UNDP Climate Change Country Profiles

Ethiopia

C. McSweeney[1], M. New[1,2] and G. Lizcano[1]

1. School of Geography and Environment, University of Oxford.
2. Tyndall Centre for Climate Change Research

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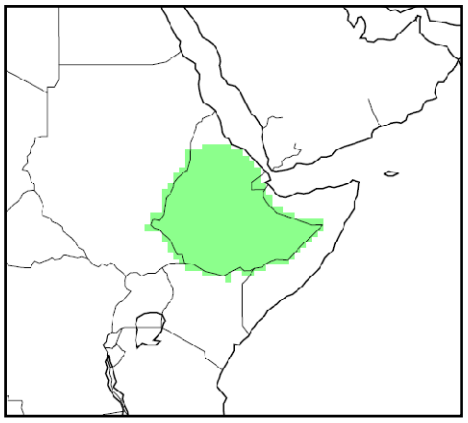

General Climate

Ethiopia makes up the greater part of the East African 'Horn of Africa'. At latitudes of 4 to 15˚N, Ethiopia's climate is typically tropical in the south-eastern and north-eastern lowland regions, but much cooler in the large central highland regions of the country. Mean annual temperatures are around 15-20˚C in these high altitude regions, whilst 25-30˚C in the lowlands.

Seasonal rainfall in Ethiopia is driven mainly by the migration of the Inter-Tropical Convergence Zone (ITCZ). The exact position of the ITCZ changes over the course of the year, oscillating across the equator from its northern most position over northern Ethiopia in July and August, to its southern most position over southern Kenya in January and February. Most of Ethiopia experiences one main wet season (called 'Kiremt') from mid-June to mid-September (up to 350mm per month in the wettest regions), when the ITCZ is at its northern-most position. Parts of northern and central Ethiopia also have a secondary wet season of sporadic, and considerably lesser, rainfall from February to May (called the 'Belg'). The southern regions of Ethiopia experience two distinct wet seasons which occur as the ITCZ passes through this more southern position The March to May 'Belg' season is the main rainfall season yielding 100-200mm per month, followed by a lesser rainfall season in October to December called 'Bega' (around 100mm per month). The eastern most corner of Ethiopia receives very little rainfall at any time of year.

The movements of the ITCZ are sensitive to variations in Indian Ocean sea-surface temperatures and vary from year to year, hence the onset and duration of the rainfall seasons vary considerably inter-annually, causing frequent drought. The most well documented cause of this variability is the El Niño Southern Oscillation (ENSO). Warm phases of ENSO (El Niño) have been associated with reduced rainfall in the main wet season, JAS, in north and central Ethiopia causing severe drought and famine, but also with enhanced rainfalls in the earlier February to April rainfall season which mainly affects southern Ethiopia.

Recent Climate Trends

Temperature

- Mean annual temperature has increased by 1.3˚C between 1960 and 2006, an average rate of 0.28˚C per decade. The increase in temperature in Ethiopia has been most rapid in JAS at a rate of 0.32˚C per decade.

- Daily temperature observations show significantly increasing trends in the frequency of hot days[1], and much large increasing trends in the frequency of hot nights.
    - The average number of 'hot' days per year in Ethiopia has increased by 73 (an additional 20% of days[2]) between 1960 and 2003. The rate of increase is seen most strongly in JJA when the average number of hot JJA days has increased by 9.9 days per month (an additional 32% of JJA days) over this period.
    - The average number of 'hot' nights per year increased by 137 (an additional 37.5% of nights) between 1960 and 2003. The rate of increase is seen most strongly in JJA when the average number of hot JJA nights has increased by 18 days per month (an additional 58.8% of JJA nights) over this period.

- The frequency of cold[3] days has decreased significantly in all seasons except DJF. The frequency of cold nights has decreased more rapidly and significantly in all seasons.
    - The average number of 'cold 'days per year has decreased by 21 (5.8% of days) between 1960 and 2003. This rate of decrease is most rapid in SON when the average number of cold SON days has decreased by 2.3 days per month (7.4% of SON days) over this period.
    - The average number of 'cold' nights per year has decreased by 41 (11.2% of days). This rate of decrease is most rapid in JJA when the average number of cold JJA nights has decreased by 3.7 nights per month (12% of JJA nights) over this period.

Precipitation

- The strong inter-annual and inter-decadal variability in Ethipoia's rainfall makes it difficult to detect long-term trends. There is not a statistically significant trend in observed mean rainfall in any season in Ethiopia between 1960 and 2006. Decreases in JAS rainfall observed in the 1980s have shown recovery in the 1990s and 2000s.

- There are insufficient daily rainfall records available to identify trends in daily rainfall variability.

[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] The increase in frequency over the 43-year period between 1960 and 2003 is estimated based on the decadal trend quoted in the summary table.

[3] '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.

GCM Projections of Future Climate

Temperature

- The mean annual temperature is projected to increase by 1.1 to 3.1˚C by the 2060s, and 1.5 to 5.1˚C by the 2090s. Under a single emissions scenario, the projected changes from different models span a range of up to 2.1˚C.

- All projections indicate substantial increases in the frequency of days and nights that are considered 'hot' in current climate.
    - Annually, projections indicate that 'hot' days will occur on 19-40% of days by the 2060s, and 26-69% of days by the 2090s. Days that are considered 'hot' for their season are projected to increase the most rapidly in JAS, occurring on 38-93% of days in JAS by the 2090s.
    - Nights that are considered 'hot' for the annual climate of 1970-99 are projected to increase more quickly that hot days, occurring on 29-66% of nights by the 2060s and 34-87% of nights by the 2090s. Nights that are considered 'hot' for their season are projected to increase the most rapidly in JAS, occurring on 53-99% of nights in JAS by the 2090s.

- All projections indicate decreases in the frequency of days and nights that are considered 'cold' in current climate. Cold nights decrease in frequency more rapidly than cold days, not occurring at all in most model projections by the 2090s under the highest emissions scenario (A2).

Precipitation

- Projections from different models in the ensemble are broadly consistent in indicating increases in annual rainfall in Ethiopia. These increases are largely a result of increasing rainfall in the 'short' rainfall season (OND) in southern Ethiopia.
    - OND rainfall is projected to change by 10 to +70% as an average over the whole of Ethiopia.
    - Proportional increases in OND rainfall in the driest, eastern most parts of Ethiopia are large.
- Projections of change in the rainy seasons AMJ and JAS which affect the larger portions of Ethiopia are more mixed, but tend towards slight increases in the south west and deceases in the north east.

- The models in the ensemble are broadly consistent in indicating increases in the proportion of total rainfall that falls in 'heavy' events, with annual changes ranging from -1 to +18%. The largest increases are seen in JAS and OND rainfall.
- The models in the ensemble are broadly consistent in indicating increases in the magnitude of 1- and 5-day rainfall maxima. The annual increases arise largely due to increases in OND.

The changes in maxima in 1-day events in OND range from 0 to +29mm and -4 to +40mm in 5-day events.

Other Regional Climate Change Information

- Model simulations show wide disagreements in projected changes in the amplitude of future El Niño events (Christensen *et al.*, 2007). East Africa's seasonal rainfall can be strongly influenced by ENSO, and this contributes to uncertainty in climate projections, particularly in the future inter-annual variability, for this region.

- 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*).

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		
			A2	0.9	**1.3**	1.6	2.0	**2.7**	3.1	3.1	**4.2**	5.1
Annual	22.7	0.28*	*A1B*	0.9	**1.4**	1.6	1.7	**2.6**	2.9	2.5	**3.5**	4.6
			B1	0.5	**1.1**	1.4	1.1	**1.8**	2.2	1.5	**2.3**	3.0
			A2	0.8	**1.3**	1.8	1.8	**2.6**	3.1	2.9	**4.4**	5.4
JFM	23.0	0.27*	*A1B*	0.6	**1.3**	1.7	1.7	**2.6**	3.1	2.3	**3.4**	4.3
			B1	0.3	**1.1**	1.4	1.0	**1.8**	2.3	1.5	**2.2**	2.9
			A2	0.9	**1.4**	1.8	2.1	**2.6**	3.3	3.0	**4.5**	5.3
AMJ	23.8	0.31*	*A1B*	0.9	**1.5**	1.9	1.8	**2.6**	3.0	2.6	**3.5**	4.9
			B1	0.6	**1.0**	1.6	1.2	**1.8**	2.5	1.5	**2.3**	3.2
			A2	0.8	**1.3**	1.6	1.8	**2.6**	3.5	3.3	**4.1**	5.2
JAS	22.4	0.32*	*A1B*	0.8	**1.3**	1.9	1.8	**2.6**	2.9	2.5	**3.4**	4.8
			B1	0.6	**1.0**	1.5	1.1	**1.8**	2.3	1.6	**2.2**	2.9
			A2	0.6	**1.2**	1.6	1.9	**2.6**	3.1	3.0	**4.0**	5.0
OND	21.7	0.22*	*A1B*	0.9	**1.4**	1.7	1.6	**2.5**	2.9	2.3	**3.4**	4.5
			B1	0.3	**1.0**	1.4	1.0	**1.7**	2.2	1.4	**2.1**	3.0
Precipitation												
	(mm per month)	(change in mm per decade)		Change in mm per month			Change in mm per month			Change in mm per month		
			A2	-2	**3**	9	-4	**2**	14	-2	**6**	25
Annual	65.6	-1.2	*A1B*	-2	**1**	7	-2	**2**	14	-4	**4**	13
			B1	-3	**1**	6	-3	**3**	9	-4	**2**	10
			A2	-2	**0**	4	-3	**2**	15	-1	**3**	13
JFM	24.7	-0.2	*A1B*	-3	**2**	14	-1	**1**	10	-6	**0**	14
			B1	-3	**1**	8	-3	**1**	6	-3	**0**	8
			A2	-13	**0**	17	-13	**-4**	13	-10	**2**	24
AMJ	84.0	-2.1	*A1B*	-12	**0**	9	-7	**-1**	12	-19	**-2**	11
			B1	-12	**0**	9	-15	**0**	12	-9	**2**	5
			A2	-20	**2**	15	-20	**2**	16	-17	**1**	30
JAS	115.9	-1.9	*A1B*	-13	**0**	11	-11	**2**	15	-12	**0**	14
			B1	-8	**0**	10	-8	**0**	15	-18	**2**	14
			A2	-1	**10**	22	-4	**7**	39	2	**22**	58
OND	37.7	-0.4	*A1B*	0	**5**	32	-2	**10**	38	3	**14**	47
			B1	-4	**6**	26	-3	**11**	20	-7	**8**	29
Precipitation (%)												
	(mm per month)	(change in % per decade)		% Change			% Change			% Change		
			A2	-4	**5**	16	-6	**4**	24	-3	**9**	42
Annual	65.6	-1.8	*A1B*	-4	**3**	16	-3	**3**	24	-6	**5**	26
			B1	-4	**2**	9	-5	**4**	22	-6	**3**	17
			A2	-19	**4**	41	-28	**8**	64	-11	**13**	51
JFM	24.7	-0.8	*A1B*	-39	**4**	39	-27	**7**	65	-42	**6**	47
			B1	-30	**5**	39	-28	**7**	68	-17	**0**	78
			A2	-13	**0**	22	-15	**-5**	21	-11	**2**	38
AMJ	84.0	-2.5	*A1B*	-14	**0**	24	-12	**-1**	22	-20	**-2**	23
			B1	-15	**0**	25	-17	**0**	31	-10	**2**	10
			A2	-12	**3**	21	-16	**1**	22	-15	**2**	41
JAS	115.9	-1.6	*A1B*	-8	**0**	15	-9	**2**	21	-13	**0**	19
			B1	-6	**0**	8	-6	**0**	20	-13	**3**	13
			A2	-2	**15**	36	-8	**16**	48	1	**36**	70
OND	37.7	-1	*A1B*	0	**8**	39	-4	**20**	46	2	**20**	63
			B1	-9	**9**	31	-6	**16**	30	-10	**17**	39

