UNDP Climate Change Country Profiles

Vietnam

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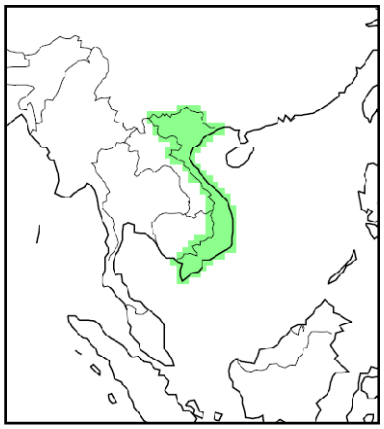
http://country-profiles.geog.ox.ac.uk



General Climate

Vietnam straddles a wide range of latitudes (8 to 23˚ north of the equator) and therefore experiences a range of climates. The Southern parts of the country sit close to the equator, experiencing a tropical climate whilst the Northern regions of Vietnam reach into the humid subtropics, where there is greater seasonal variation. The majority of rainfall in Vietnam is caused by monsoon circulations which bring heavy rains in May through to October in the North and South, and from September to January in the central regions. Mean monthly rainfall in the wet season is 200-400mm. The long coastline of Vietnam is also vulnerable to pacific tropical cyclones between June and November, which contribute significantly to wet season rainfall totals.

The northern regions experience more distinct seasonal variations in average temperature than the south. In the northern provinces, average temperatures drop to 15-20˚C in winter from summer temperatures of 22.5 to 27.5˚C, whilst in the south temperature drop to 26-27˚C from 28-29˚C.

Inter-annual variations in climate are caused by the El Niño Southern Oscillation. El Niño episodes influence the behaviour of the monsoons in this region, and generally bring warmer and drier than average winter conditions across south-east Asia, whilst La Niña episodes bring cooler than average summers.

Recent Climate Trends

Temperature

- Mean annual temperature has increased by 0.4˚C since 1960, a rate of around 0.09˚C per decade. The rate of increase is most rapid in the dry seasons (NDJ and FMA) at a rate of 0.14-0.15˚C per decade and slower in the wet seasons (MJJ and ASO) at a rate 0.08-0.11˚C per decade. This warming has been more rapid in the southern parts of Vietnam than the central and northern regions.

- The frequency of hot days[1] and hot nights has increased significantly since 1960 in every season.
    - The average number of 'hot' days per year in Vietnam has increased by 29 (an additional 7.8% of days[2]) between 1960 and 2003. The rate of increase is seen most strongly in SON when the average number of hot SON days has increased by 2.9 days per month (an additional 9.5% of SON days) over this period.
    - The average number of 'hot' nights per year increased by 49 (an additional 13.3% 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 5.1 days per month (an additional 16.3% of JJA nights) over this period.
- The frequency of cold days[3] and nights, annually, has decreased significantly since 1960.
    - The average number of 'cold 'days per year has decreased by 11 (3.0% of days) between 1960 and 2003. This rate of decrease is most rapid in DJF when the average number of cold DJF days has decreased by 1.9 days per month (6.0% of DJF days) over this period.
    - The average number of 'cold' nights per year has decreased by 35 (9.5% of days). This rate of decrease is most rapid in DJF when the average number of cold DJF nights has decreased by 4 nights per month (12.8% of DJF nights) over this period.

Precipitation

- Mean rainfall over Vietnam does not show any consistent increase or decrease since 1960.

- Neither the proportion of rainfall that occurs in heavy[4] events, nor the magnitude of maximum 1- and 5-day day events have altered significantly or consistently over the observed period.

GCM Projections of Future Climate

Temperature

- The mean annual temperature is projected to increase by 0.8 to 2.7˚C by the 2060s, and 1.4 to 4.2 degrees by the 2090s. The range of projections by the 2090s under any one emissions scenario is around 1.5-2.0˚C.
- The projected rate of warming is similar in all seasons and regions of Vietnam.

- All projections indicate substantial increases in the frequency of days and nights that are considered 'hot' in current climate.

[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.
[4] 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.

- Annually, projections indicate that 'hot' days will occur on 17-41% of days by the 2060s, and 23-55% of days by the 2090s. Days considered 'hot' by current climate standards for their season are projected to increase fastest in summer (MJJ), occurring on 26-87% of days of the season by the 2090s.
- Nights that are considered 'hot' for the annual climate of 1970-99 are projected increase at a faster rate than hot days, occurring on 25-51% of nights by the 2060s and 34-68% of nights by the 2090s. Nights that are considered hot for each season are projected to increase most rapidly in summer (MJJ) occurring on 55-92% of nights in every season by the 2090s.
- All projections indicate decreases in the frequency of days and nights that are considered 'cold' in current climate. These events are expected to become exceedingly rare, occurring on 0-6% of days in the year, potentially not at all under the higher emissions scenarios by the 2090s.

Precipitation

- Projections of mean annual rainfall from different models in the ensemble are broadly consistent in indicating increases in rainfall for Vietnam. This increase is mainly due to the projected increases in ASO rainfall (-1 to +33% by the 2090s), but is partially offset by projected decreases in FMA (-62 to +23%).

- The proportion of total rainfall that falls in heavy events is projected in increase by all the models in the ensemble, by an additional 2 to 14% by the 2090s. Again, these increases arise mainly due to increases in heavy events in ASO and MJJ rainfall, and are partially offset by decreases in NDJ and FMA.
- All models in the ensemble project increases in the magnitude of 1- and 5-day rainfalls of up to 43mm and 52mm, respectively, by the 2090s.

Other 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 ENSO, which introduces uncertainty at the regional scale. The uncertainty in potential changes in tropical cyclones also contributes to uncertainties in future wet-season rainfall (Christensen *et al*., 2007).
- Model simulations show wide disagreements in projected changes in the amplitude of future El Niño events. ENSO influences the monsoon variability in South East Asia, a relationship which is also poorly understood, contributing to uncertainty in climate projections for this region.
- Vietnam's coastal lowlands are vulnerable to sea-level rise. Sea-level in this region is projected by climate models to rise by the following levels[5] by the 2090s, relative to 1980-1999 sea-level:
    - 0.18 to 0.43m under SRES B1
    - 0.21 to 0.52m under SRES A1B
    - 0.23 to 0.56m under SRES A2

- For further information on climate change projections for Asia see Christensen *et al*. (2007) IPCC Working Group I Report: '*The Physical Science Basis'*, Chapter 11 *(Regional Climate projections*): Section 11.4 *(Asia*).

[5] 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 Min	Median	Max	Projected changes by the 2060s Min	Median	Max	Projected changes by the 2090s Min	Median	Max
Temperature												
	(˚C)	*(change in ˚C per decade)*		*Change in ˚C*			*Change in ˚C*			*Change in ˚C*		
			A2	0.3	**0.9**	1.3	1.5	**2.0**	2.7	2.5	**3.2**	4.2
Annual	23.5	0.09*	*A1B*	0.5	**1.1**	1.4	1.5	**2.0**	2.5	2.0	**2.6**	3.8
			B1	0.3	**0.8**	1.3	0.8	**1.4**	1.9	1.4	**1.7**	2.4
			A2	-0.2	**0.8**	1.6	1.2	**2.0**	2.8	2.2	**3.1**	4.5
NDJ	20.1	0.15*	*A1B*	0.1	**1.1**	1.5	1.2	**1.7**	2.9	1.6	**2.4**	3.8
			B1	0.1	**0.8**	1.1	0.9	**1.4**	2.0	1.3	**1.8**	2.7
			A2	0.4	**1.0**	1.6	1.2	**2.0**	3.0	2.3	**3.5**	4.7
FMA	22.7	0.14*	*A1B*	0.4	**0.9**	1.6	1.6	**2.0**	2.5	2.0	**2.8**	4.5
			B1	0.1	**0.8**	1.4	0.7	**1.6**	2.2	1.3	**1.7**	2.8
			A2	0.6	**1.1**	1.6	1.6	**2.2**	2.8	2.8	**3.4**	4.8
MJJ	26.1	0.11*	*A1B*	0.7	**1.1**	1.7	1.6	**2.1**	2.7	2.1	**2.9**	4.0
			B1	0.5	**0.9**	1.4	0.9	**1.3**	1.9	1.3	**1.7**	2.8
			A2	0.5	**0.9**	1.3	1.5	**2.0**	2.6	2.5	**3.2**	4.2
ASO	24.9	0.08*	*A1B*	0.5	**1.0**	1.4	1.1	**2.0**	2.5	2.0	**2.5**	3.5
			B1	0.3	**0.9**	1.1	0.6	**1.4**	2.0	1.3	**1.7**	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*		
			A2	-10	**-3**	12	-6	**0**	15	-4	**0**	37
Annual	143.2	-0.6	*A1B*	-6	**0**	14	-6	**1**	21	-3	**3**	24
			B1	-10	**0**	9	-1	**2**	13	-4	**5**	10
			A2	-10	**-4**	6	-9	**-3**	4	-28	**-6**	18
NDJ	70.3	0.9	*A1B*	-17	**-3**	10	-14	**0**	10	-13	**-3**	13
			B1	-17	**3**	11	-12	**-3**	16	-17	**-4**	7
			A2	-16	**-5**	8	-16	**-3**	8	-14	**-6**	6
FMA	47.2	0.0	*A1B*	-11	**-3**	11	-14	**-5**	6	-16	**-6**	9
			B1	-13	**-3**	7	-10	**-2**	9	-11	**-2**	7
			A2	-19	**-1**	26	-23	**4**	27	-24	**9**	51
MJJ	218.8	0.7	*A1B*	-11	**-2**	34	-17	**3**	38	-16	**8**	46
			B1	-11	**-5**	13	-4	**6**	32	-6	**7**	33
			A2	-9	**0**	23	-6	**5**	41	-1	**25**	86
ASO	236.3	-2.8	*A1B*	-13	**3**	22	-1	**20**	38	4	**17**	38
			B1	-13	**4**	21	-6	**9**	28	-1	**14**	33
Precipitation (%)												
	(mm per month)	*(change in % per decade)*		*% Change*			*% Change*			*% Change*		
			A2	-9	**-2**	7	-6	**0**	12	-4	**0**	21
Annual	143.2	-0.4	*A1B*	-5	**0**	8	-4	**1**	12	-3	**3**	14
			B1	-6	**0**	7	-1	**1**	8	-4	**3**	9
			A2	-27	**-8**	11	-26	**-8**	8	-38	**-10**	35
NDJ	70.3	1.3	*A1B*	-39	**-4**	19	-22	**-1**	18	-27	**-6**	12
			B1	-16	**3**	21	-32	**-4**	31	-22	**-8**	13
			A2	-47	**-11**	8	-36	**-6**	19	-62	**-17**	11
FMA	47.2	0.0	*A1B*	-32	**-6**	21	-45	**-11**	13	-57	**-12**	23
			B1	-34	**-7**	19	-45	**-2**	18	-48	**-2**	15
			A2	-14	**-1**	15	-9	**2**	15	-13	**4**	30
MJJ	218.8	0.3	*A1B*	-8	**-1**	19	-7	**1**	22	-9	**4**	26
			B1	-7	**-2**	7	-2	**2**	18	-3	**3**	14
			A2	-5	**0**	11	-3	**3**	20	-1	**12**	33
ASO	236.3	-1.2	*A1B*	-6	**2**	12	-1	**10**	16	1	**9**	20
			B1	-6	**2**	9	-4	**5**	11	0	**7**	16

