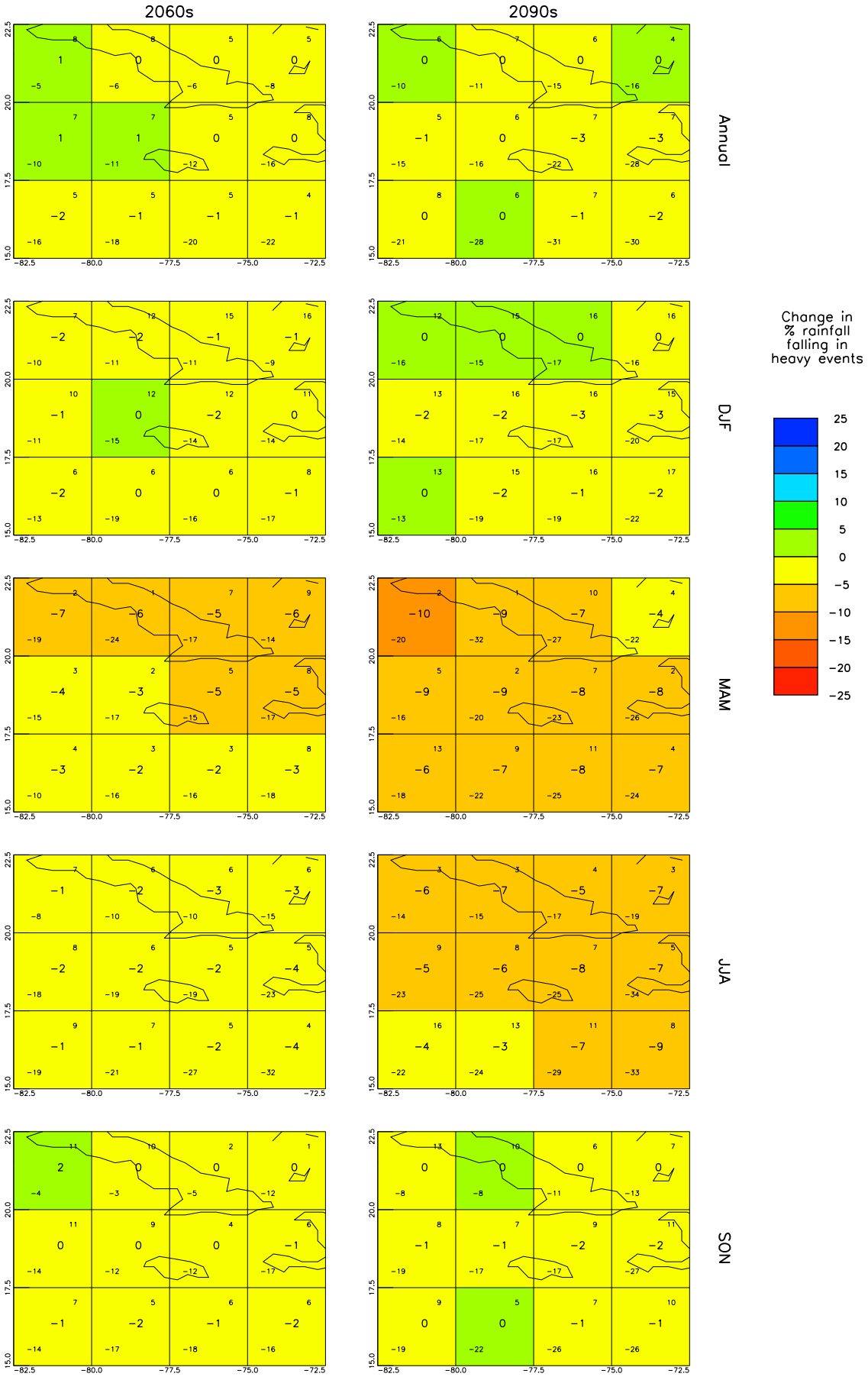

Figure 16: Spatial patterns of projected change in the proportion of precipitation falling in 'heavy' events for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. See Figure 2 for details.