	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)												
			A2	****	****	****	26	**32**	40	37	**45**	69
Annual	13.8	4.66*	*A1B*	****	****	****	22	**32**	39	32	**40**	60
			B1	****	****	****	19	**26**	29	26	**29**	43
			A2	****	****	****	26	**40**	46	39	**60**	76
JFM	13.8	(3.27*)	*A1B*	****	****	****	18	**41**	49	35	**50**	70
(DJF)			*B1*	****	****	****	20	**29**	36	30	**38**	53
			A2	****	****	****	27	**40**	50	46	**60**	82
AMJ	16.1	(5.60*)	*A1B*	****	****	****	33	**39**	51	41	**53**	77
(MAM)			*B1*	****	****	****	25	**34**	39	27	**38**	58
			A2	****	****	****	39	**46**	67	59	**74**	93
JAS	16.3	(7.43*)	*A1B*	****	****	****	43	**51**	67	48	**71**	89
(JJA)			*B1*	****	****	****	28	**40**	49	38	**46**	67
			A2	****	****	****	24	**35**	55	36	**52**	82
OND	****	****	*A1B*	****	****	****	24	**35**	54	27	**48**	75
(SON)			*B1*	****	****	****	19	**26**	40	26	**32**	57
Frequency of Hot Nights (TN90p)												
			A2	****	****	****	40	**50**	65	67	**77**	87
Annual	18.3	8.71*	*A1B*	****	****	****	42	**51**	66	55	**71**	79
			B1	****	****	****	29	**37**	50	34	**48**	61
			A2	****	****	****	29	**48**	61	57	**76**	87
JFM	16.1	(7.77*)	*A1B*	****	****	****	26	**47**	61	42	**66**	82
(DJF)			*B1*	****	****	****	19	**31**	55	28	**42**	61
			A2	****	****	****	50	**62**	82	82	**89**	96
AMJ	19.8	(9.66*)	*A1B*	****	****	****	51	**60**	83	68	**80**	92
(MAM)			*B1*	****	****	****	36	**48**	60	40	**57**	76
			A2	****	****	****	60	**77**	90	85	**96**	99
JAS	22.7	(13.68*)	*A1B*	****	****	****	61	**76**	94	76	**94**	96
(JJA)			*B1*	****	****	****	43	**58**	70	53	**72**	85
			A2	****	****	****	37	**60**	79	67	**85**	95
OND	20.9	(12.90*)	*A1B*	****	****	****	36	**58**	83	52	**78**	92
(SON)			*B1*	****	****	****	27	**42**	64	32	**52**	77
Frequency of Cold Days (TX10p)												
			A2	****	****	****	1	**3**	4	0	**1**	2
Annual	8.5	-1.34*	*A1B*	****	****	****	1	**3**	4	0	**1**	3
			B1	****	****	****	2	**4**	6	1	**3**	4
			A2	****	****	****	0	**3**	5	0	**1**	3
JFM	8.9	(-1.09)	*A1B*	****	****	****	0	**3**	4	0	**1**	5
(DJF)			*B1*	****	****	****	2	**4**	6	1	**2**	6
			A2	****	****	****	1	**2**	4	0	**0**	1
AMJ	8.6	(-1.03*)	*A1B*	****	****	****	1	**2**	3	0	**1**	3
(MAM)			*B1*	****	****	****	2	**3**	4	1	**2**	3
			A2	****	****	****	1	**3**	6	0	**1**	4
JAS	8.0	(-1.18*)	*A1B*	****	****	****	1	**2**	6	0	**1**	6
(JJA)			*B1*	****	****	****	2	**4**	8	1	**2**	5
			A2	****	****	****	1	**3**	5	0	**1**	2
OND	7.7	(-1.71*)	*A1B*	****	****	****	1	**3**	5	0	**1**	4
(SON)			*B1*	****	****	****	3	**4**	6	1	**2**	4
Frequency of Cold Nights (TN10p)												
			A2	****	****	****	0	**1**	2	0	**0**	0
Annual	7.2	-2.60*	*A1B*	****	****	****	0	**1**	3	0	**0**	1
			B1	****	****	****	1	**2**	4	0	**1**	2
			A2	****	****	****	0	**0**	1	0	**0**	0
JFM	7.3	(-2.16*)	*A1B*	****	****	****	0	**0**	1	0	**0**	0
(DJF)			*B1*	****	****	****	0	**1**	3	0	**1**	2
			A2	****	****	****	0	**0**	2	0	**0**	1
AMJ	6.9	(-2.27*)	*A1B*	****	****	****	0	**0**	1	0	**0**	1
(MAM)			*B1*	****	****	****	0	**1**	2	0	**1**	1
			A2	****	****	****	0	**0**	2	0	**0**	1
JAS	6.5	(-2.79*)	*A1B*	****	****	****	0	**0**	2	0	**0**	2
(JJA)			*B1*	****	****	****	0	**1**	2	0	**0**	2
			A2	****	****	****	0	**0**	1	0	**0**	0
OND	6.7	(-2.62*)	*A1B*	****	****	****	0	**0**	3	0	**0**	0
(SON)			*B1*	****	****	****	0	**1**	4	0	**1**	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 %*		
			A2	****	****	****	-3	**2**	8	0	**6**	18
Annual	****	****	*A1B*	****	****	****	-3	**3**	12	0	**5**	16
			B1	****	****	****	0	**2**	5	-1	**2**	7
			A2	****	****	****	-9	**0**	8	-7	**2**	8
JFM	****	****	*A1B*	****	****	****	-10	**2**	10	-12	**0**	9
(DJF)			*B1*	****	****	****	-13	**0**	12	-8	**1**	13
			A2	****	****	****	-5	**2**	7	-5	**2**	9
AMJ	****	****	*A1B*	****	****	****	-5	**0**	6	-6	**0**	7
(MAM)			*B1*	****	****	****	-3	**0**	5	-3	**0**	8
			A2	****	****	****	-2	**2**	11	-3	**6**	15
JAS	****	****	*A1B*	****	****	****	-3	**2**	11	-5	**6**	16
(JJA)			*B1*	****	****	****	-2	**2**	13	-2	**3**	9
			A2	****	****	****	-7	**6**	13	-6	**8**	25
OND	****	****	*A1B*	****	****	****	-3	**6**	20	-3	**7**	20
(SON)			*B1*	****	****	****	-8	**5**	12	0	**5**	9
Maximum 1-day rainfall (RX1day)												
	mm	*Change in mm per decade*					*Change in mm*			*Change in mm*		
			A2	****	****	****	-3	**2**	16	0	**5**	27
Annual	****	****	*A1B*	****	****	****	-2	**2**	13	0	**4**	19
			B1	****	****	****	0	**1**	11	-3	**1**	9
			A2	****	****	****	-1	**0**	4	0	**1**	3
JFM	****	****	*A1B*	****	****	****	-2	**0**	2	-1	**0**	3
(DJF)			*B1*	****	****	****	-2	**0**	2	-1	**0**	4
			A2	****	****	****	-2	**1**	7	0	**1**	8
AMJ	****	****	*A1B*	****	****	****	0	**0**	5	-2	**1**	7
(MAM)			*B1*	****	****	****	-1	**0**	4	-1	**0**	4
			A2	****	****	****	-3	**1**	5	-2	**2**	14
JAS	****	****	*A1B*	****	****	****	-3	**0**	4	-2	**3**	13
(JJA)			*B1*	****	****	****	-1	**0**	8	-4	**0**	7
			A2	****	****	****	0	**2**	16	0	**6**	29
OND	****	****	*A1B*	****	****	****	0	**2**	16	0	**3**	20
(SON)			*B1*	****	****	****	-1	**1**	11	0	**2**	8
Maximum 5-day Rainfall (RX5day)												
	mm	*Change in mm per decade*					*Change in mm*			*Change in mm*		
			A2	****	****	****	-5	**5**	17	0	**13**	32
Annual	****	****	*A1B*	****	****	****	-4	**4**	14	0	**8**	23
			B1	****	****	****	-2	**2**	11	-4	**5**	12
			A2	****	****	****	-4	**0**	4	-1	**3**	6
JFM	3.9	-1.8	*A1B*	****	****	****	-2	**1**	7	-2	**0**	6
(DJF)			*B1*	****	****	****	-4	**1**	5	-2	**1**	9
			A2	****	****	****	-6	**0**	9	-6	**2**	11
AMJ	****	****	*A1B*	****	****	****	-3	**0**	7	-9	**2**	10
(MAM)			*B1*	****	****	****	-4	**0**	4	-3	**0**	7
			A2	****	****	****	-5	**2**	7	-5	**2**	17
JAS	****	****	*A1B*	****	****	****	-6	**1**	8	-4	**4**	14
(JJA)			*B1*	****	****	****	-2	**1**	12	-5	**0**	9
			A2	****	****	****	-3	**6**	24	-4	**13**	40
OND	****	****	*A1B*	****	****	****	-1	**7**	25	-1	**6**	31
(SON)			*B1*	****	****	****	-4	**4**	16	0	**4**	15

* 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.

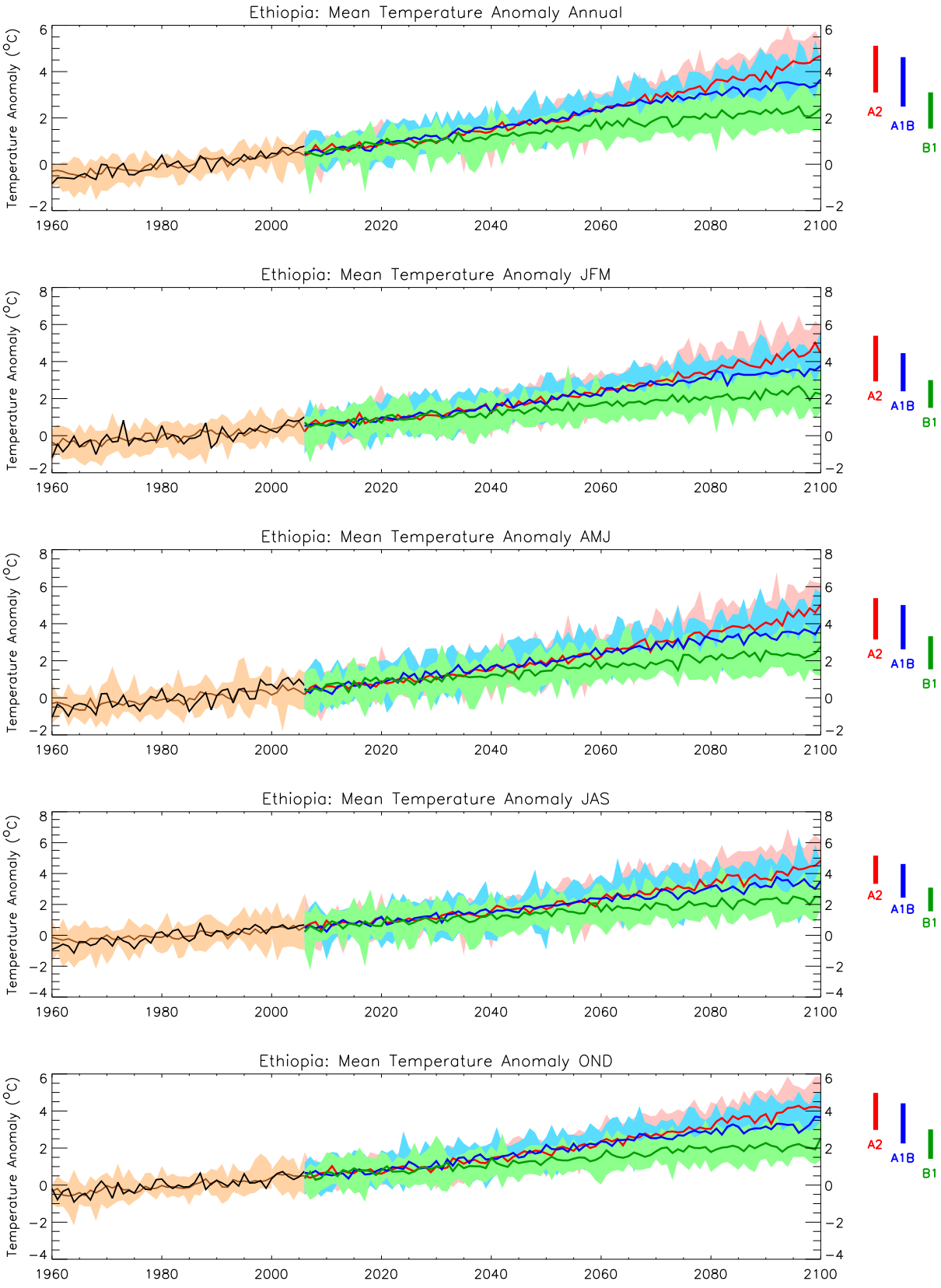

Figure 1: Trends in annual and seasonal mean temperature for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. Black curves show the mean of observed data from 1960 to 2006, Brown curves show the median (solid line) and range (shading) of model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