	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	****	****	****	23	**30**	41	31	**42**	55
Annual	11.0	1.83*	*A1B*	****	****	****	20	**28**	40	28	**37**	52
			B1	****	****	****	17	**20**	35	23	**27**	41
			A2	****	****	****	19	**30**	39	33	**50**	55
NDJ	10.4	(1.51*)	*A1B*	****	****	****	20	**30**	38	25	**39**	49
(DJF)			*B1*	****	****	****	16	**22**	33	22	**30**	39
			A2	****	****	****	20	**29**	41	34	**46**	55
FMA	11.2	(1.55*)	*A1B*	****	****	****	17	**32**	42	31	**40**	51
(MAM)			*B1*	****	****	****	16	**24**	34	21	**27**	40
			A2	****	****	****	30	**39**	66	42	**55**	87
MJJ	11.1	(1.43*)	*A1B*	****	****	****	25	**39**	63	38	**52**	85
(JJA)			*B1*	****	****	****	22	**28**	56	26	**35**	64
			A2	****	****	****	33	**45**	59	54	**63**	79
ASO	11.1	(2.21*)	*A1B*	****	****	****	34	**51**	61	46	**58**	73
(SON)			*B1*	****	****	****	26	**42**	53	34	**46**	60
Frequency of Hot Nights (TN90p)												
			A2	****	****	****	35	**44**	51	46	**56**	68
Annual	11.4	3.09*	*A1B*	****	****	****	32	**44**	50	42	**52**	62
			B1	****	****	****	25	**34**	41	34	**41**	48
			A2	****	****	****	19	**32**	44	30	**48**	62
NDJ	12.0	(3.27*)	*A1B*	****	****	****	19	**30**	43	26	**40**	57
(DJF)			*B1*	****	****	****	12	**22**	39	21	**28**	43
			A2	****	****	****	24	**34**	48	36	**51**	67
FMA	12.0	(3.25*)	*A1B*	****	****	****	20	**34**	49	30	**47**	61
(MAM)			*B1*	****	****	****	17	**27**	39	21	**33**	45
			A2	****	****	****	58	**69**	81	85	**90**	92
MJJ	12.3	(3.80*)	*A1B*	****	****	****	48	**71**	84	74	**85**	91
(JJA)			*B1*	****	****	****	36	**56**	68	55	**67**	80
			A2	****	****	****	50	**60**	71	64	**83**	86
ASO	11.6	(3.12*)	*A1B*	****	****	****	49	**66**	72	61	**77**	84
(SON)			*B1*	****	****	****	41	**48**	61	50	**54**	69
Frequency of Cold Days (TX10p)												
			A2	****	****	****	3	**4**	6	0	**2**	4
Annual	10.0	-0.69*	*A1B*	****	****	****	2	**4**	6	1	**3**	5
			B1	****	****	****	4	**4**	8	3	**4**	6
			A2	****	****	****	2	**4**	7	0	**1**	4
NDJ	9.6	(-1.39*)	*A1B*	****	****	****	1	**3**	7	0	**2**	6
(DJF)			*B1*	****	****	****	2	**4**	9	1	**3**	6
			A2	****	****	****	3	**5**	6	0	**3**	4
FMA	10.1	(-0.28)	*A1B*	****	****	****	3	**4**	5	0	**4**	4
(MAM)			*B1*	****	****	****	3	**5**	7	2	**3**	6
			A2	****	****	****	0	**2**	3	0	**0**	2
MJJ	9.8	(-0.53)	*A1B*	****	****	****	0	**2**	3	0	**1**	3
(JJA)			*B1*	****	****	****	2	**3**	4	1	**2**	3
			A2	****	****	****	0	**3**	6	0	**2**	4
ASO	10.0	(-0.74*)	*A1B*	****	****	****	0	**3**	4	0	**2**	5
(SON)			*B1*	****	****	****	2	**3**	5	1	**2**	5
Frequency of Cold Nights (TN10p)												
			A2	****	****	****	3	**4**	6	0	**1**	2
Annual	8.4	-2.20*	*A1B*	****	****	****	2	**4**	5	0	**2**	4
			B1	****	****	****	3	**4**	6	2	**4**	5
			A2	****	****	****	1	**2**	6	0	**0**	2
NDJ	8.2	(-2.97*)	*A1B*	****	****	****	0	**2**	5	0	**1**	3
(DJF)			*B1*	****	****	****	2	**3**	6	0	**3**	4
			A2	****	****	****	2	**4**	5	0	**2**	3
FMA	8.1	(-2.39*)	*A1B*	****	****	****	2	**3**	5	0	**2**	3
(MAM)			*B1*	****	****	****	3	**4**	5	2	**3**	5
			A2	****	****	****	0	**1**	3	0	**0**	1
MJJ	8.1	(-2.34*)	*A1B*	****	****	****	0	**1**	3	0	**1**	2
(JJA)			*B1*	****	****	****	0	**2**	3	0	**1**	3
			A2	****	****	****	0	**3**	4	0	**1**	2
ASO	8.7	(-1.51*)	*A1B*	****	****	****	1	**2**	4	0	**2**	3
(SON)			*B1*	****	****	****	1	**3**	6	1	**3**	5

	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	****	****	****	0	**3**	6	2	**5**	14
Annual	22.8	0.8	*A1B*	****	****	****	0	**2**	8	2	**4**	12
			B1	****	****	****	0	**1**	5	1	**3**	9
			A2	****	****	****	-9	**-3**	2	-15	**-4**	1
NDJ	****	****	*A1B*	****	****	****	-6	**-1**	6	-8	**-1**	7
(DJF)			*B1*	****	****	****	-13	**0**	12	-9	**1**	6
			A2	****	****	****	-11	**-1**	6	-11	**2**	6
FMA	****	****	*A1B*	****	****	****	-7	**-1**	5	-16	**1**	7
(MAM)			*B1*	****	****	****	-5	**0**	9	-7	**0**	6
			A2	****	****	****	0	**3**	8	1	**5**	12
MJJ	****	****	*A1B*	****	****	****	0	**3**	8	1	**4**	10
(JJA)			*B1*	****	****	****	0	**2**	6	1	**3**	8
			A2	****	****	****	0	**3**	8	2	**7**	16
ASO	****	****	*A1B*	****	****	****	1	**3**	7	2	**7**	13
(SON)			*B1*	****	****	****	0	**1**	4	0	**3**	9
Maximum 1-day rainfall (RX1day)												
	mm	Change in mm per decade					Change in mm			Change in mm		
			A2	****	****	****	0	**3**	21	0	**9**	43
Annual	113.4	2.41	*A1B*	****	****	****	0	**6**	23	1	**10**	39
			B1	****	****	****	0	**2**	15	0	**6**	24
			A2	****	****	****	-6	**0**	8	-6	**-1**	11
NDJ	10.6	(0.73)	*A1B*	****	****	****	-3	**0**	8	-3	**0**	16
(DJF)			*B1*	****	****	****	-9	**0**	11	-5	**0**	12
			A2	****	****	****	-4	**0**	2	-5	**0**	4
FMA	34.4	(0.85)	*A1B*	****	****	****	-3	**-1**	1	-5	**0**	2
(MAM)			*B1*	****	****	****	-2	**0**	5	-4	**0**	2
			A2	****	****	****	0	**2**	9	0	**6**	20
MJJ	67.7	(0.24)	*A1B*	****	****	****	0	**3**	15	0	**5**	15
(JJA)			*B1*	****	****	****	0	**1**	8	0	**4**	7
			A2	****	****	****	0	**2**	15	1	**7**	30
ASO	40.6	(-0.98)	*A1B*	****	****	****	0	**4**	14	1	**9**	28
(SON)			*B1*	****	****	****	0	**2**	12	0	**3**	18
Maximum 5-day Rainfall (RX5day)												
	mm	Change in mm per decade					Change in mm			Change in mm		
			A2	****	****	****	0	**10**	23	3	**18**	48
Annual	186.8	-0.27	*A1B*	****	****	****	-1	**13**	28	3	**18**	52
			B1	****	****	****	-2	**7**	17	0	**11**	26
			A2	****	****	****	-11	**-2**	11	-12	**-3**	14
NDJ	16.1	(0.64)	*A1B*	****	****	****	-6	**0**	14	-12	**1**	19
(DJF)			*B1*	****	****	****	-14	**0**	16	-13	**0**	18
			A2	****	****	****	-7	**-2**	4	-10	**-1**	8
FMA	55.5	(2.05)	*A1B*	****	****	****	-8	**-2**	5	-12	**0**	6
(MAM)			*B1*	****	****	****	-7	**-1**	10	-8	**0**	3
			A2	****	****	****	0	**6**	20	2	**9**	33
MJJ	118.1	(-1.43)	*A1B*	****	****	****	1	**6**	19	2	**10**	24
(JJA)			*B1*	****	****	****	0	**4**	12	1	**6**	16
			A2	****	****	****	0	**8**	17	2	**15**	51
ASO	76.6	(-0.95)	*A1B*	****	****	****	2	**10**	22	3	**16**	48
(SON)			*B1*	****	****	****	0	**3**	17	0	**7**	22

* 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.

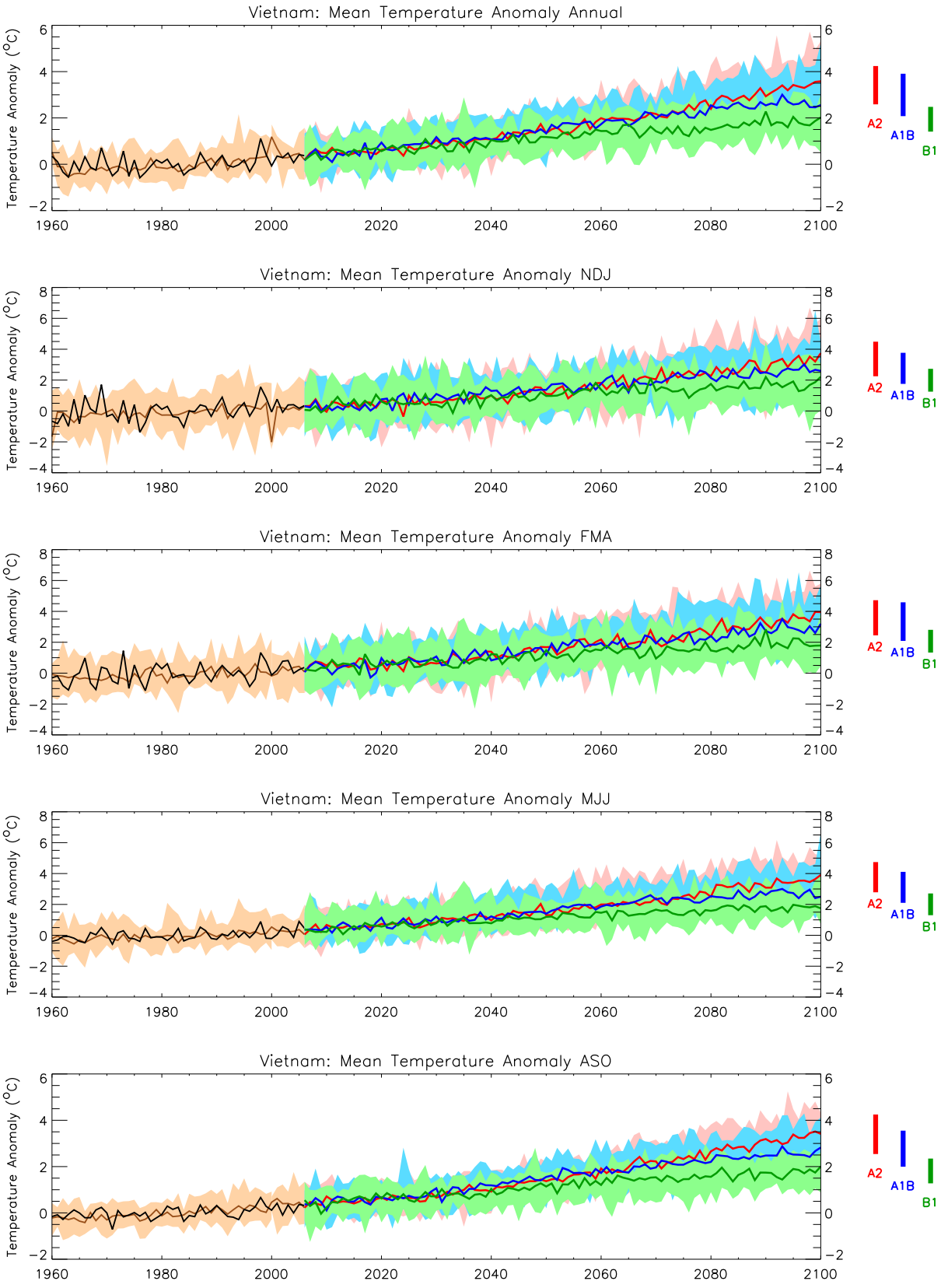


Figure 1: Trends in annual and seasonal mean temperature for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. Black curves show the mean of observed data from 1960 to 2006, Brown curves show the median (solid line) and range (shading) of model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