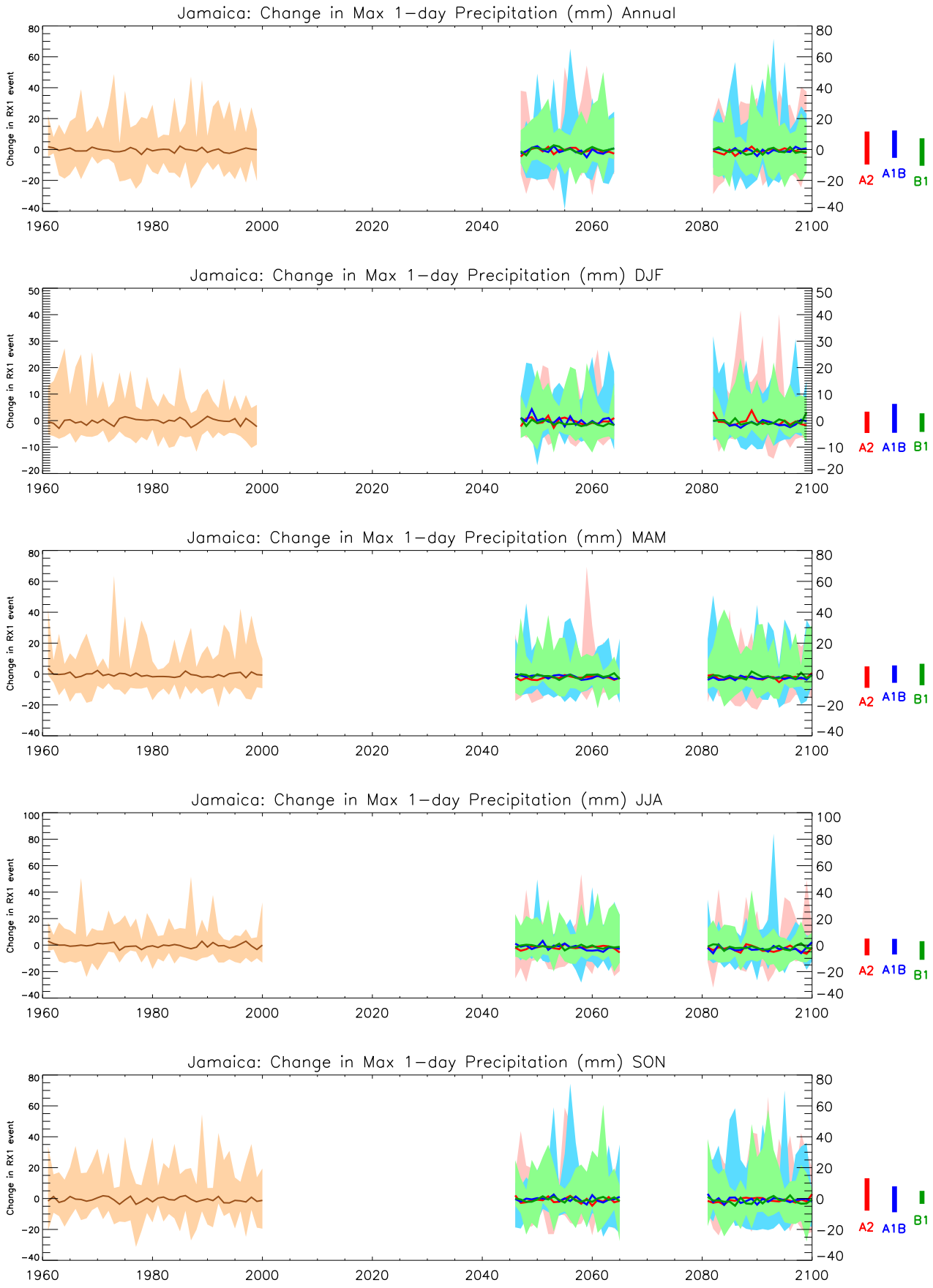

Figure 17: Trends in maximum 1-day rainfall for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