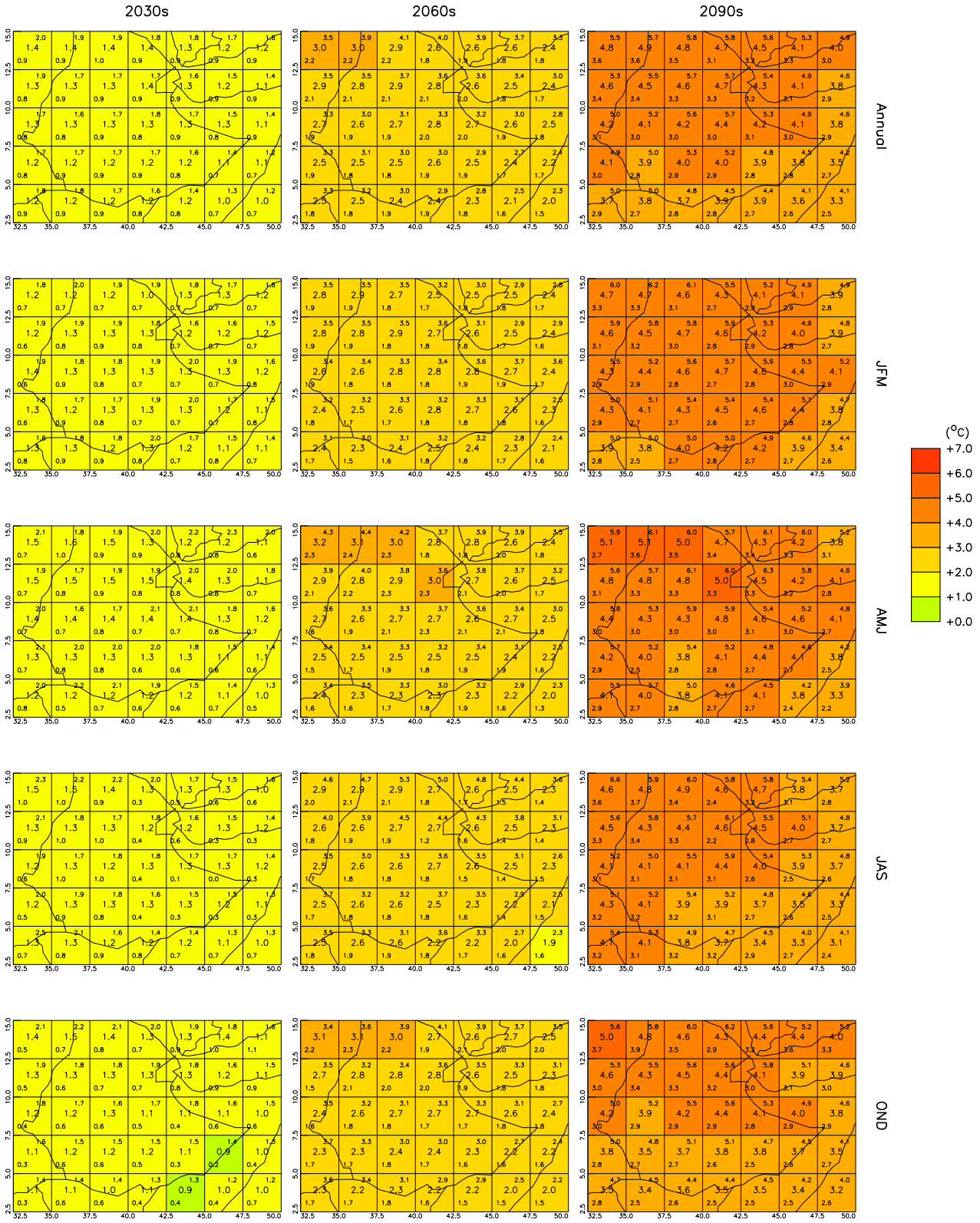

Figure 2: Spatial patterns of projected change in mean annual and seasonal temperature for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. In each grid box, the central value gives the ensemble median and the values in the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

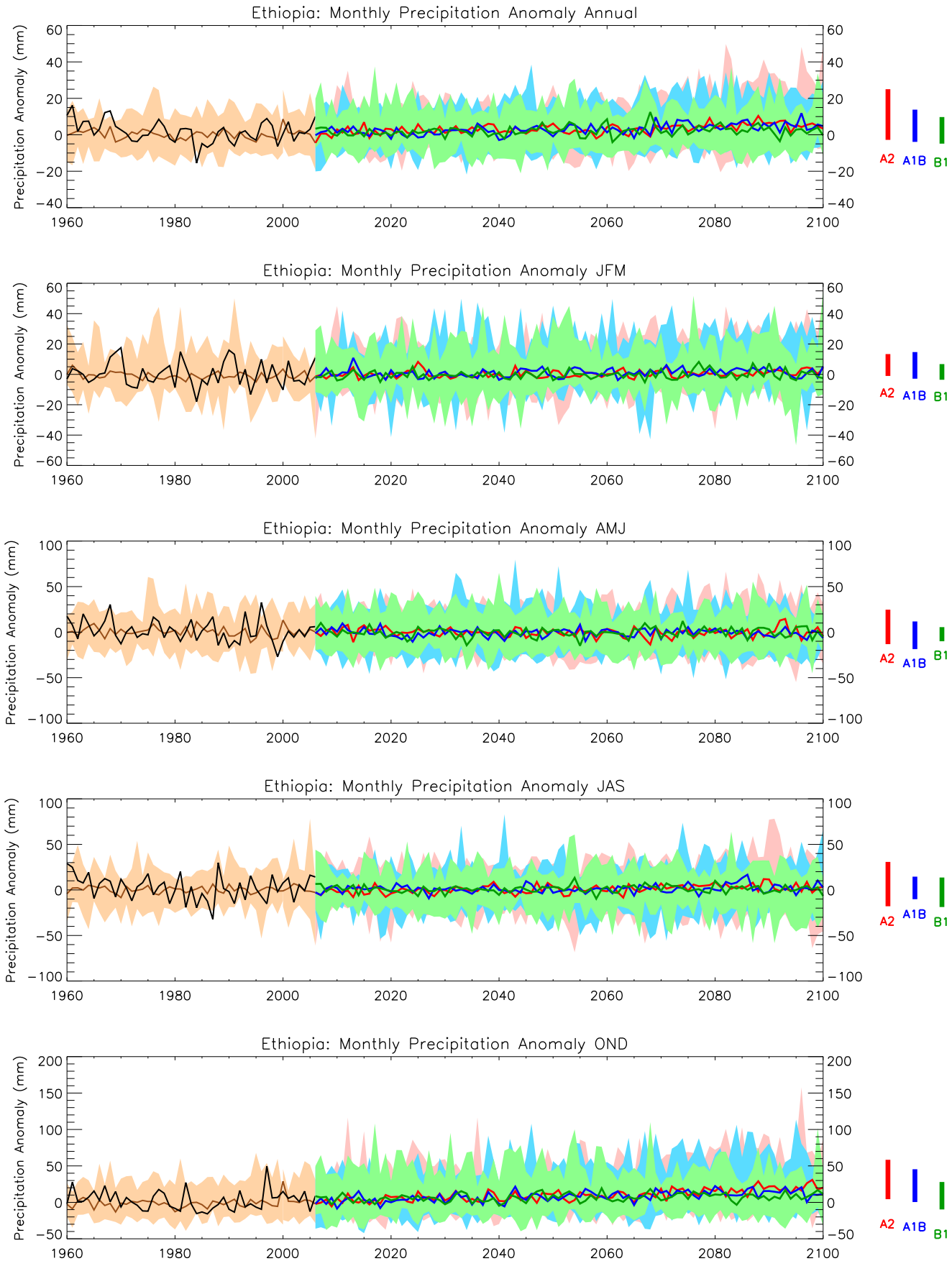

Figure 3: Trends in monthly precipitation for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

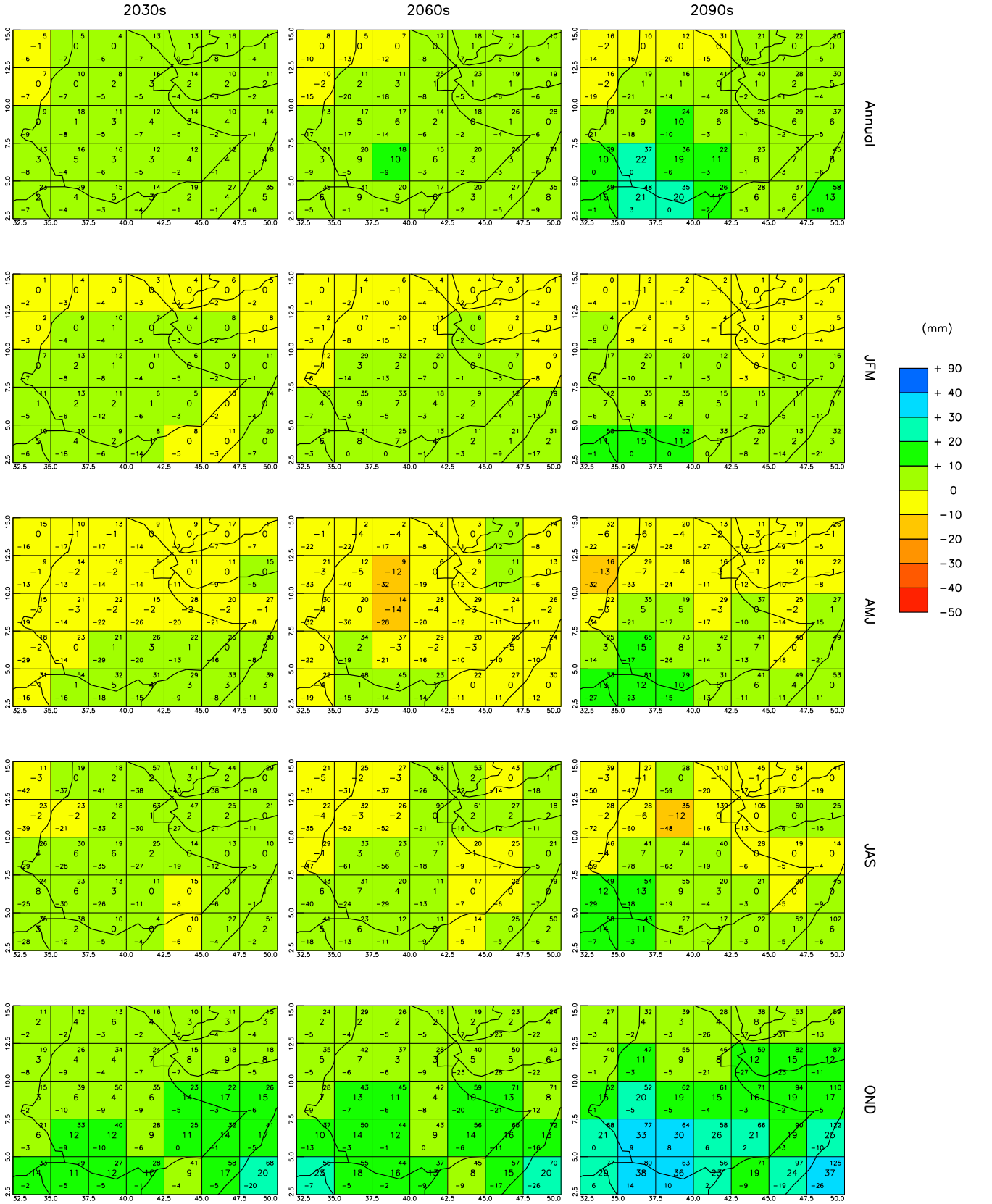

Figure 4: Spatial patterns of projected change in monthly precipitation for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999.See Figure 2 for details.