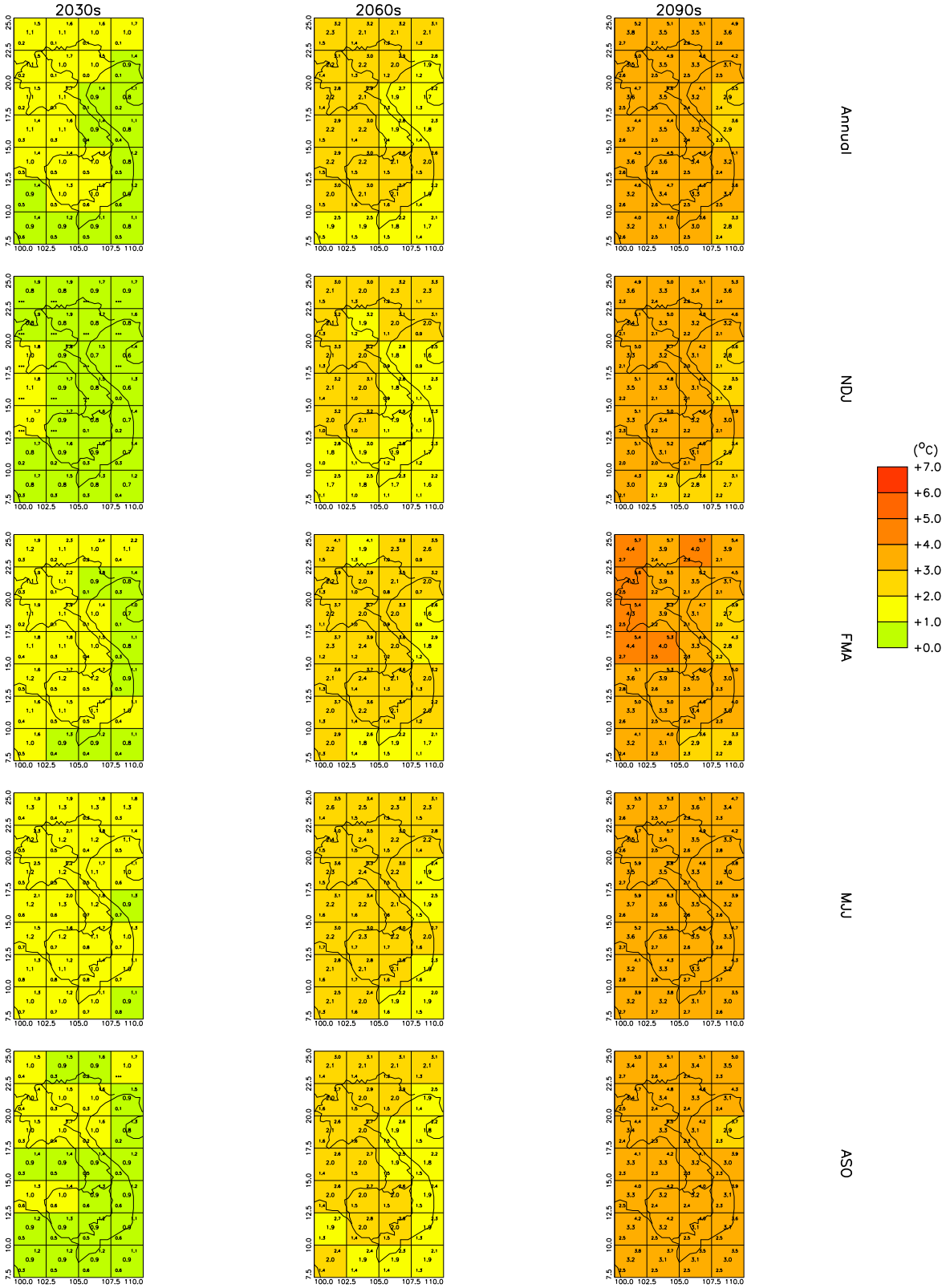


Figure 2: Spatial patterns of projected change in mean annual and seasonal temperature for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. In each grid box, the central value gives the ensemble median and the values in the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

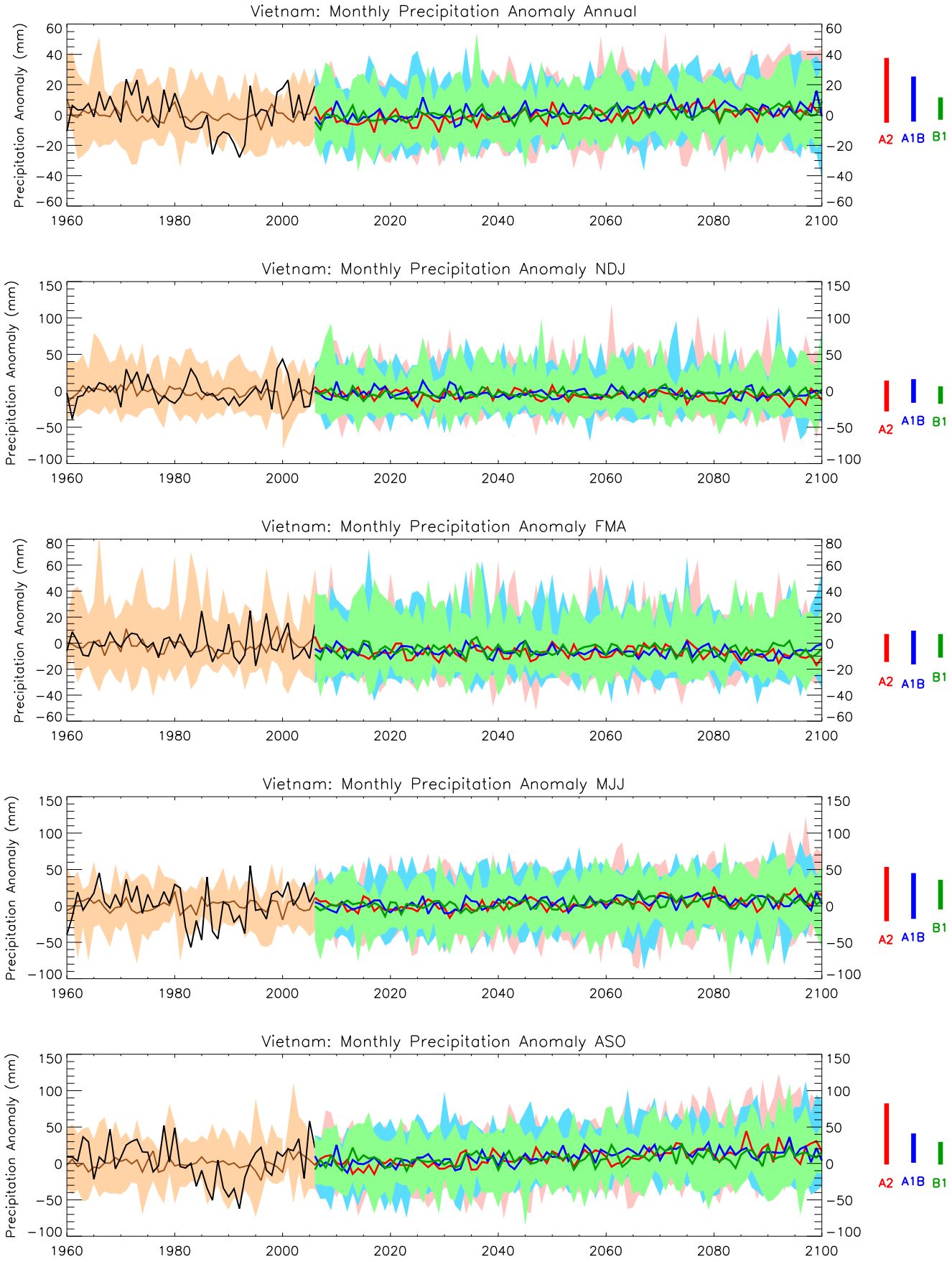


Figure 3: Trends in monthly precipitation for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

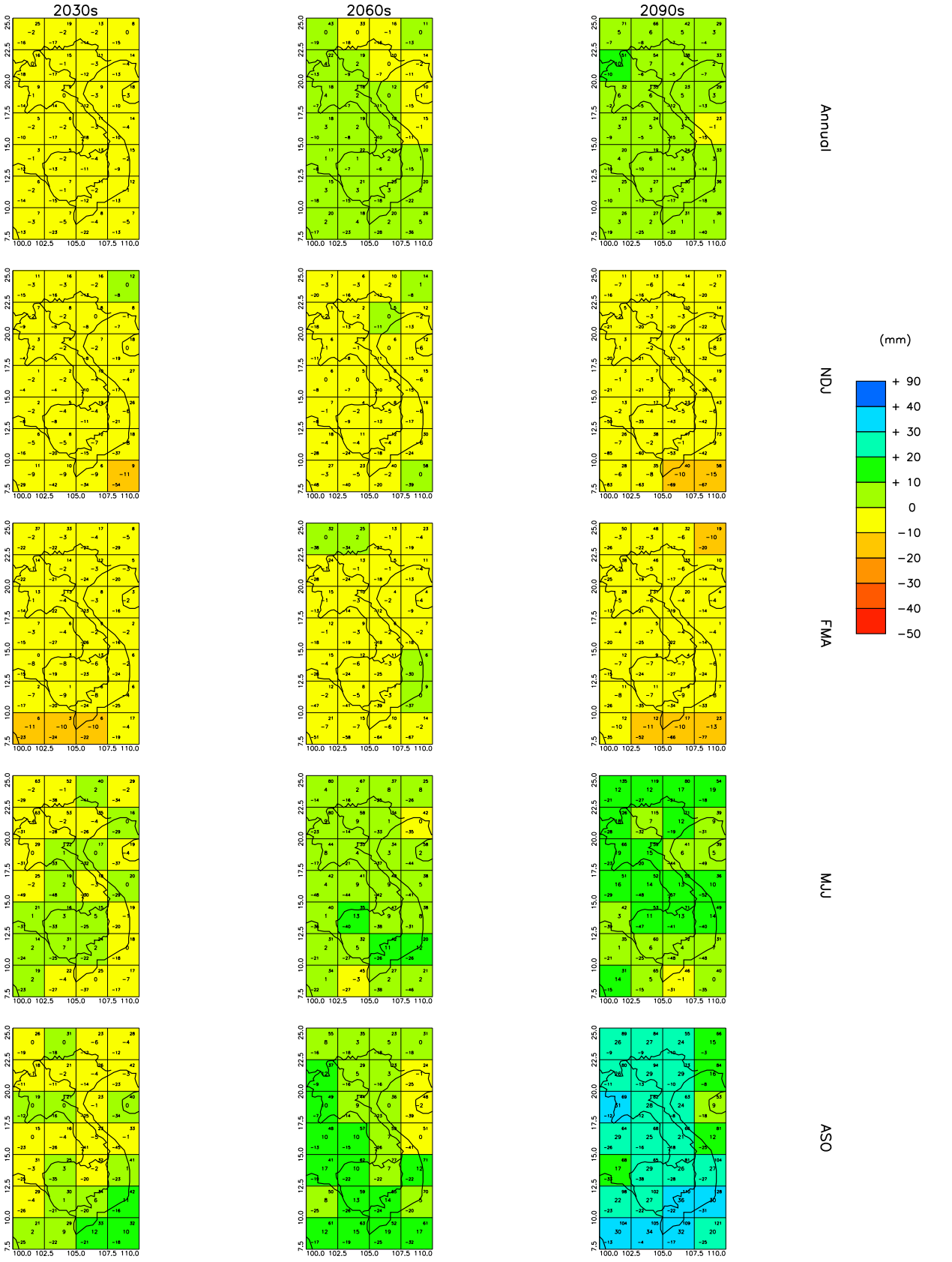


Figure 4: Spatial patterns of projected change in monthly precipitation for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999.See Figure 2 for details.