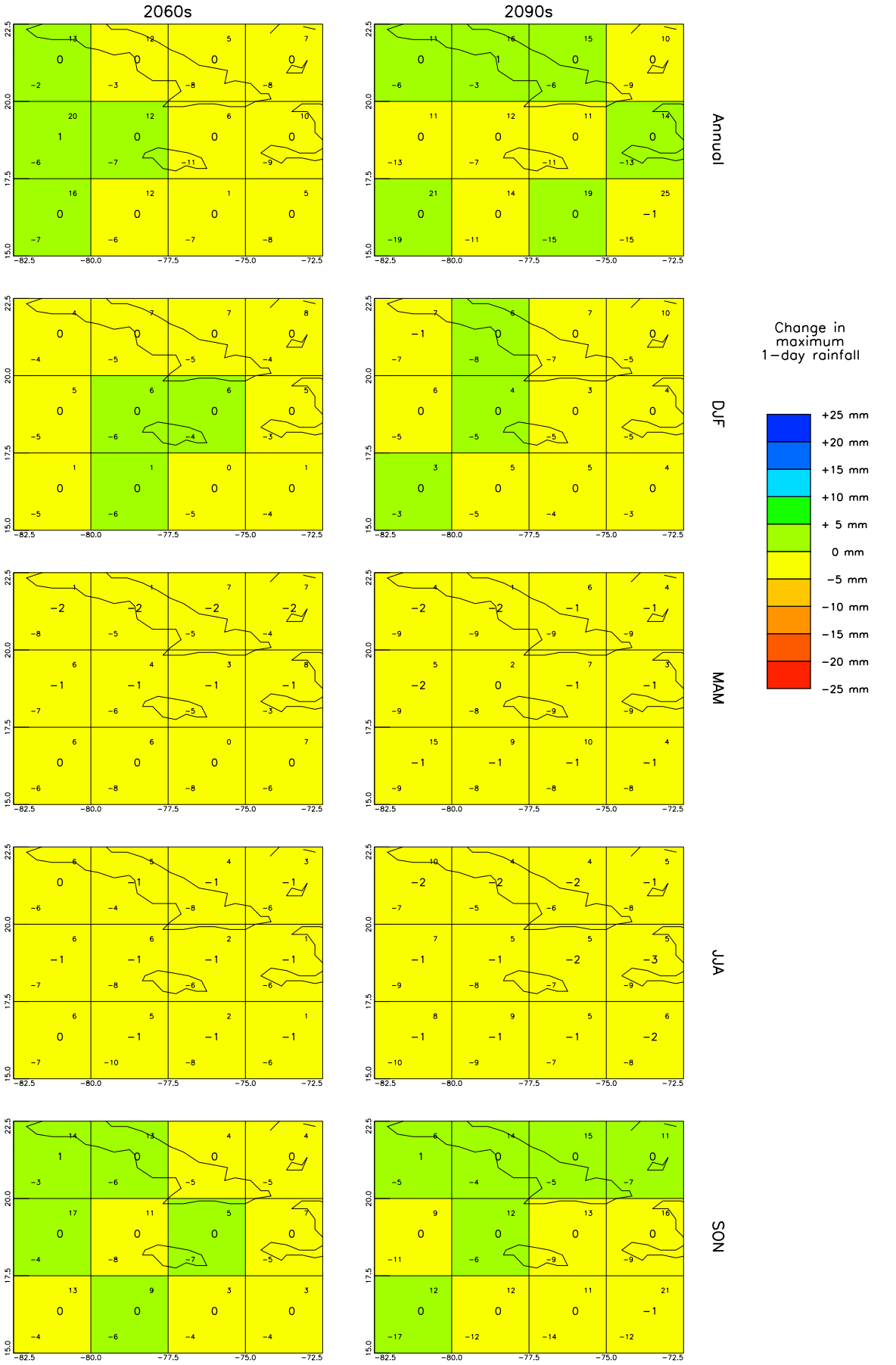

Figure 18: Spatial patterns of maximum 1-day rainfall for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. See Figure 2 for details.