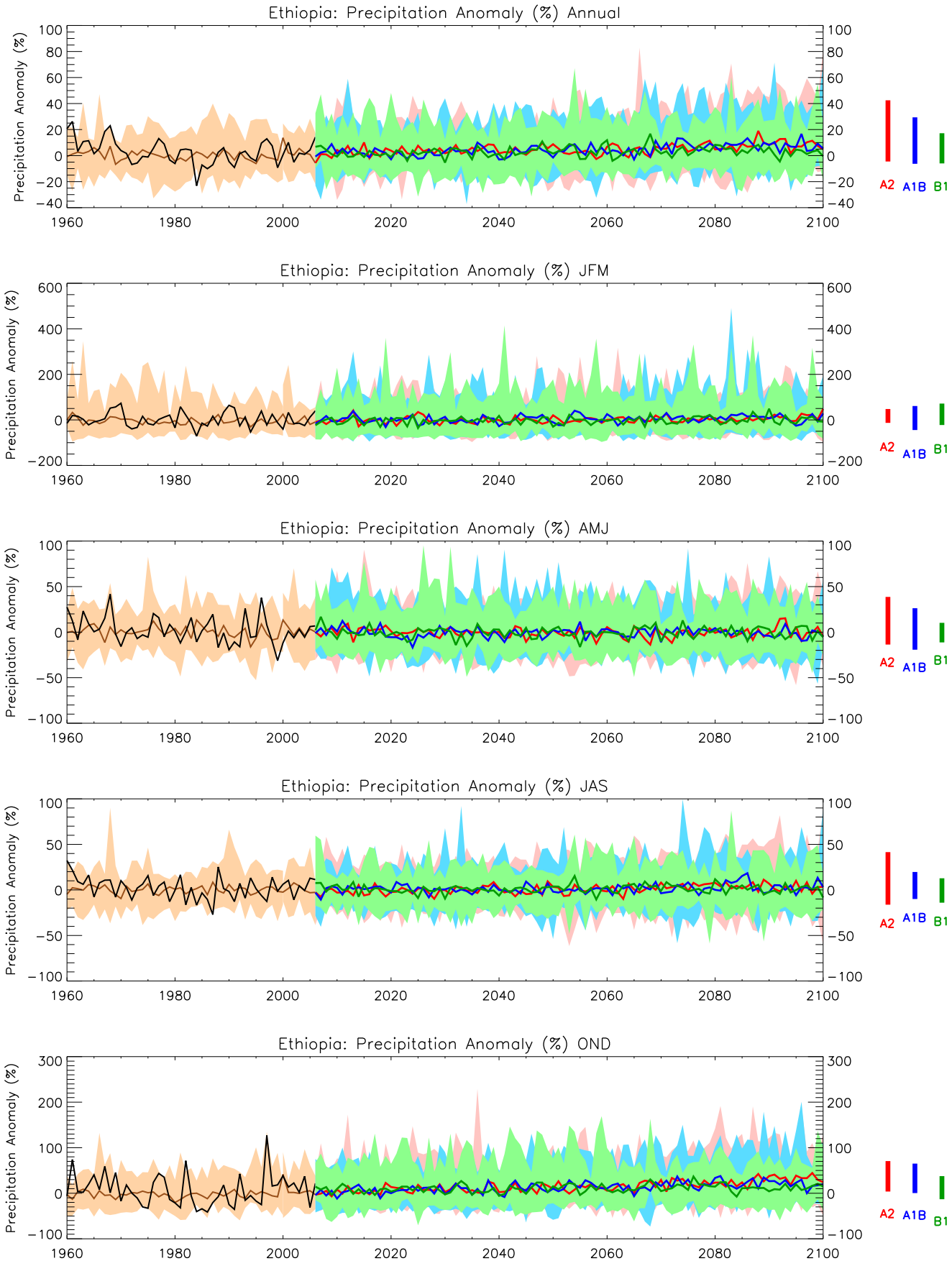

Figure 5: Trends in monthly precipitation for the recent past and projected future. All values shown are percentage anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

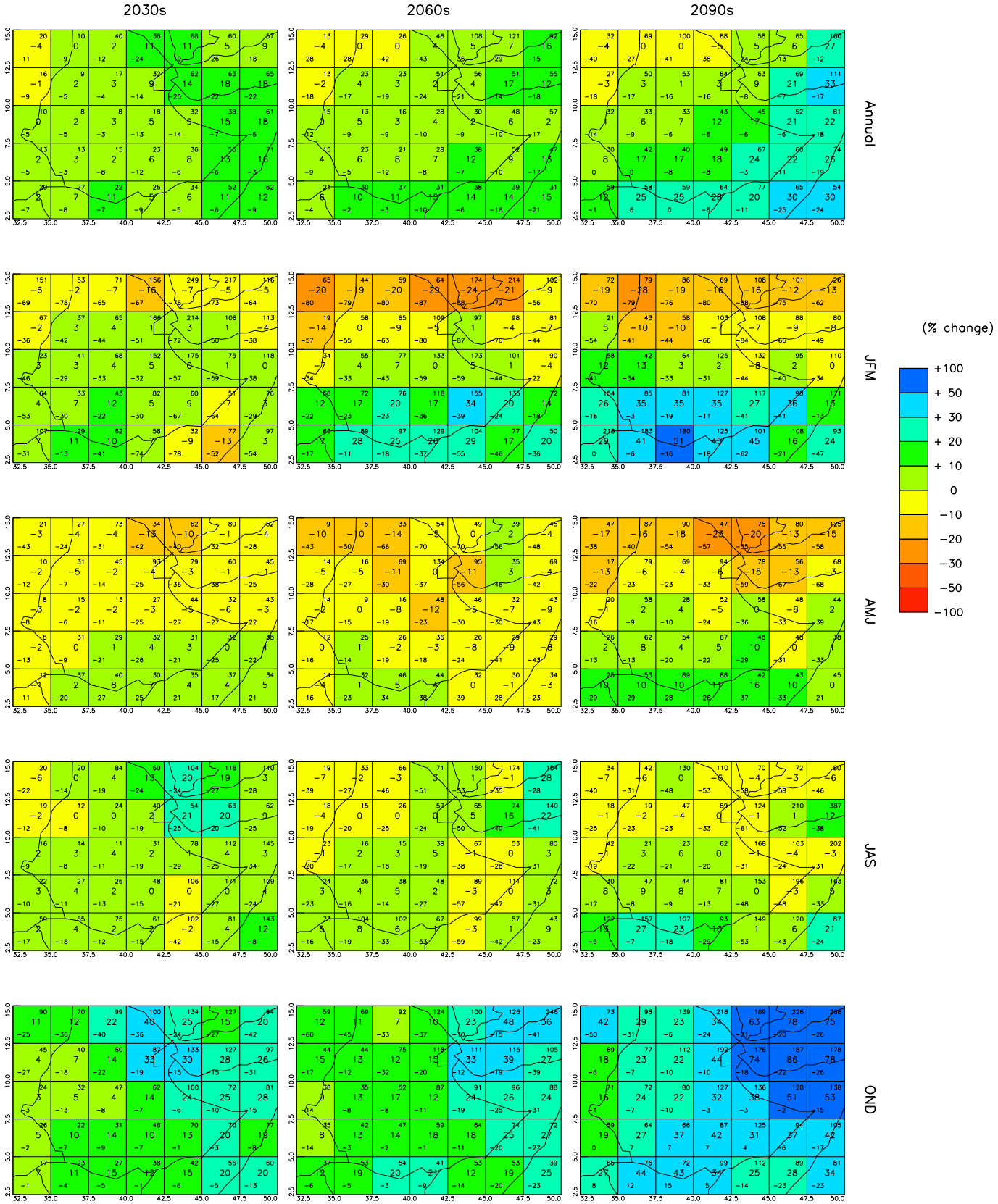

Figure 6: Spatial patterns of projected change in monthly precipitation for 10-year periods in the future under the SRES A2 scenario. All values are percentage anomalies relative to the mean climate of 1970-1999.See Figure 2 for details.

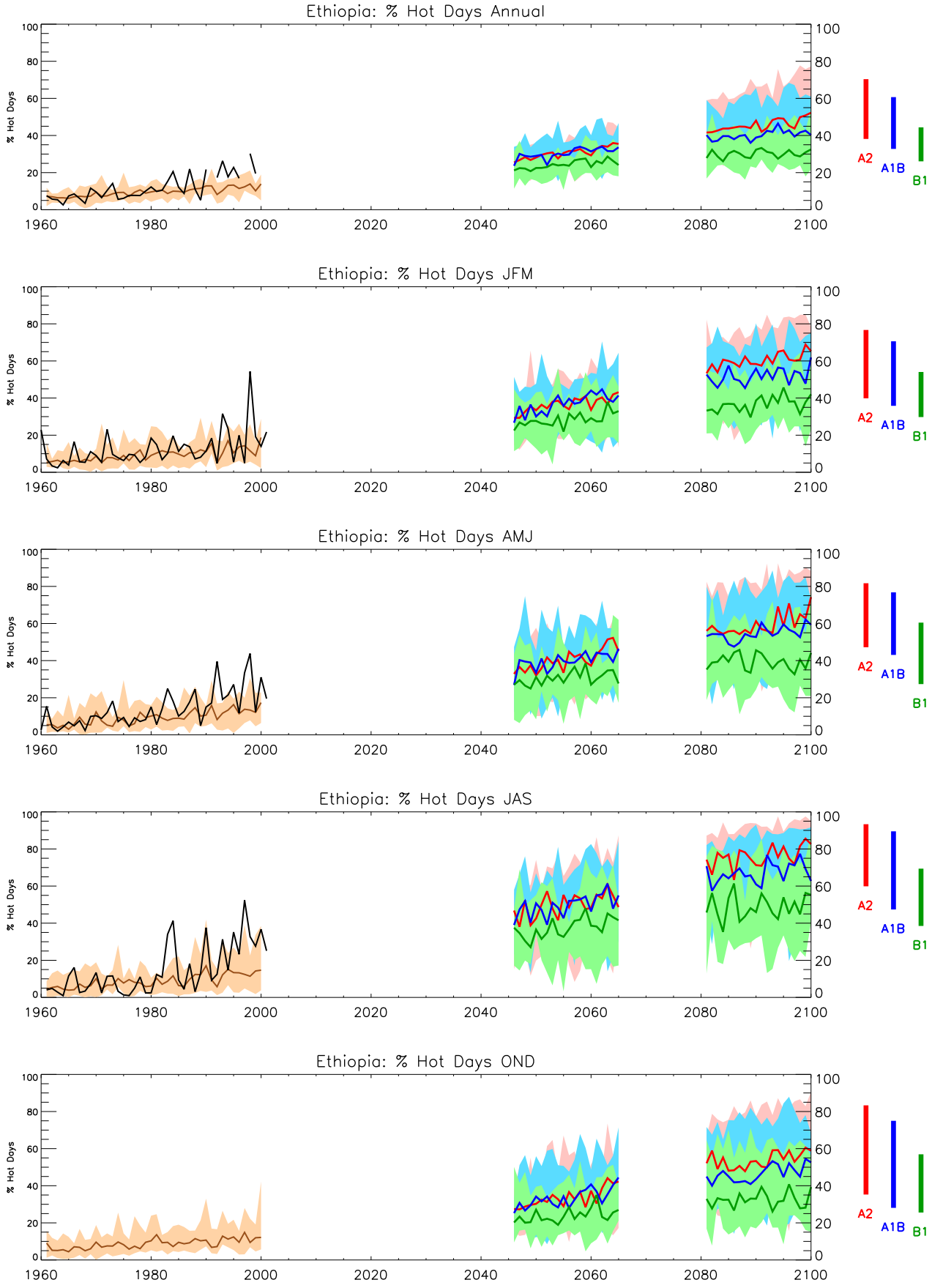

Figure 7: Trends in Hot-day frequency for the recent past and projected future. See Figure 1 for details.