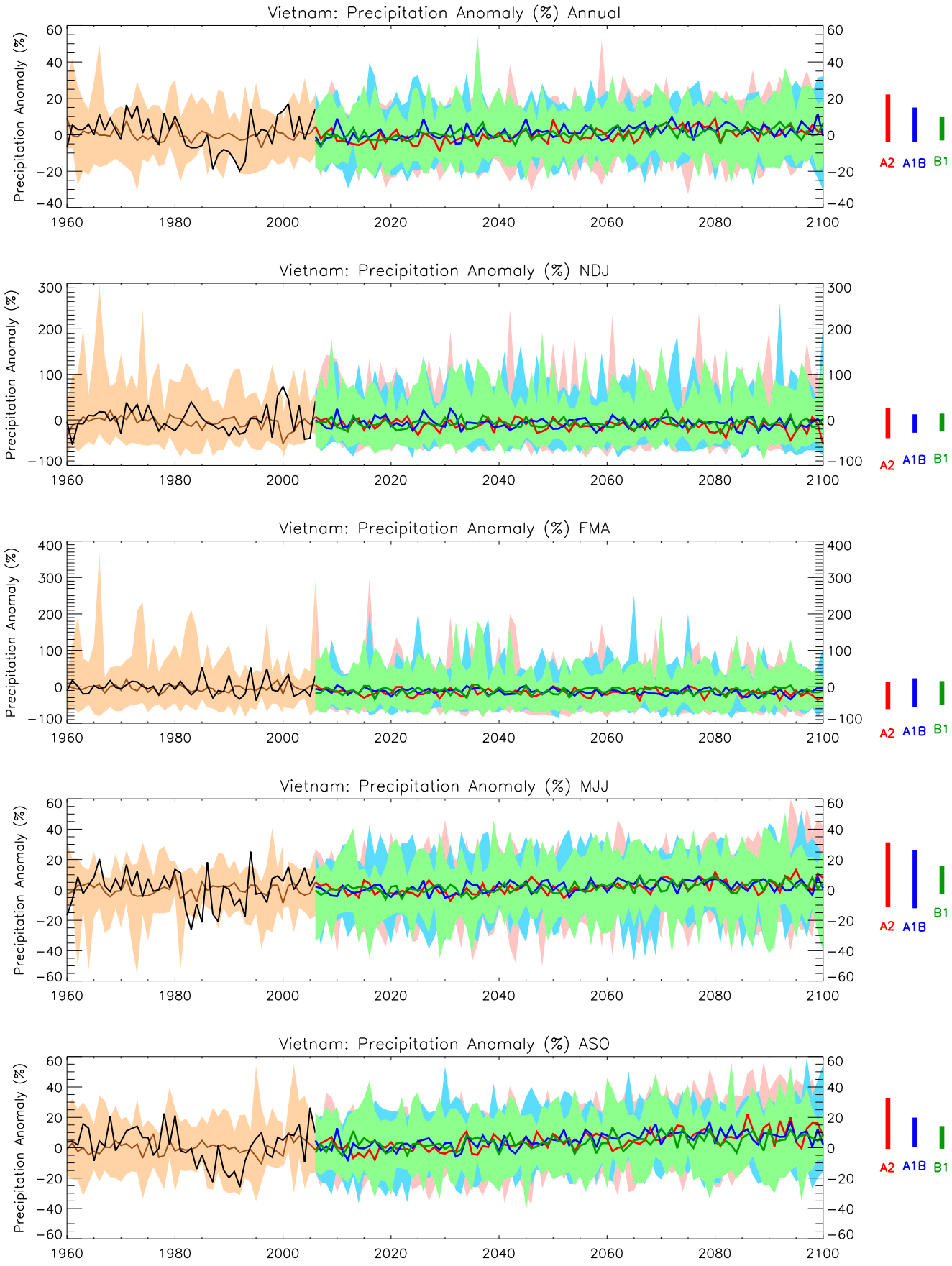


Figure 5: Trends in monthly precipitation for the recent past and projected future. All values shown are percentage anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

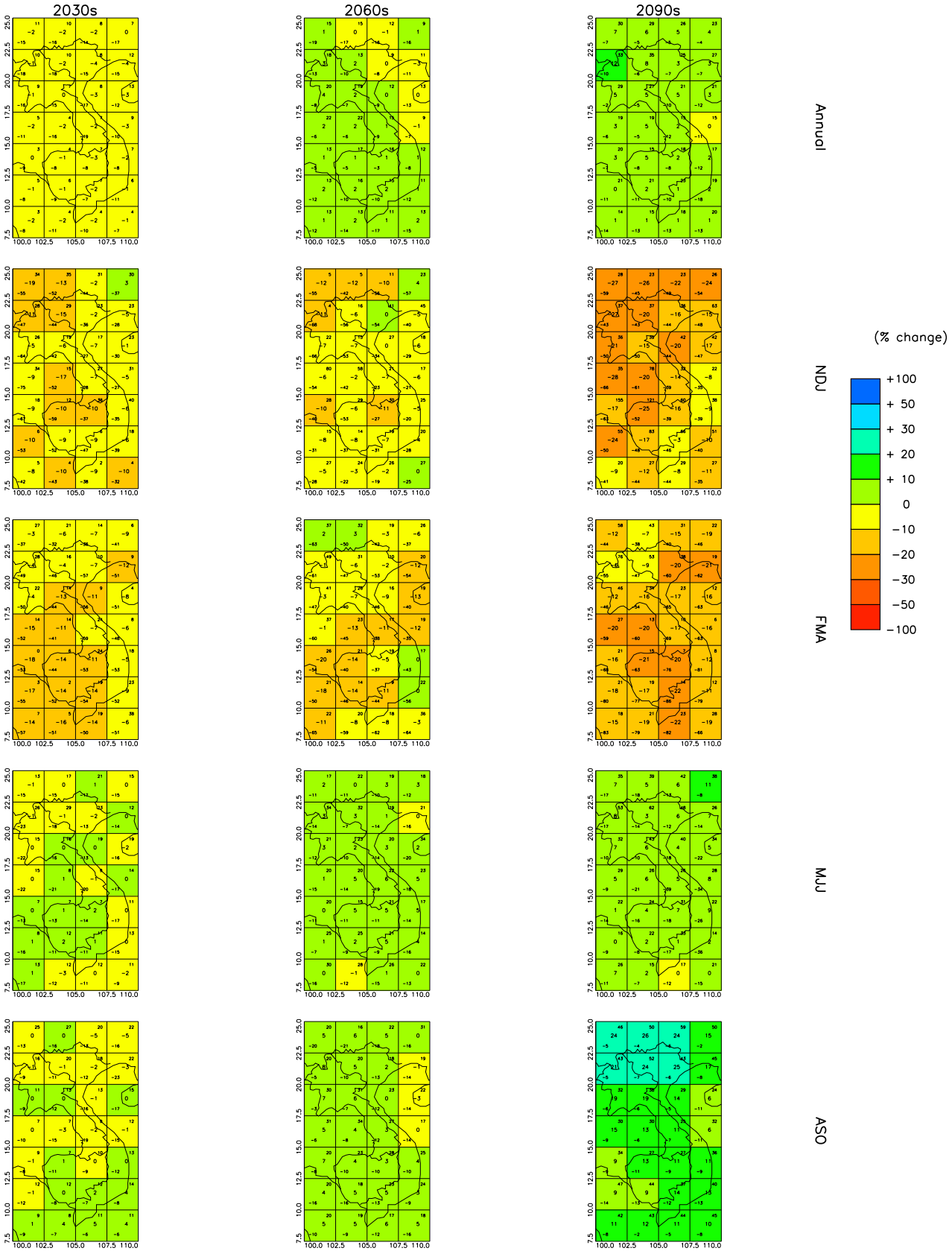


Figure 6: Spatial patterns of projected change in monthly precipitation for 10-year periods in the future under the SRES A2 scenario. All values are percentage anomalies relative to the mean climate of 1970-1999.See Figure 2 for details.

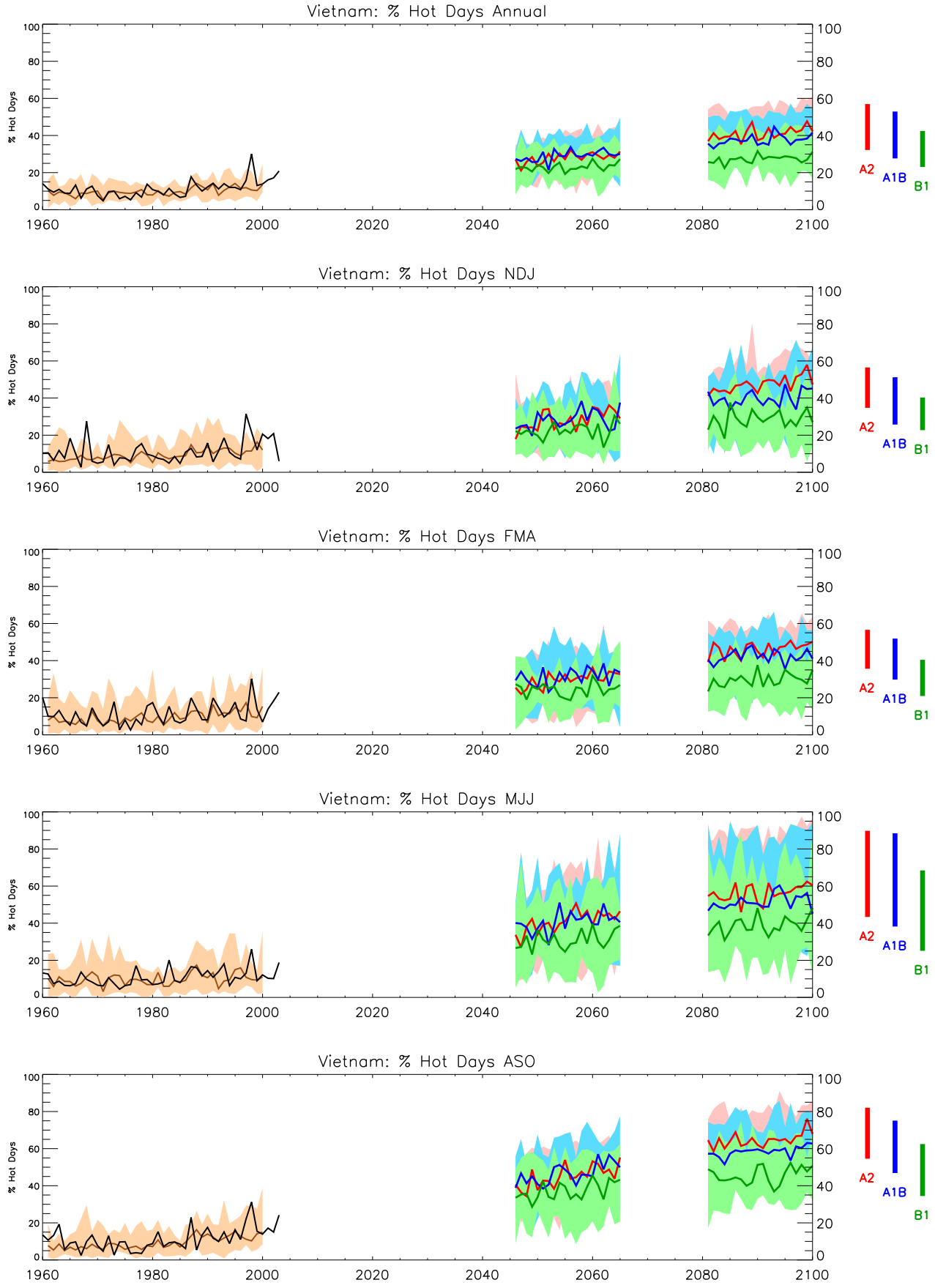


Figure 7: Trends in Hot-day frequency for the recent past and projected future. See Figure 1 for details.