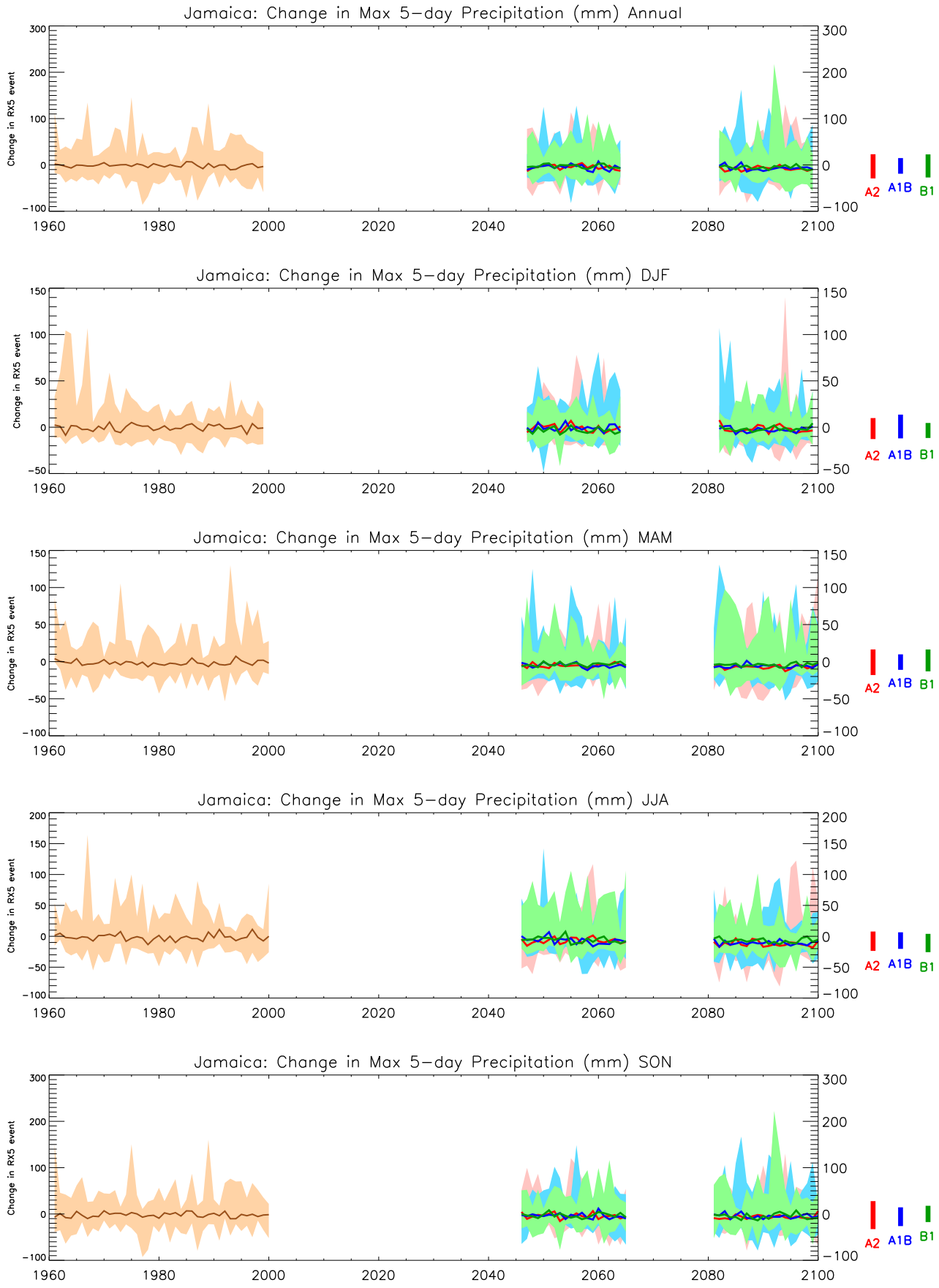

Figure 19: Trends in maximum 5-day rainfall for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