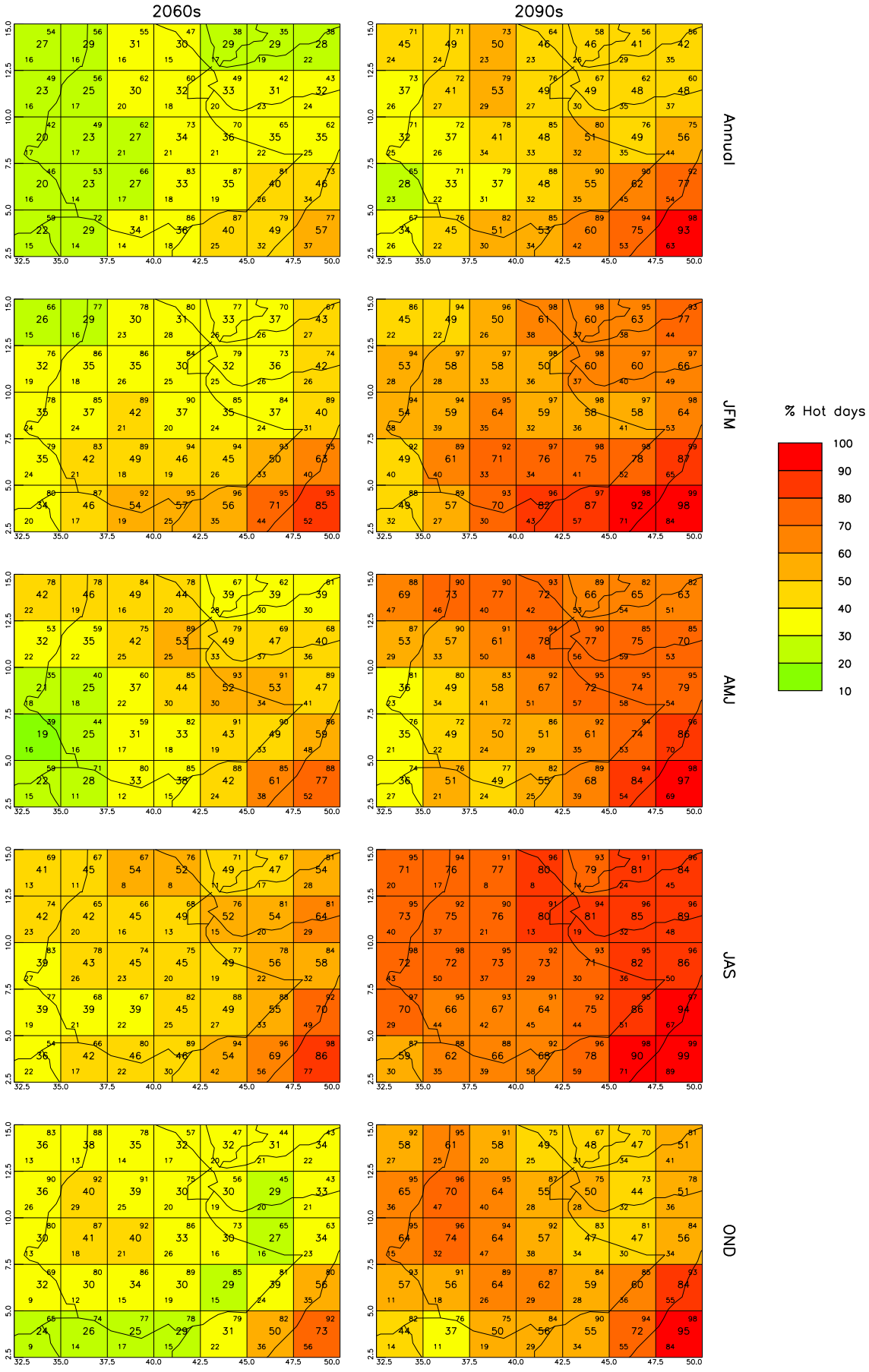

Figure 8: Spatial patterns of projected change in Hot-day frequency for 10-year periods in the future under the SRES A2 scenario. See Figure 2 for details.

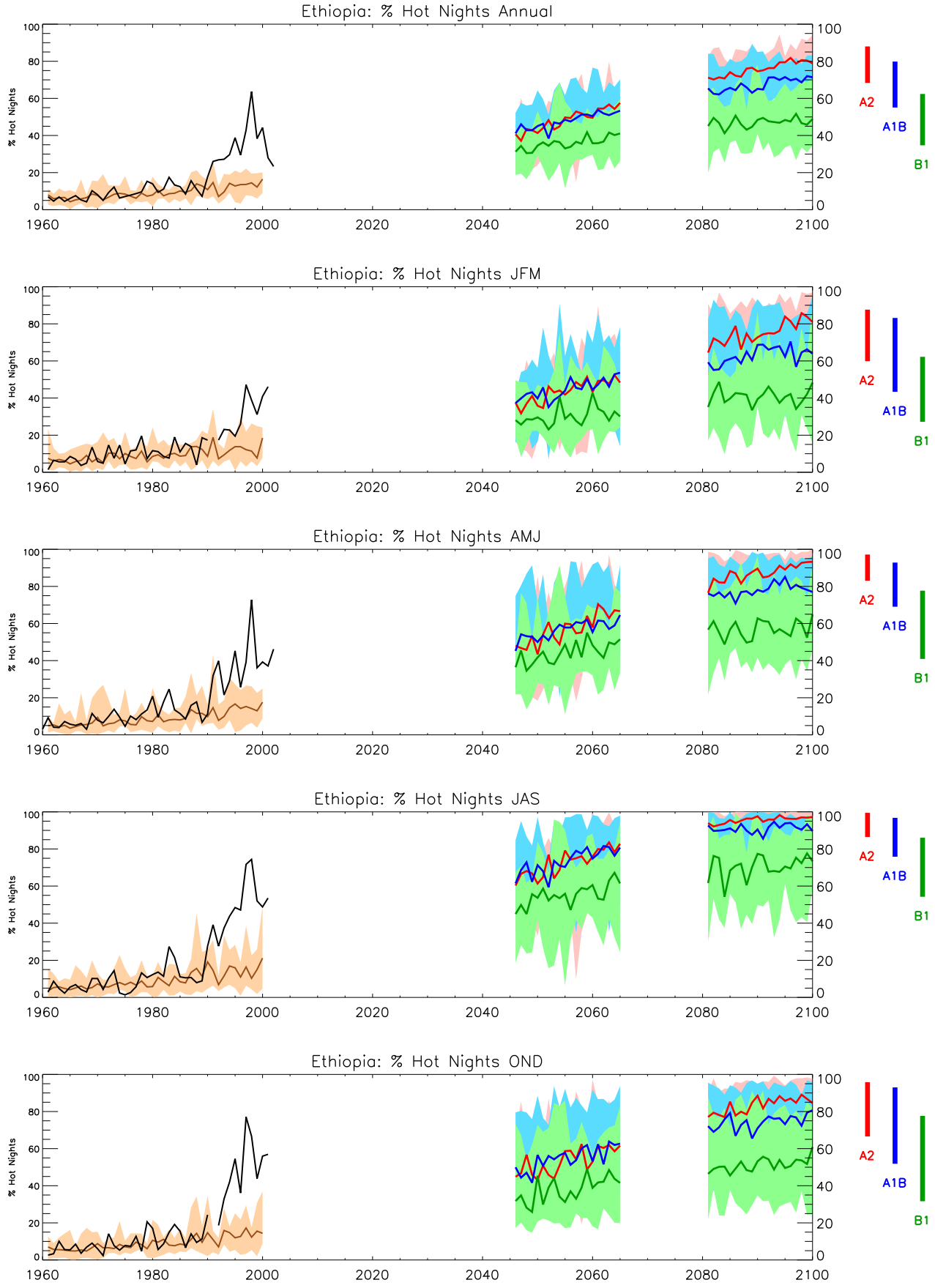

Figure 9: Trends in hot-night frequency for the recent past and projected future. See Figure 1 for details.

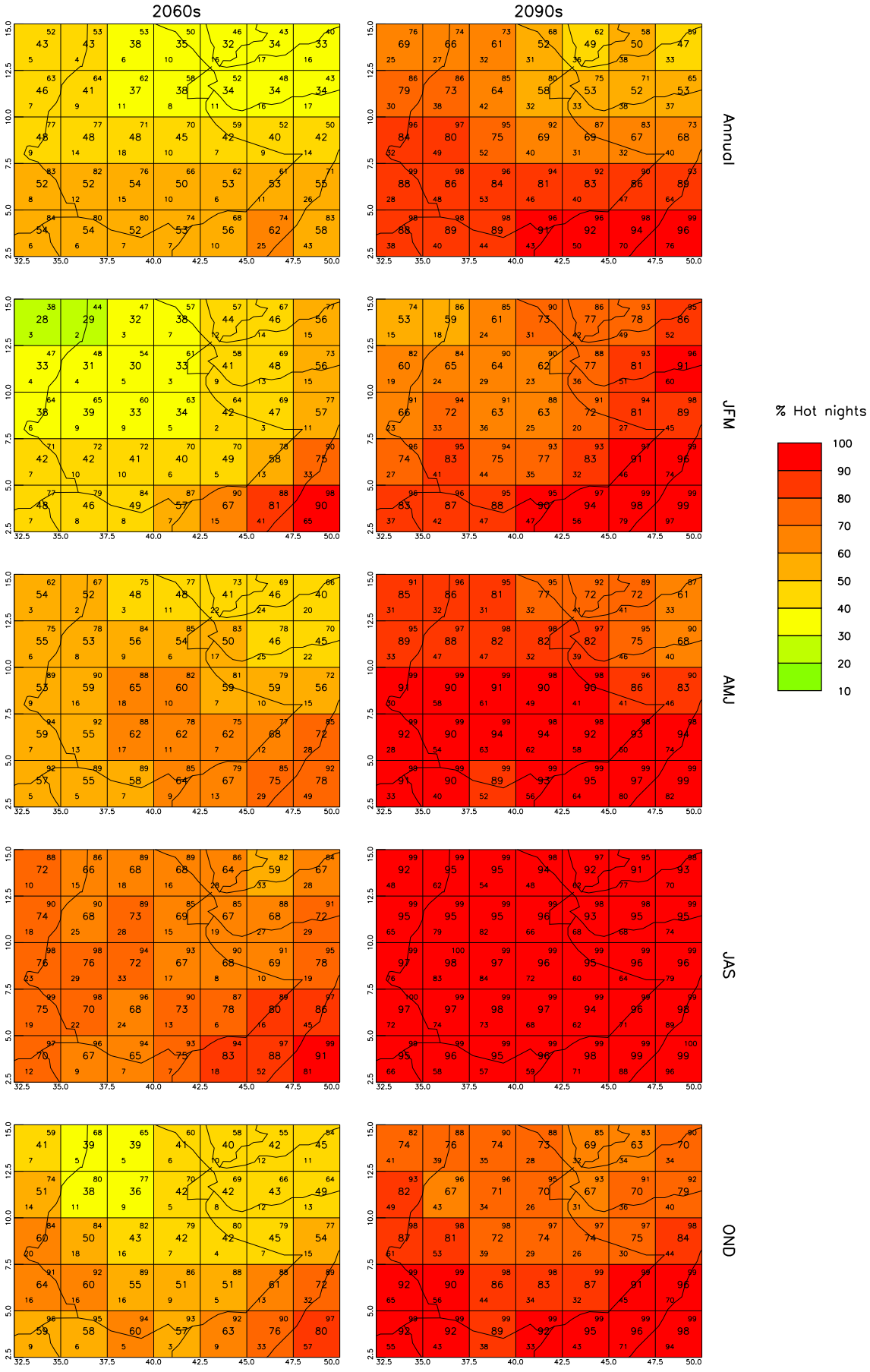

Figure 10: Spatial patterns of projected change in hot-night frequency for 10-year periods in the future under the SRES A2 scenario. See Figure 2 for details.