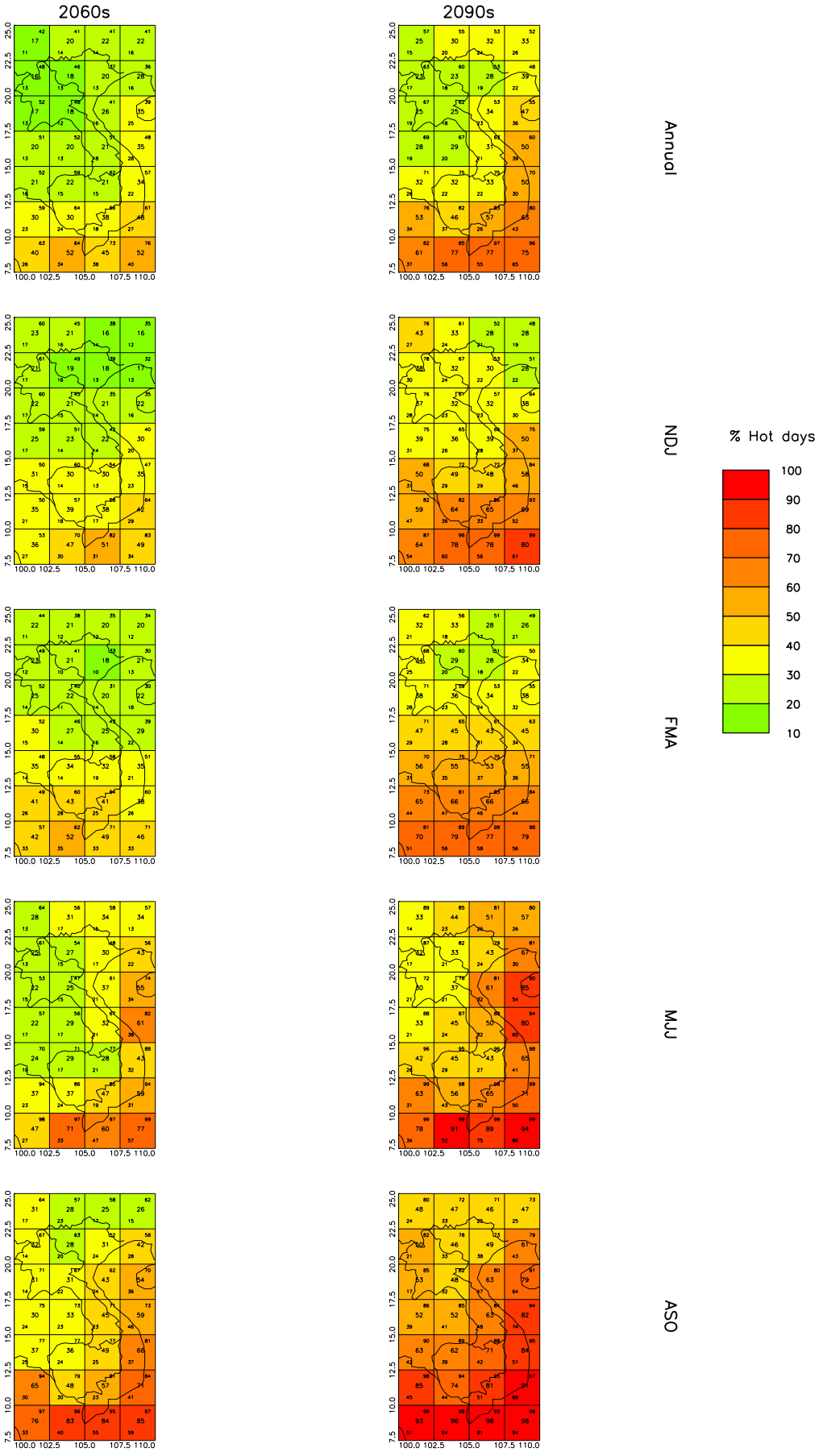


Figure 8: Spatial patterns of projected change in Hot-day frequency for 10-year periods in the future under the SRES A2 scenario. See Figure 2 for details.

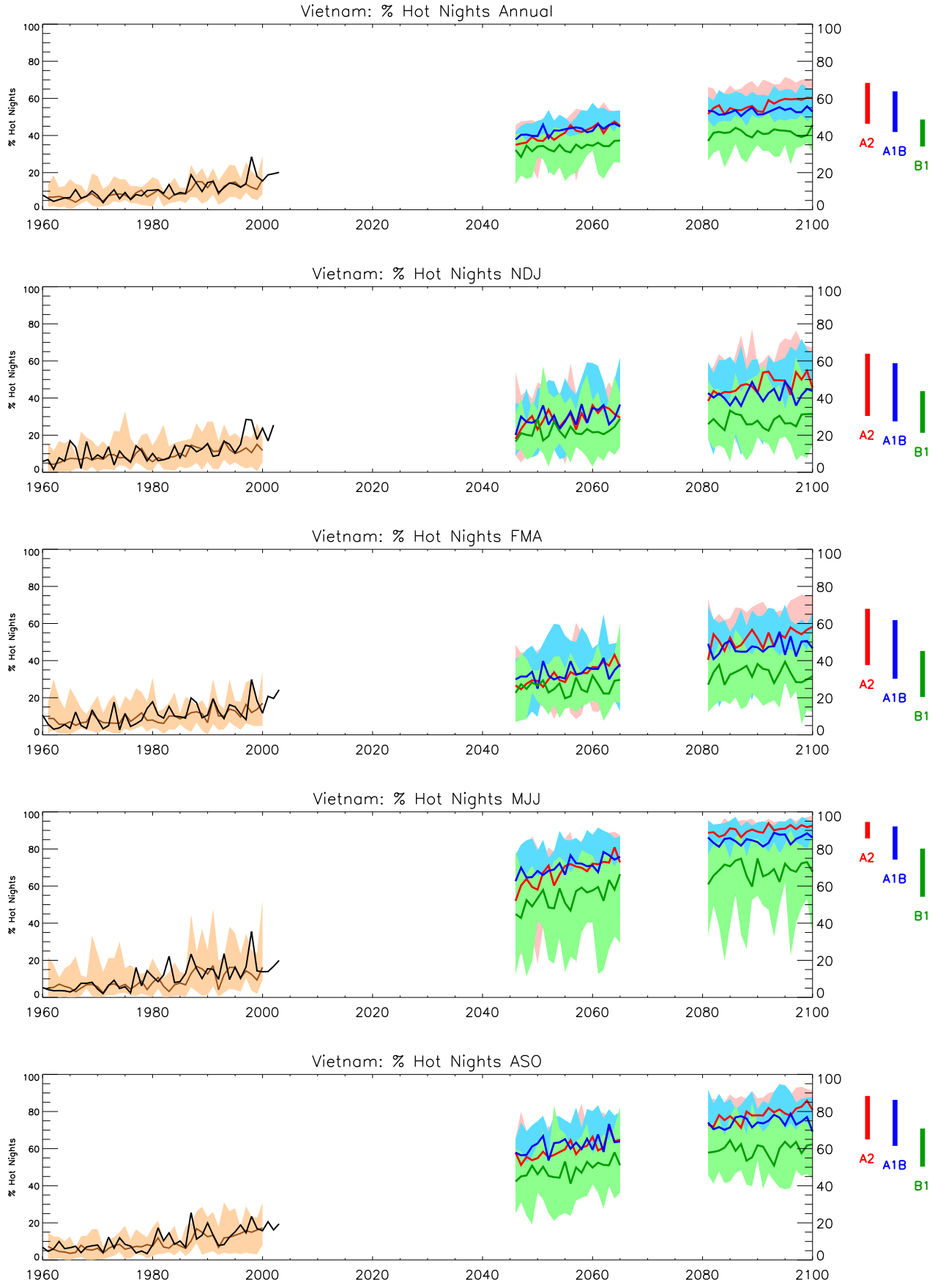


Figure 9: Trends in hot-night frequency for the recent past and projected future. See Figure 1 for details.

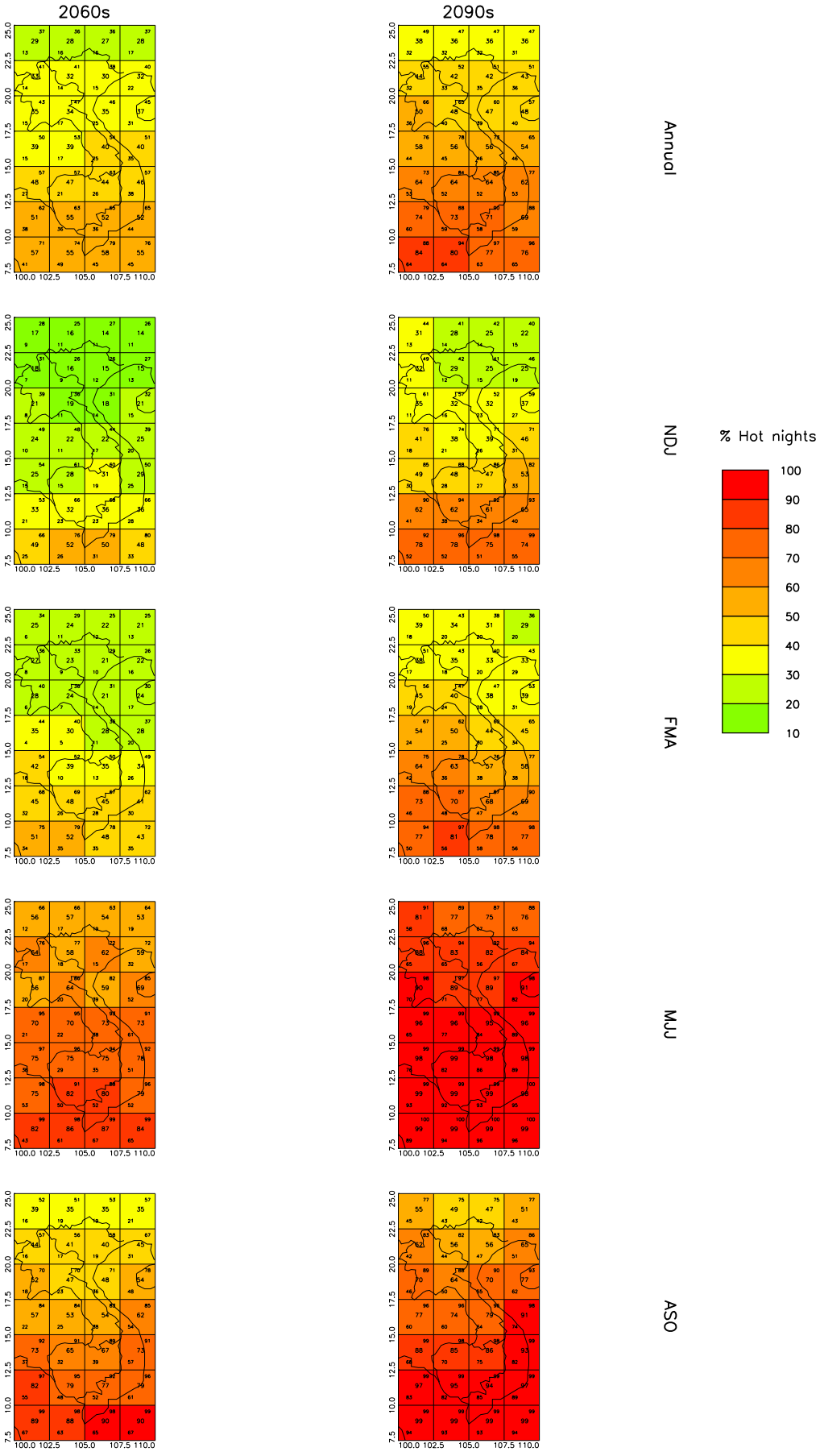


Figure 10: Spatial patterns of projected change in hot-night frequency for 10-year periods in the future under the SRES A2 scenario. See Figure 2 for details.

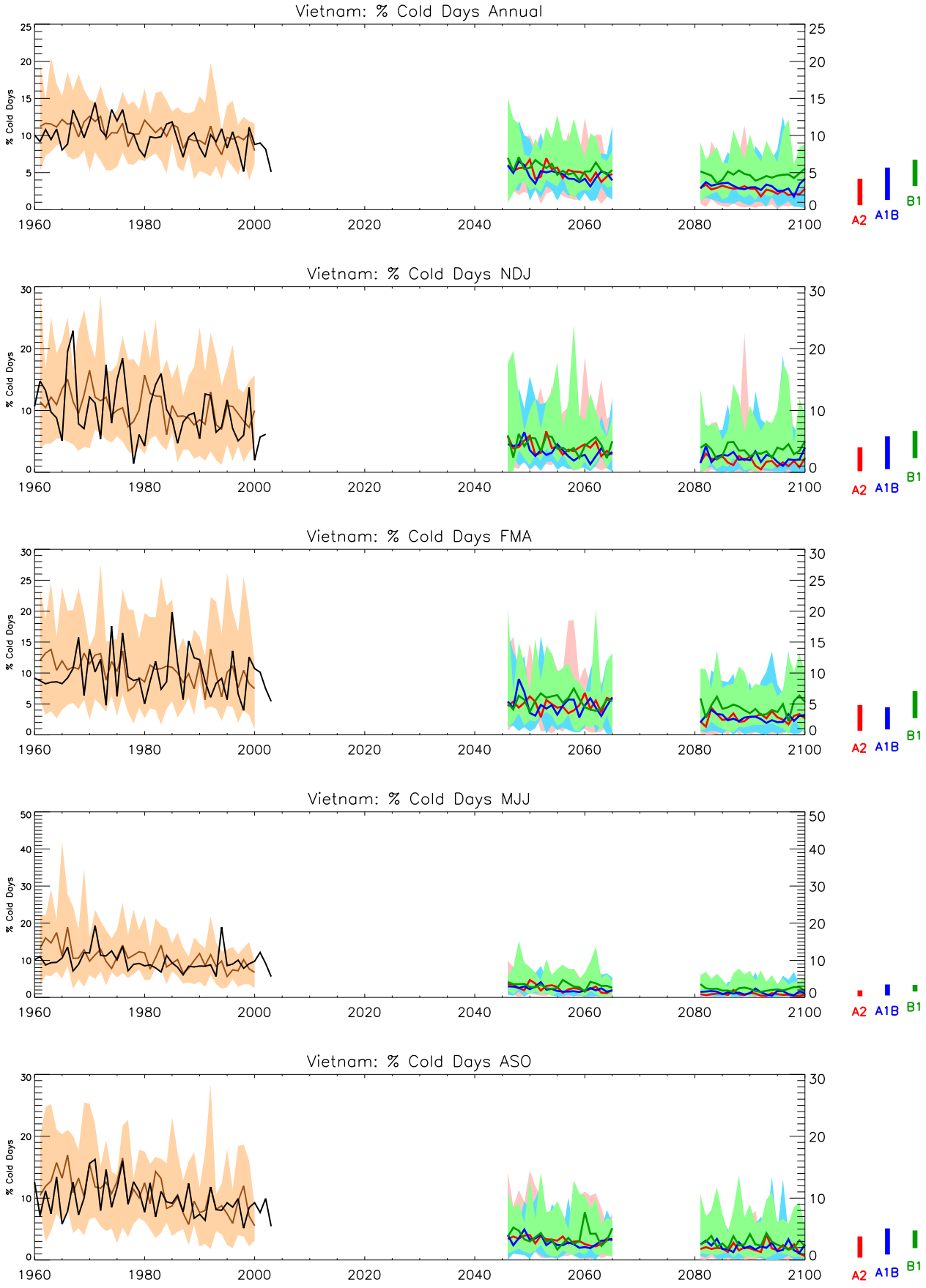


Figure 11: Trends in cold-day frequency for the recent past and projected future. See Figure 1 for details.