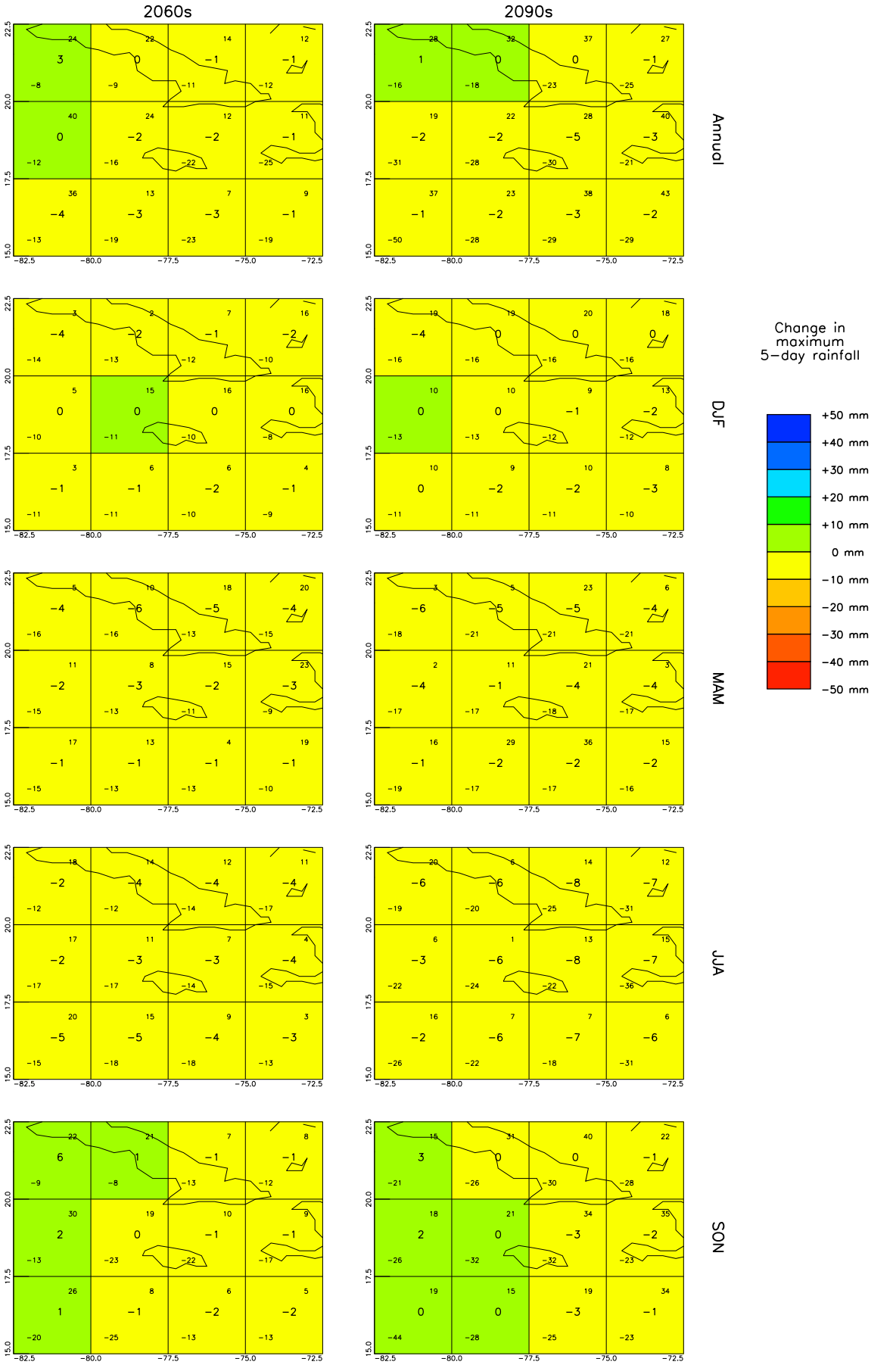

Figure 20: Spatial patterns of projected change in maximum 5-day rainfall for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. See Figure 2 for details.