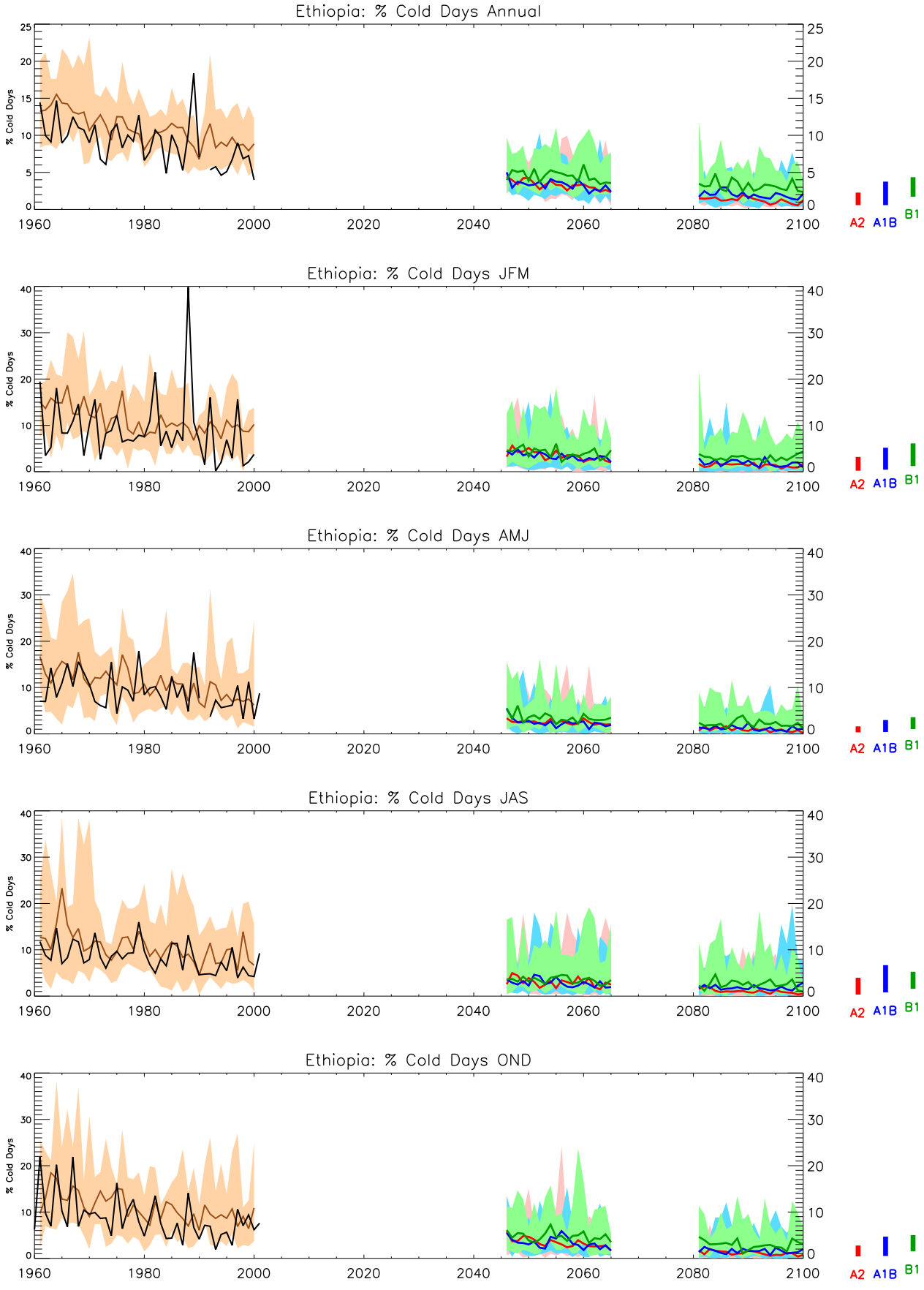

Figure 11: Trends in cold-day frequency for the recent past and projected future. See Figure 1 for details.

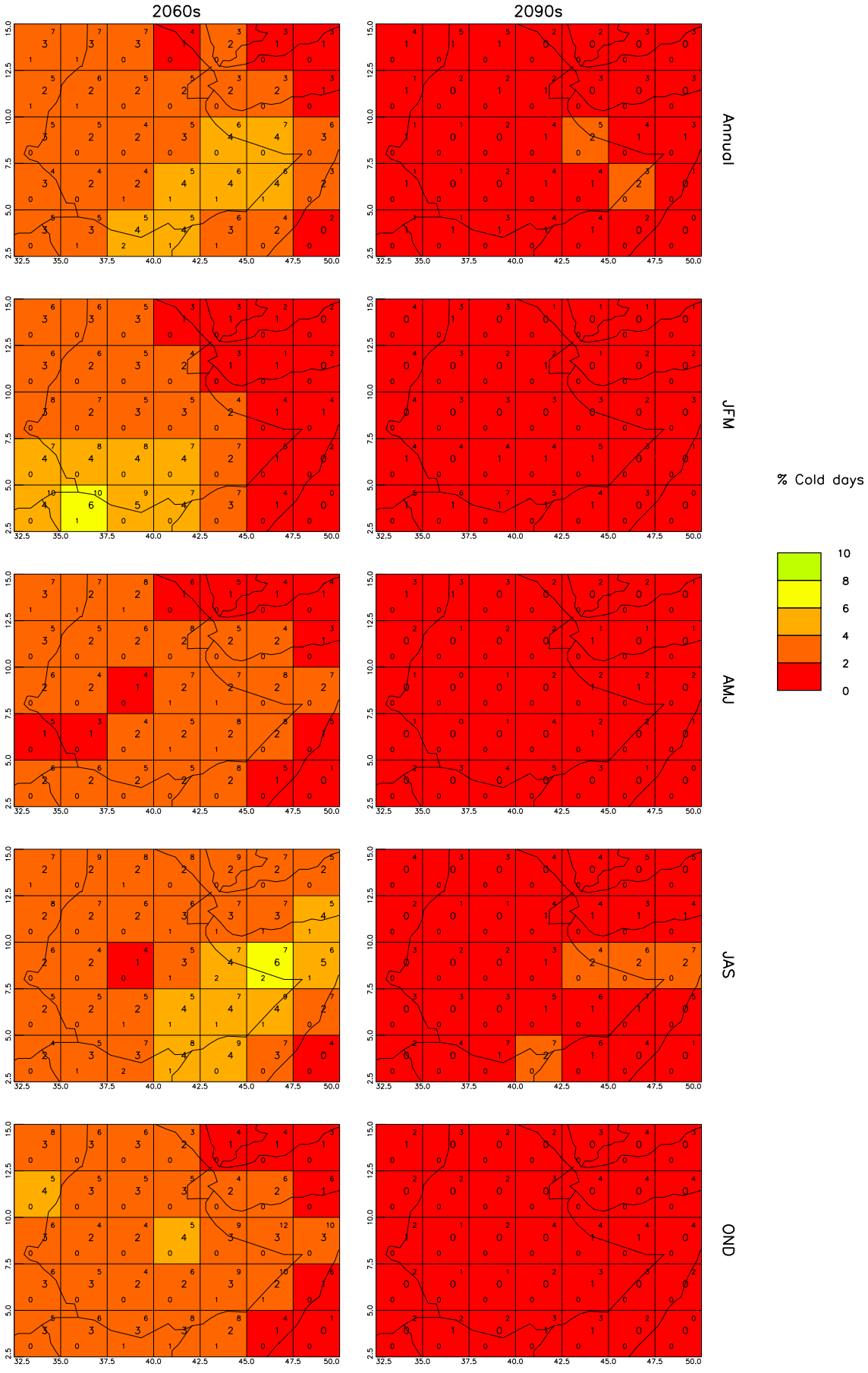

Figure 12: Spatial patterns of projected change in cold-day frequency for 10-year periods in the future under the SRES A2 scenario. See Figure 2 for details.

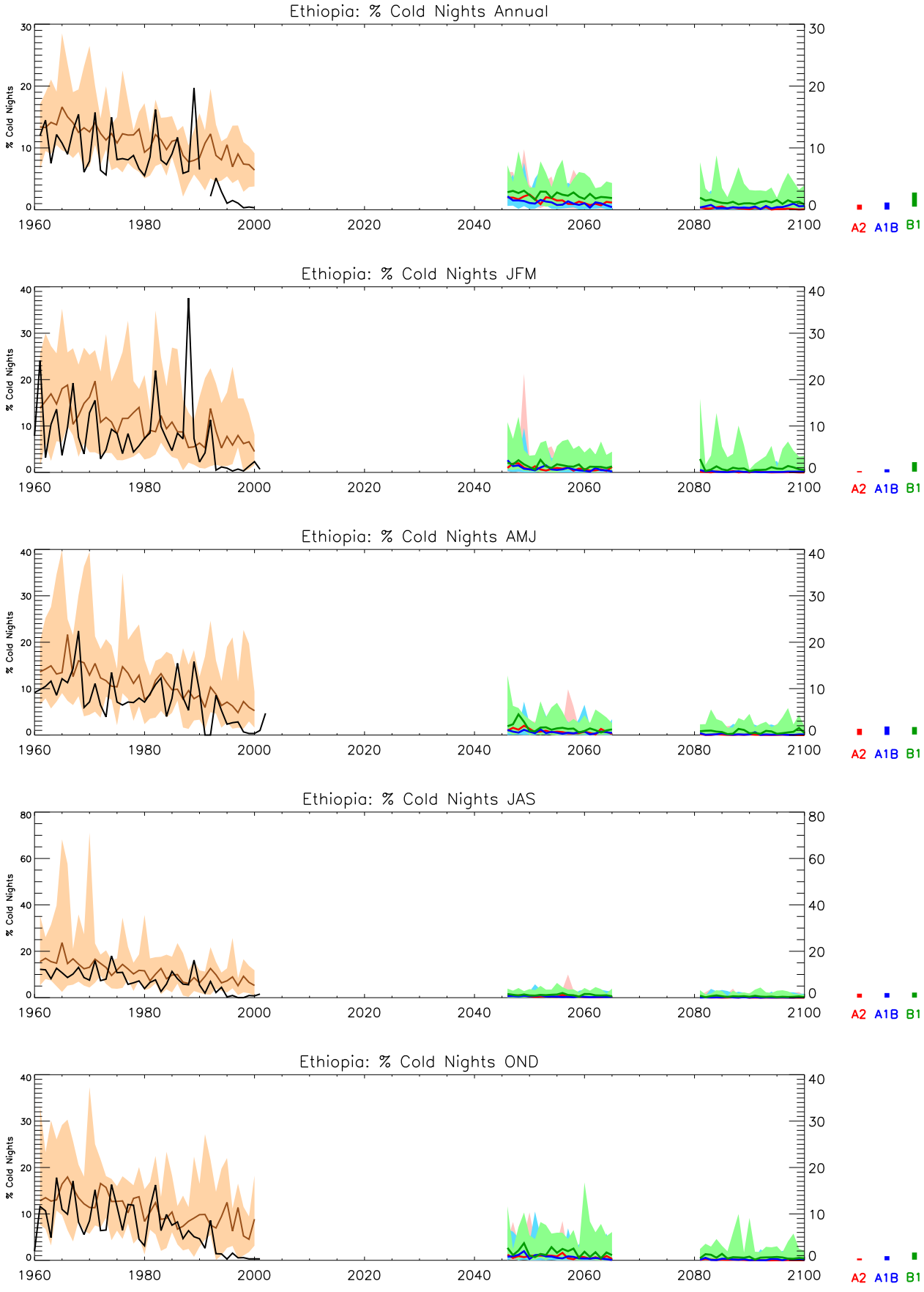

Figure 13: Trends in cold-night frequency for the recent past and projected future. See Figure 1 for details.

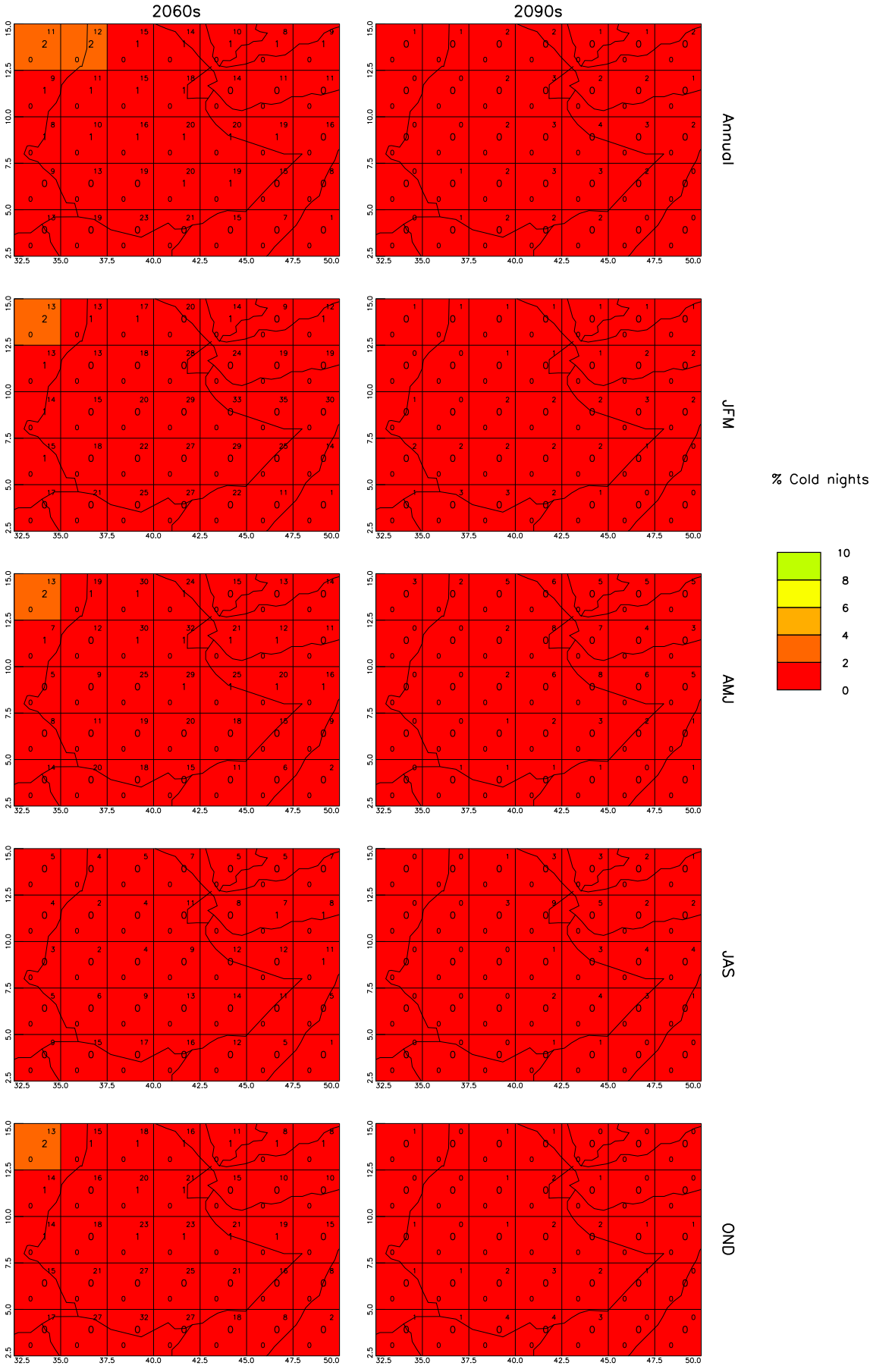

Figure 14: Spatial patterns of projected change in cold-night frequency for 10-year periods in the future under the SRES A2 scenario. See Figure 2 for details.