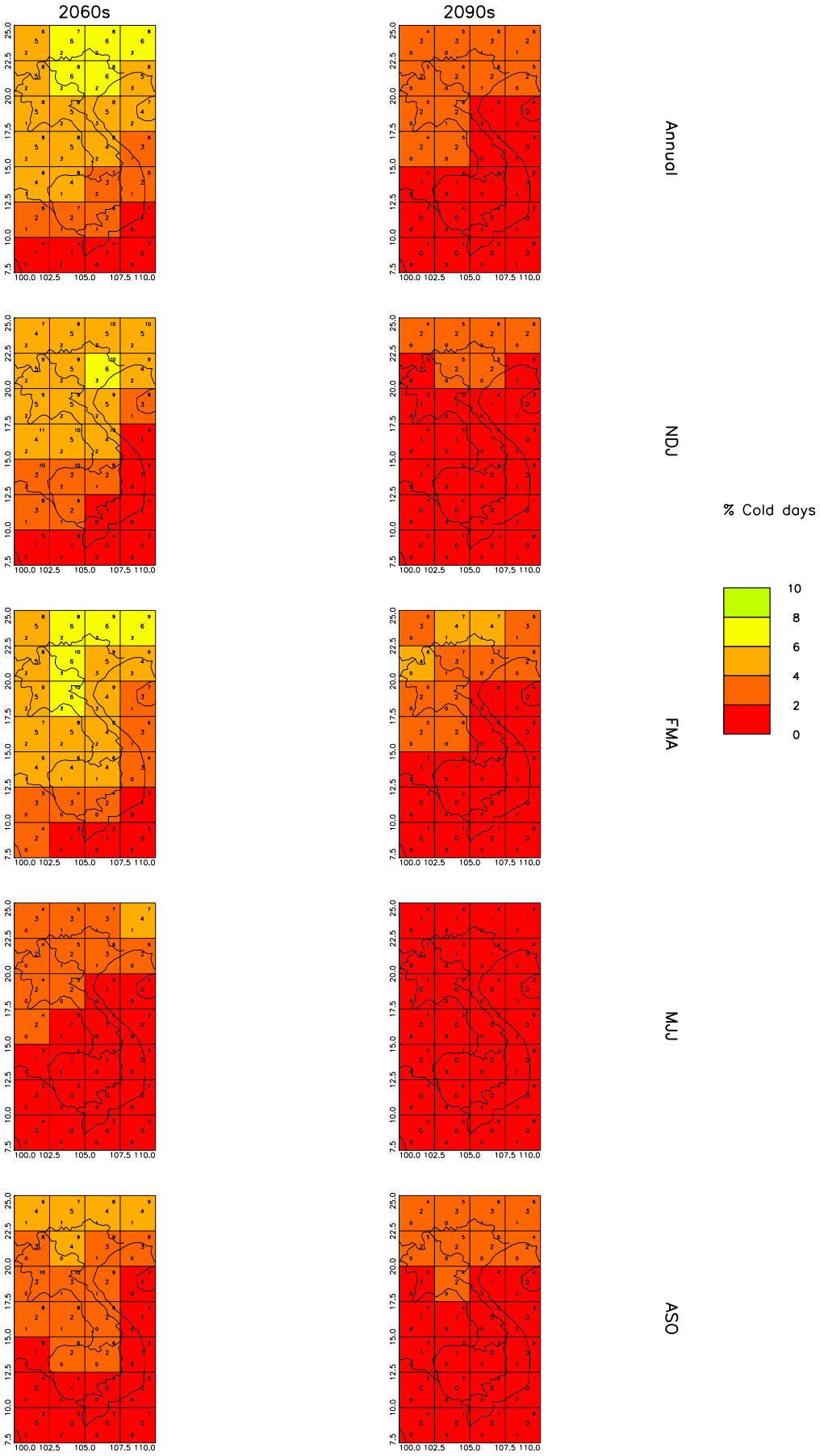


Figure 12: Spatial patterns of projected change in cold-day frequency for 10-year periods in the future under the SRES A2 scenario. See Figure 2 for details.

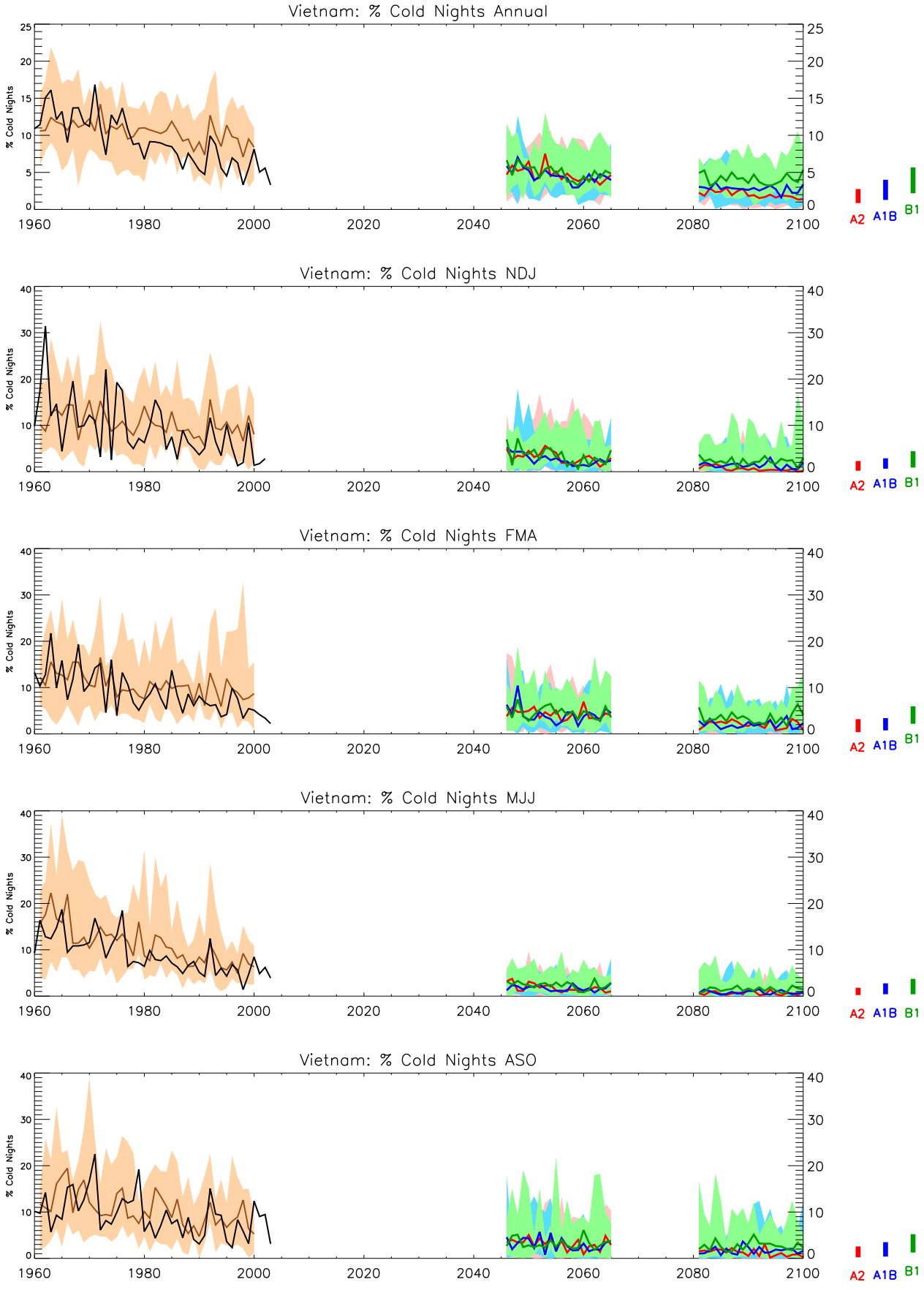


Figure 13: Trends in cold-night frequency for the recent past and projected future. See Figure 1 for details.

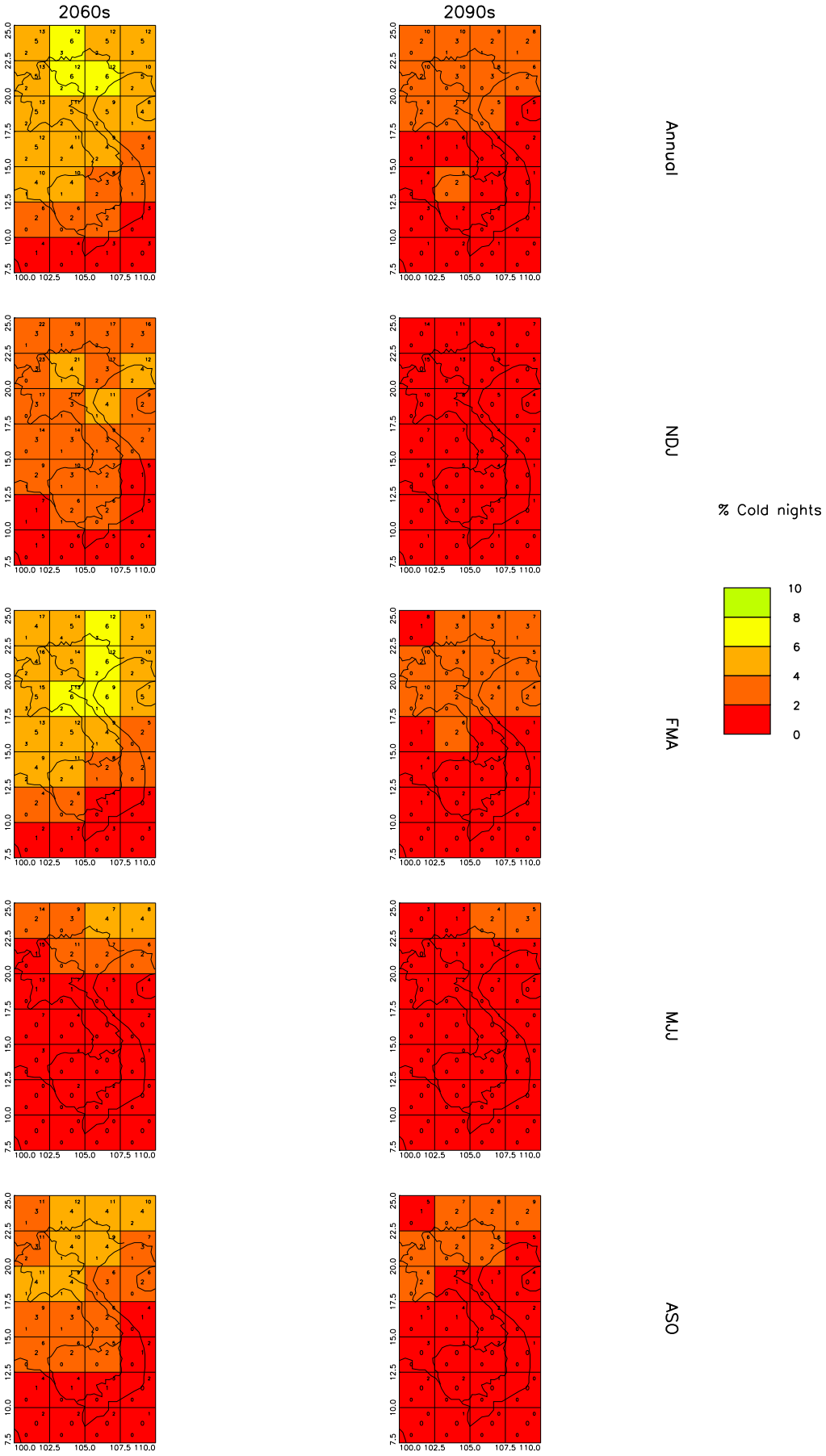


Figure 14: Spatial patterns of projected change in cold-night frequency for 10-year periods in the future under the SRES A2 scenario. See Figure 2 for details.