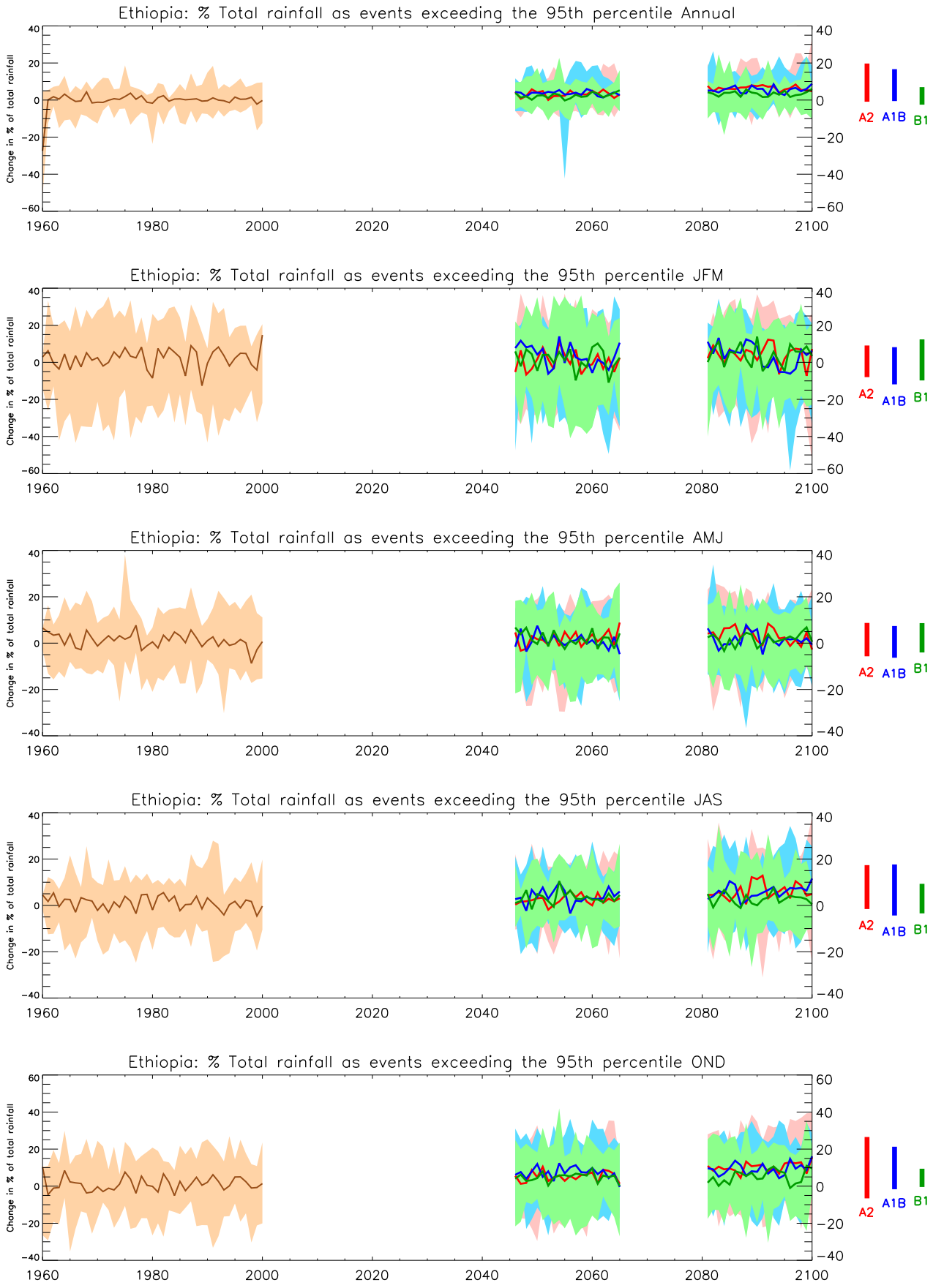

Figure 15: Trends in the proportion of precipitation falling in 'heavy' events for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

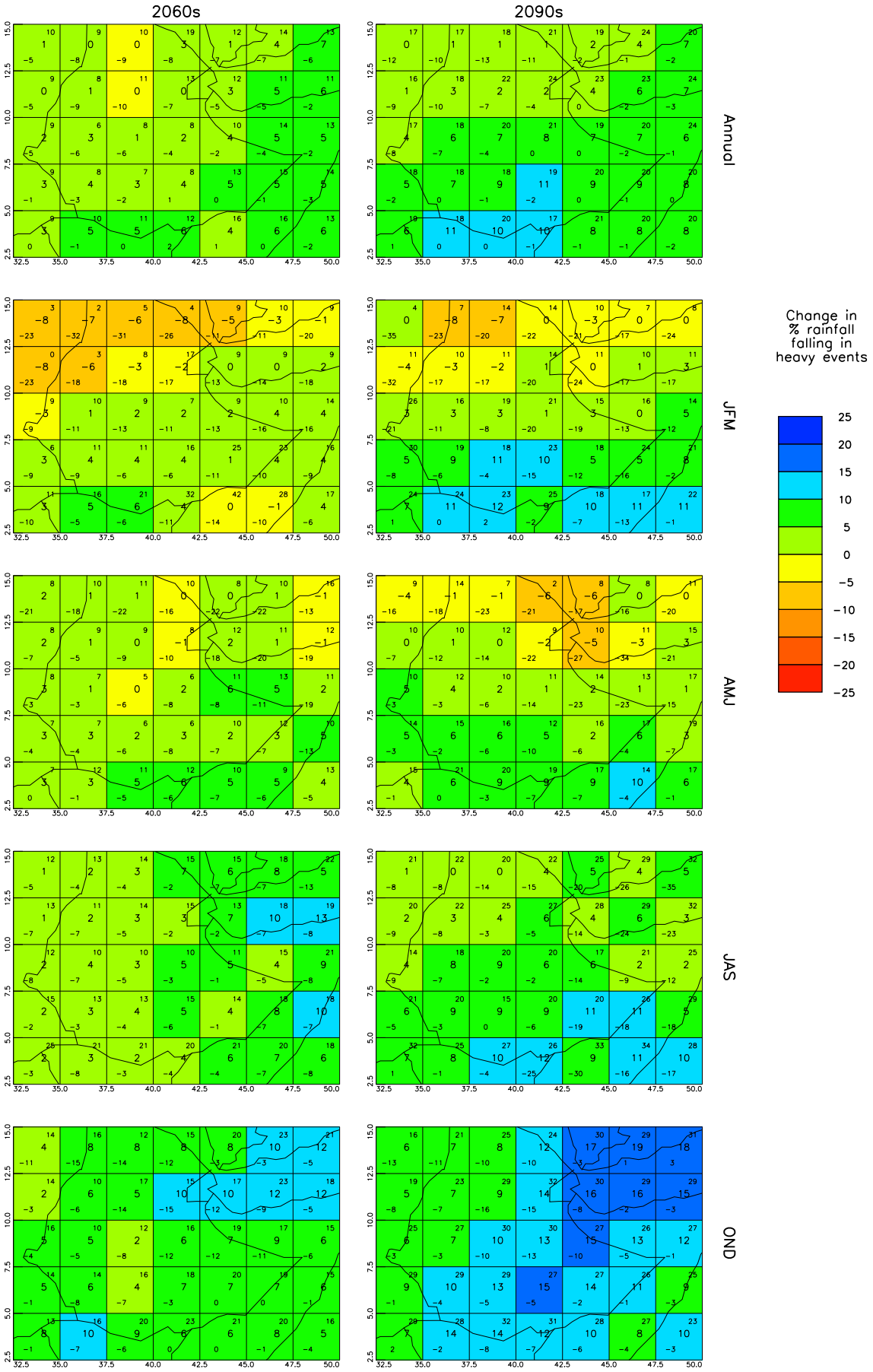

Figure 16: Spatial patterns of projected change in the proportion of precipitation falling in 'heavy' events for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. See Figure 2 for details.

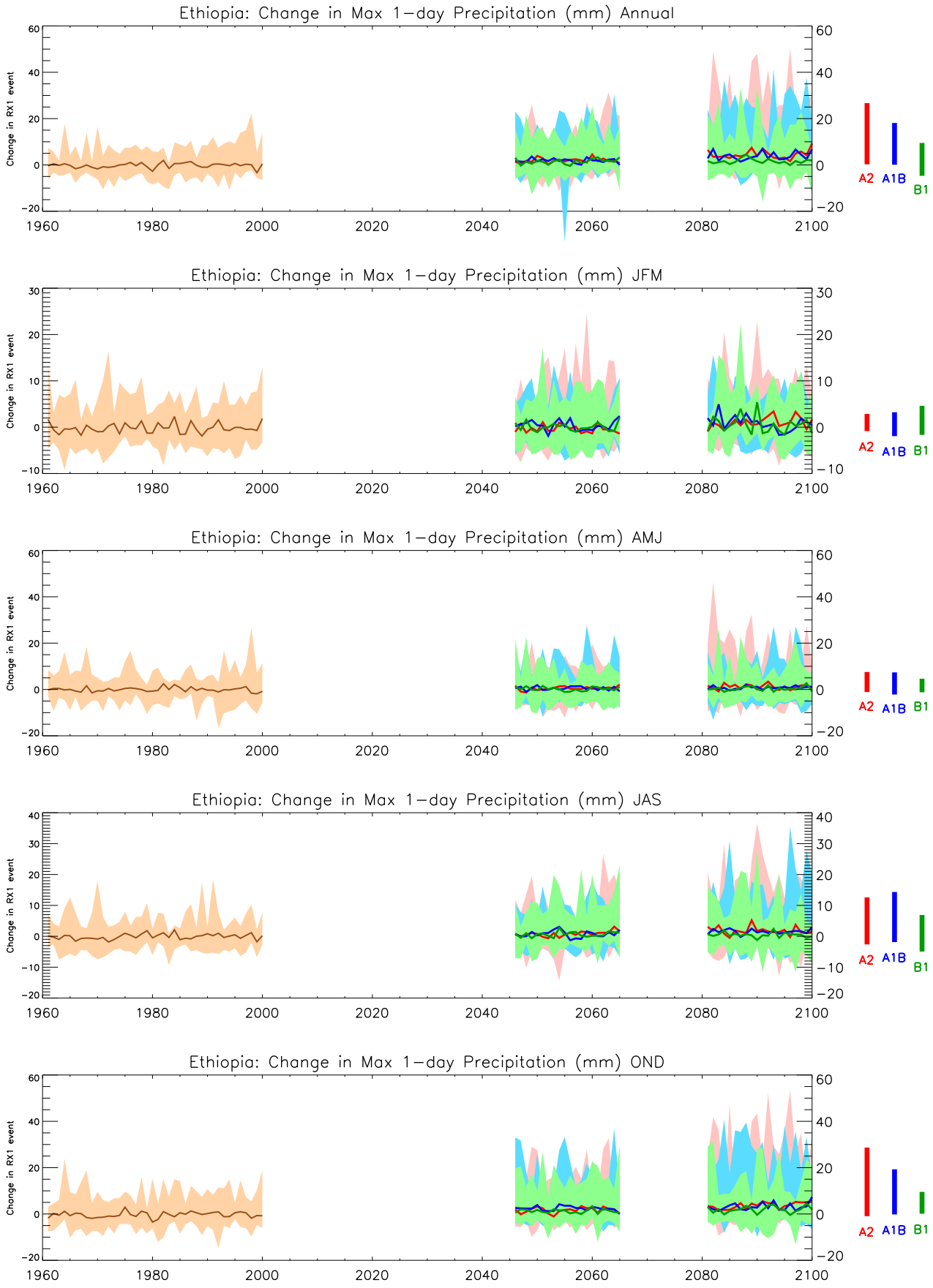

Figure 17: Trends in maximum 1-day rainfall for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