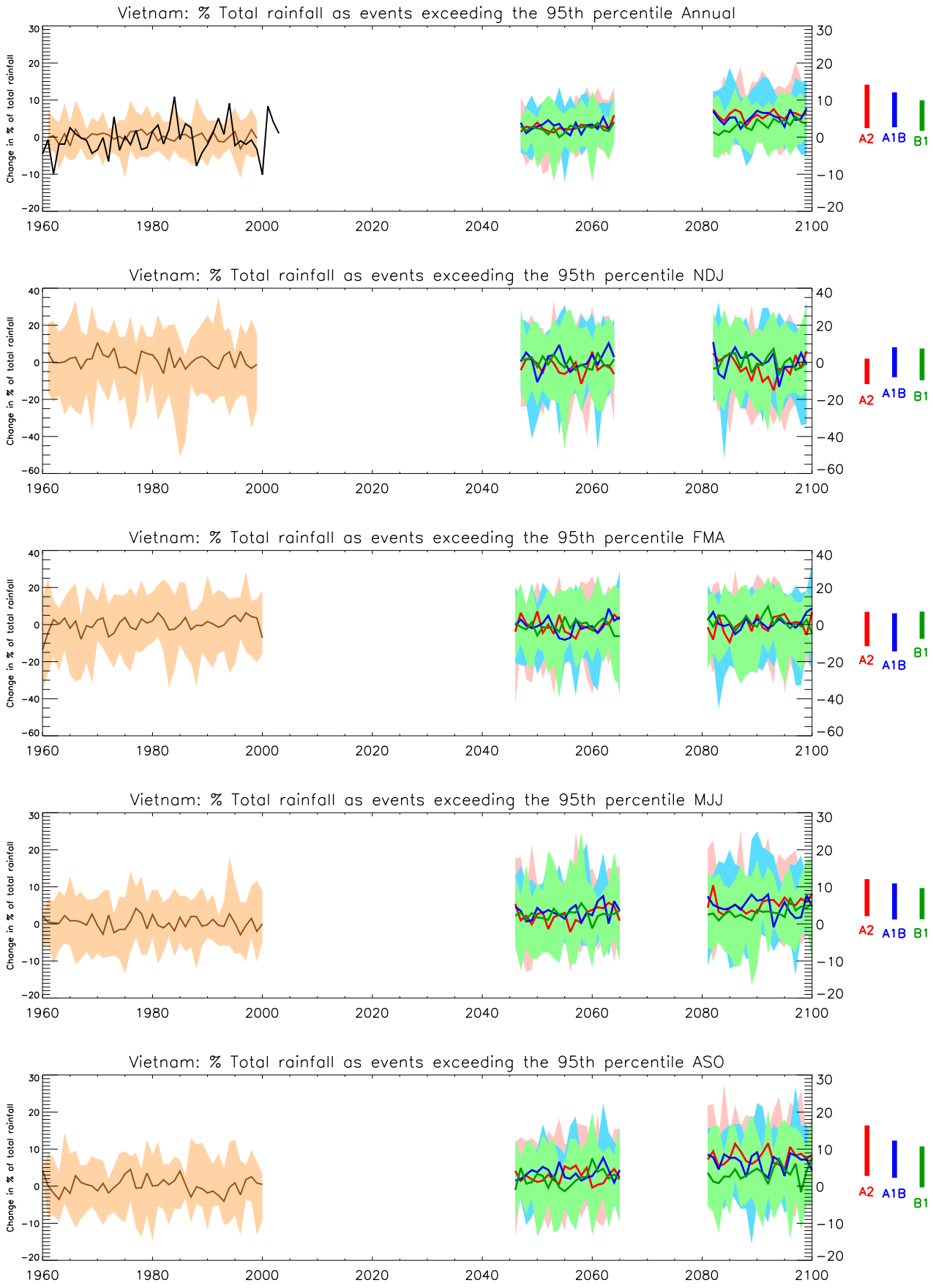


Figure 15: Trends in the proportion of precipitation falling in 'heavy' events for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

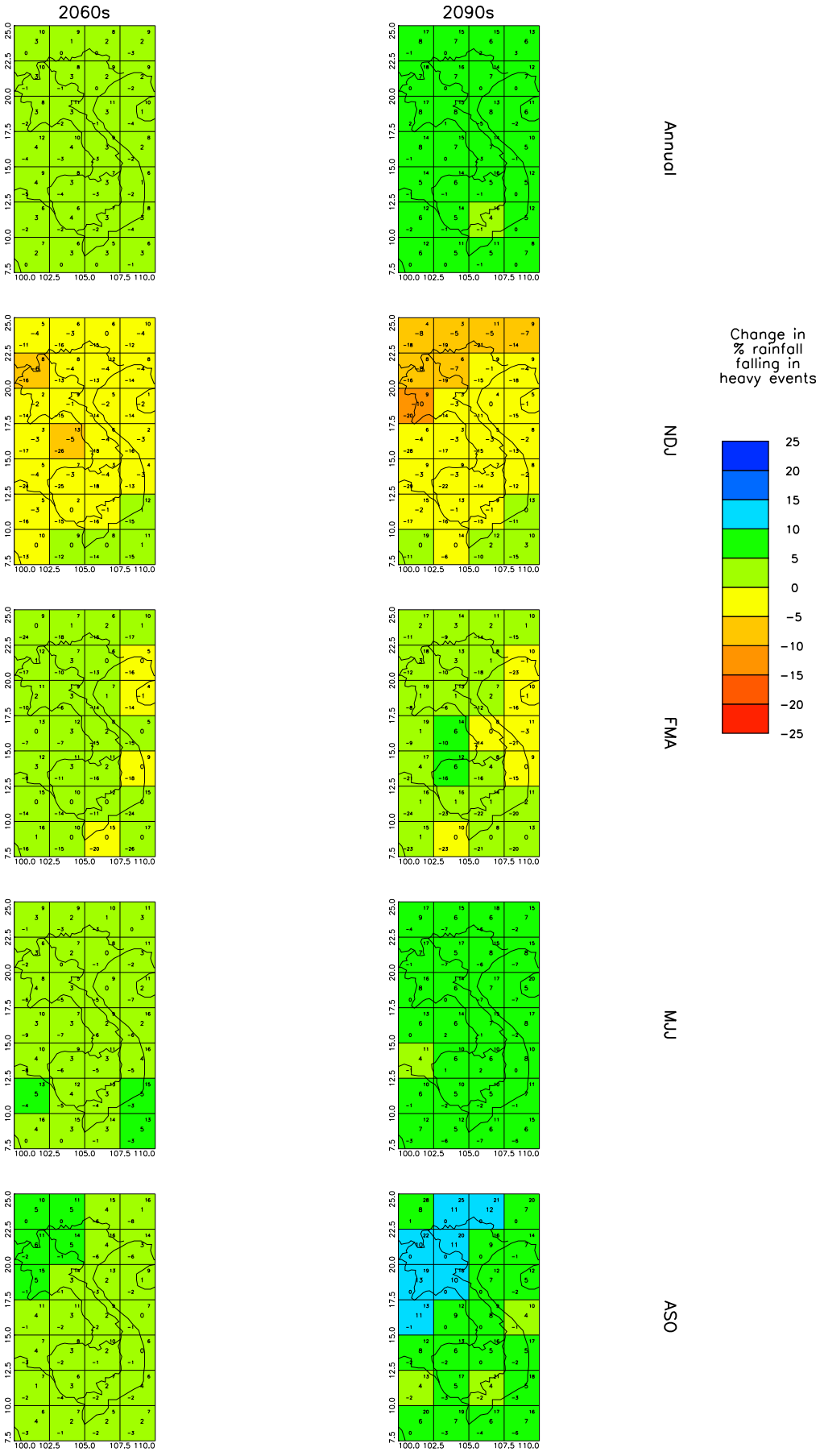


Figure 16: Spatial patterns of projected change in the proportion of precipitation falling in 'heavy' events for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. See Figure 2 for details.

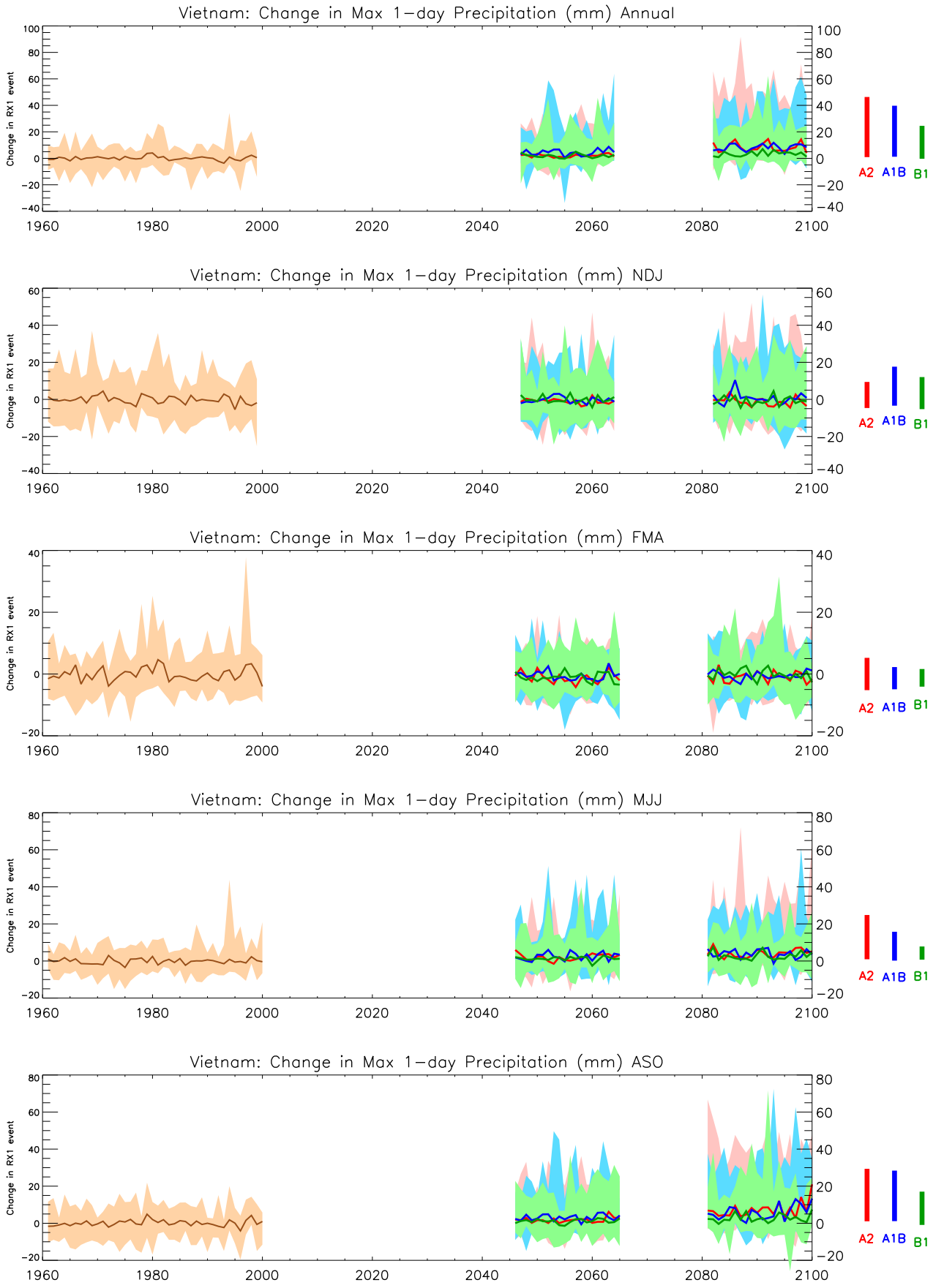


Figure 17: Trends in maximum 1-day rainfall for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

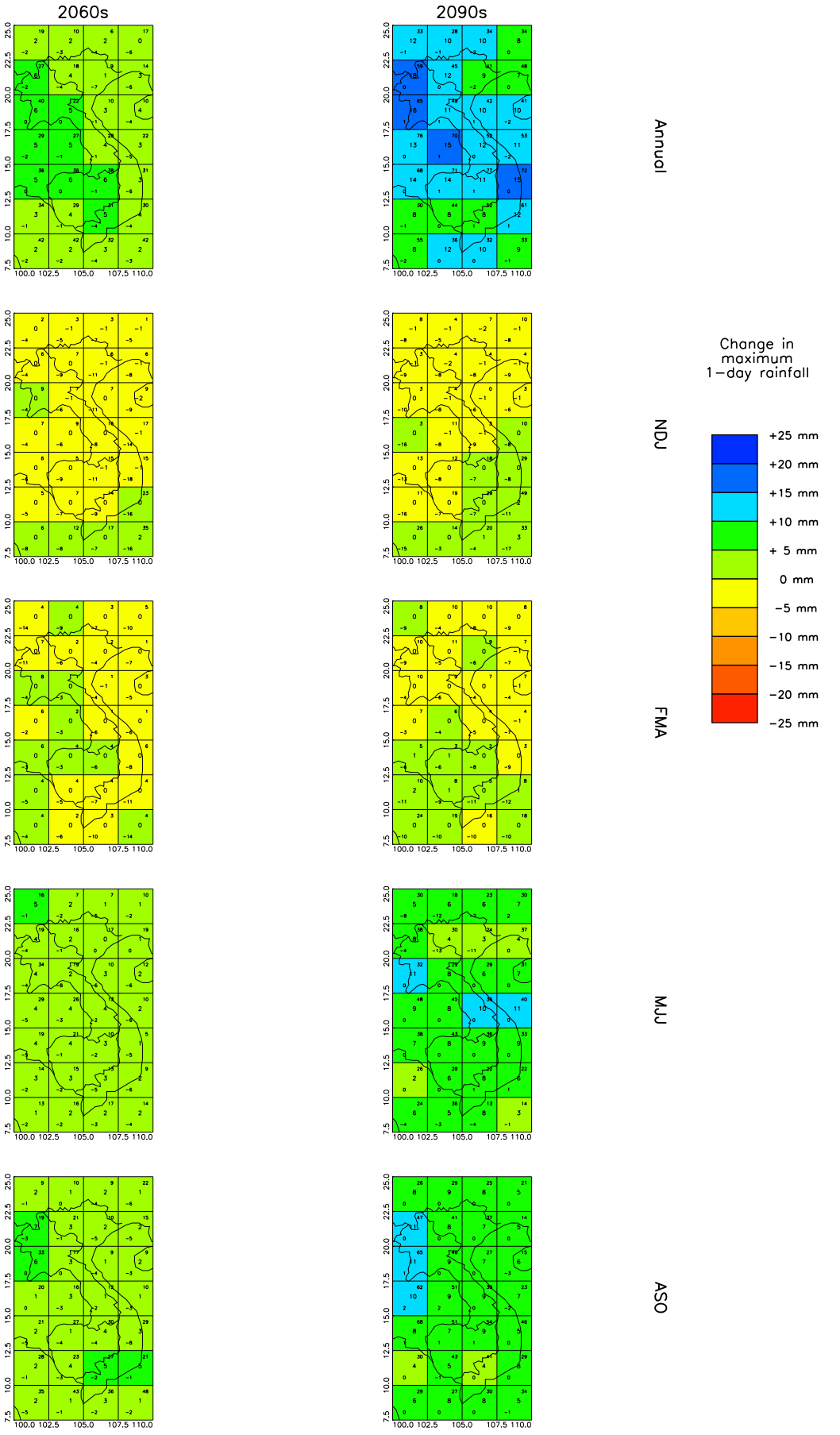


Figure 18: Spatial patterns of maximum 1-day rainfall for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. See Figure 2 for details.

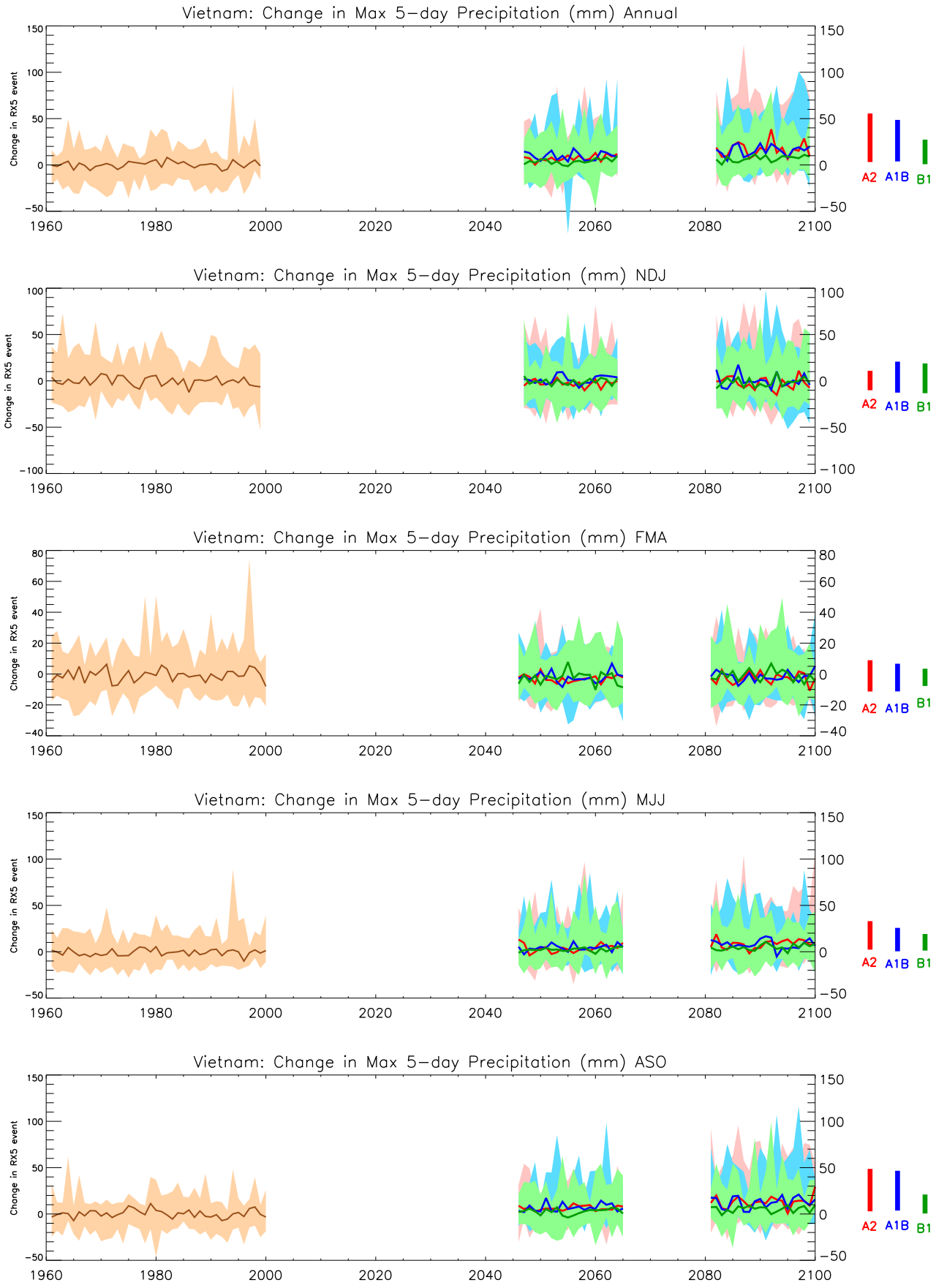


Figure 19: Trends in maximum 5-day rainfall for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. See Figure 1 for details.

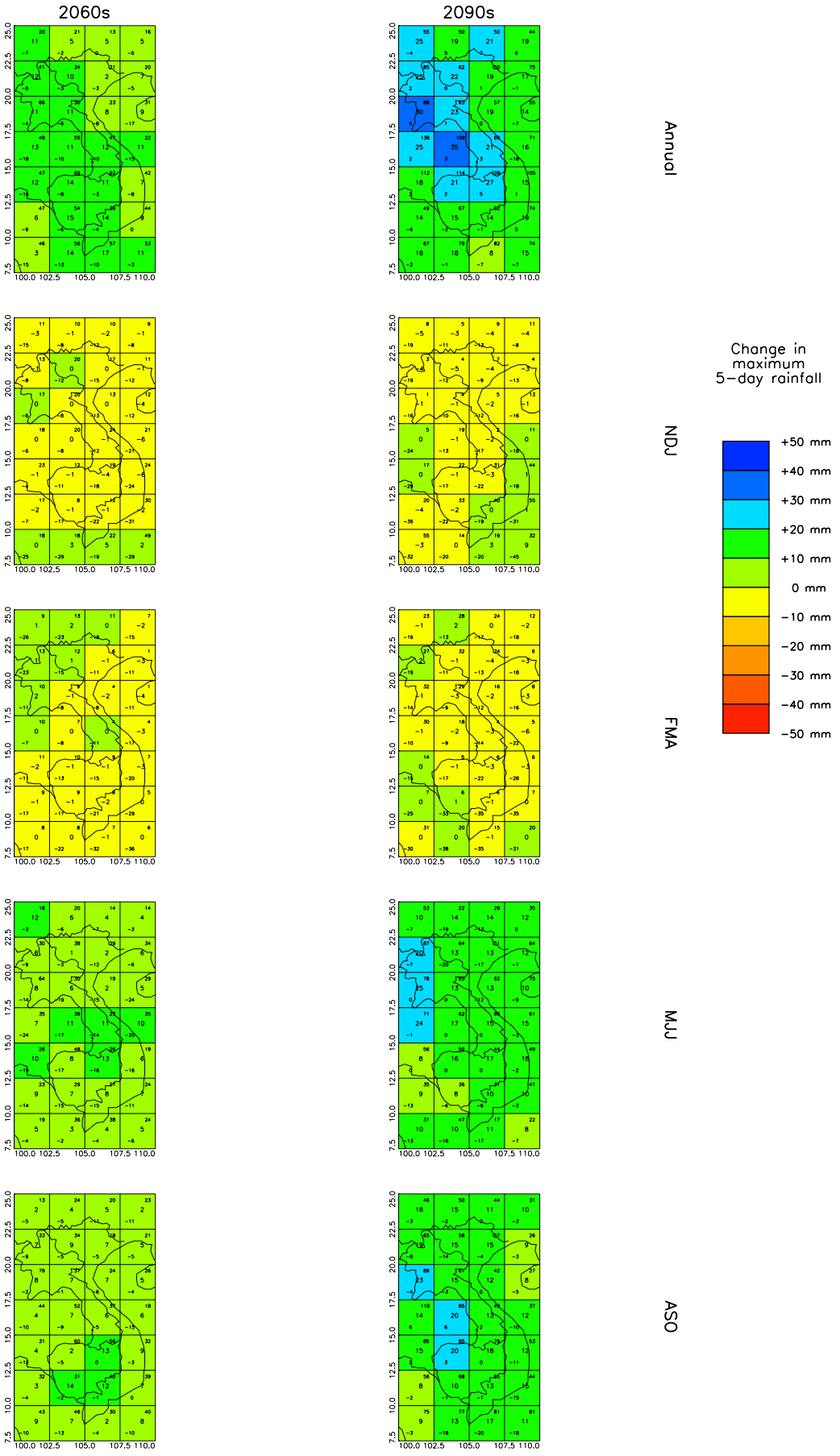


Figure 20: Spatial patterns of projected change in maximum 5-day rainfall for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. See Figure 2 for details.