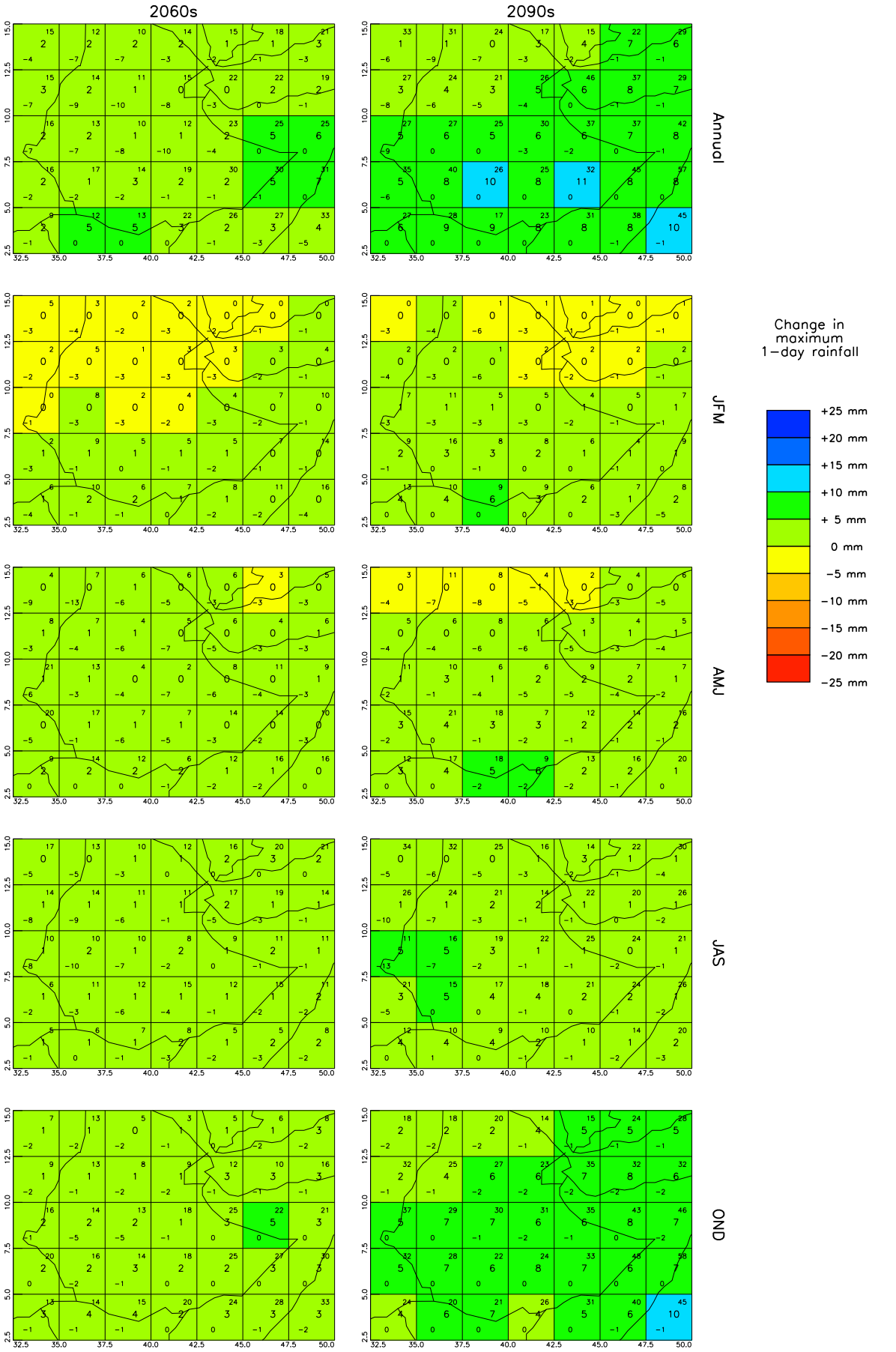

Figure 18: Spatial patterns of maximum 1-day rainfall for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. See Figure 2 for details.

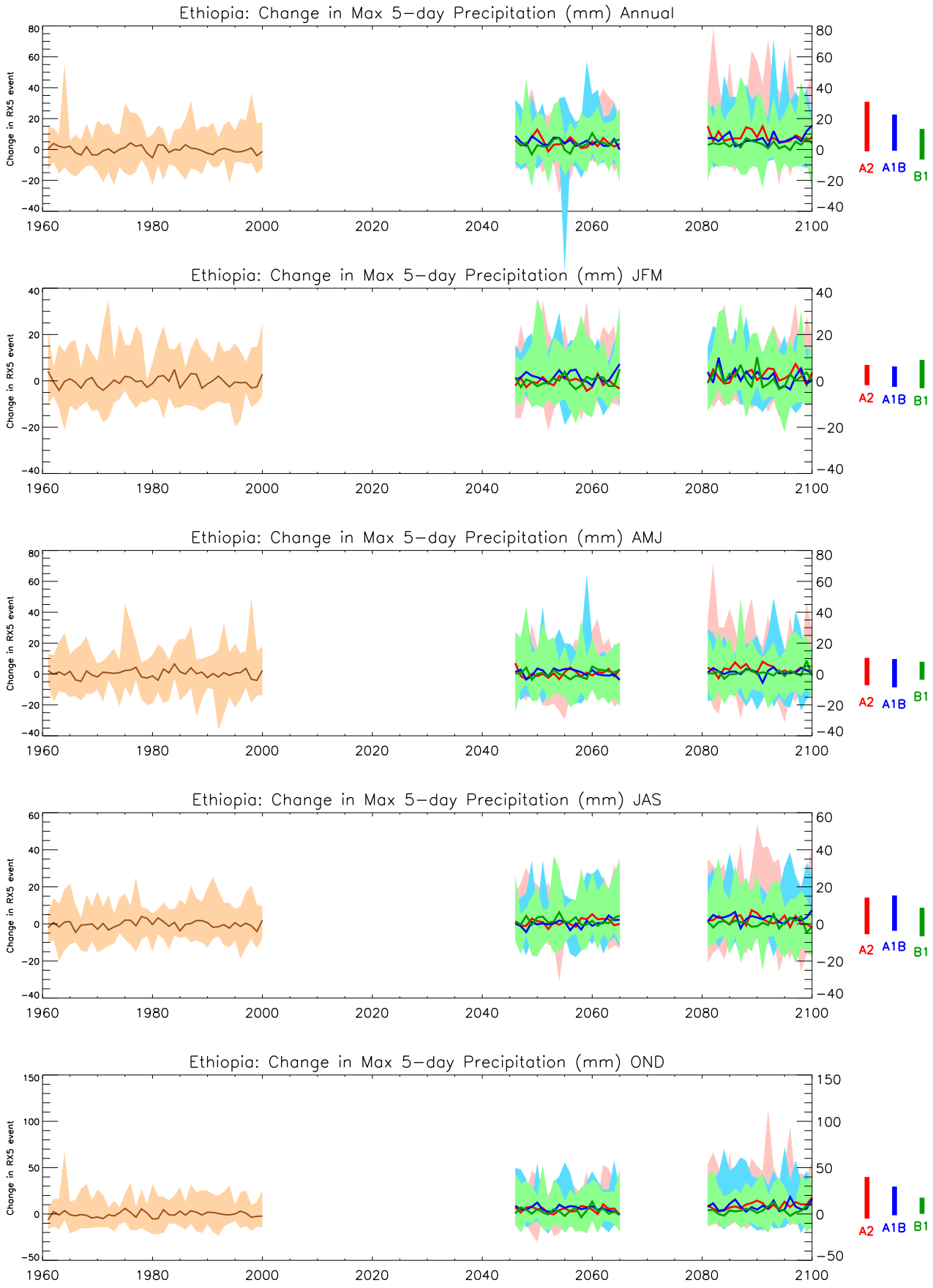

Figure 19: Trends in maximum 5-day rainfall for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

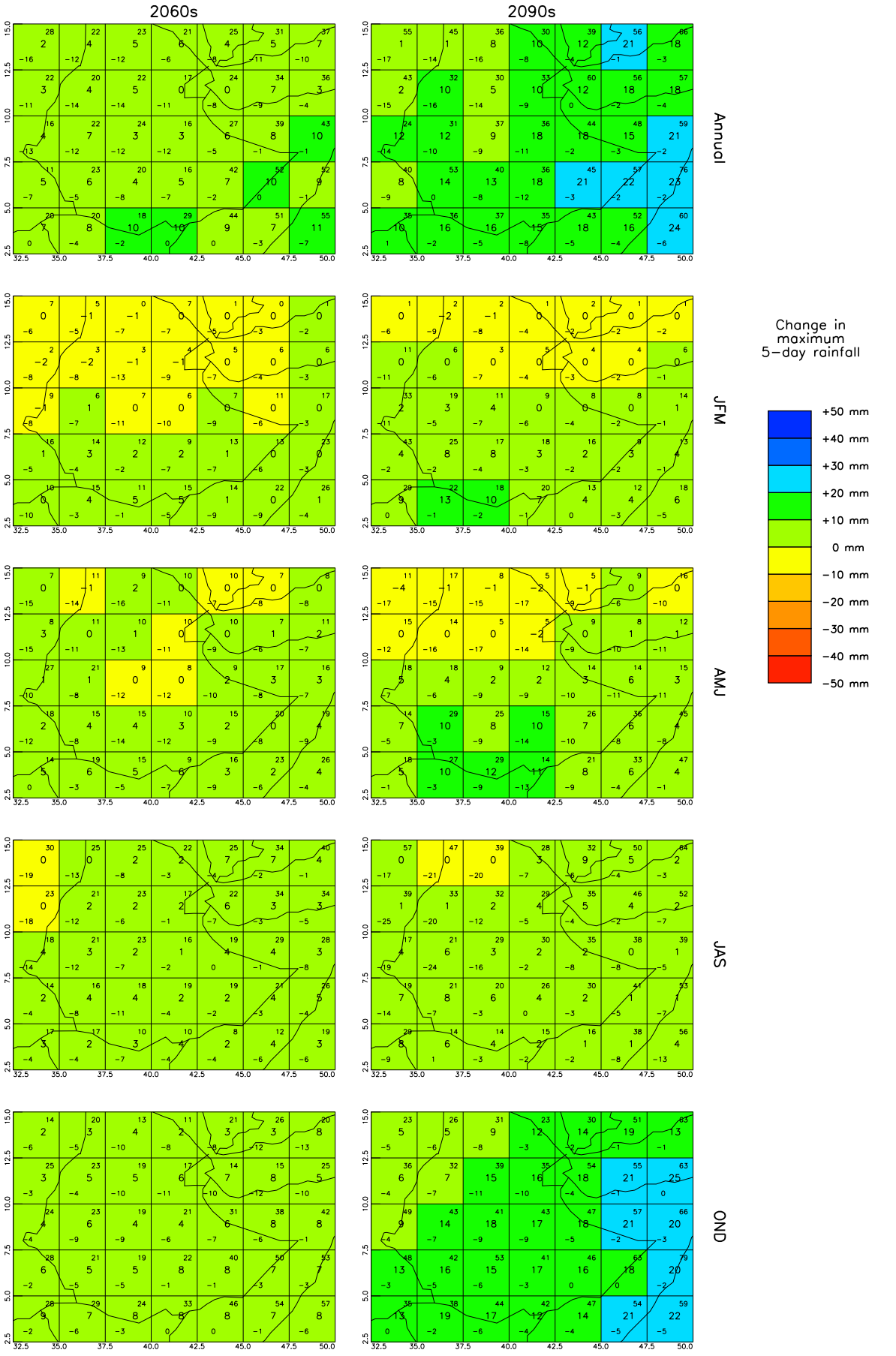

Figure 20: Spatial patterns of projected change in maximum 5-day rainfall for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. See Figure 2 for details.