

# **Assessing Future Precipitation Patterns, Extremes, and Variability in Major Nile Basin Cities: An Ensemble Approach with CORDEX CORE Regional Climate Models**

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Table S1. The location of each station and their attributes in the NRB

Station	Country	Area (km <sup>2</sup> )	Population (million)	Koppen Classification	Lat.	Lon.
Addis Ababa	Ethiopia	527	5.5	Subtropical highland climate (Cwb)	8.98°	38.76°
Asmara	Somalia	45	1.1	Semi-arid cool climate (BSk)	15.32°	38.93°
Cairo	Egypt	3085	22.2	Hot desert climate (BWh)	30.04°	31.24°
Dodoma	Tanzania	418	0.32	Subtropical steppe (BSh)	-6.16°	35.75°
Gitega	Burundi	22	0.02	Temperate highland tropical climate (Cwb)	-3.43°	29.92°
Juba	South Sudan	52	0.46	Tropical wet and dry/ savanna climate (Aw)	4.86°	31.57°
Kampala	Uganda	189	3.8	Tropical rainforest (Af)	0.35°	32.58°
Khartoum	Sudan	22142	6.3	Hot desert climate (BWh)	15.5°	32.56°
Kigali	Rwanda	730	1.25	Tropical climate (Aw)	-1.94°	30.06°
Kinshasa	DR Congo	9965	16.32		-4.3°	15.31°
Nairobi	Kenya	696.1	4.4	Subtropical highland (Cfb)	-1.29°	36.82°

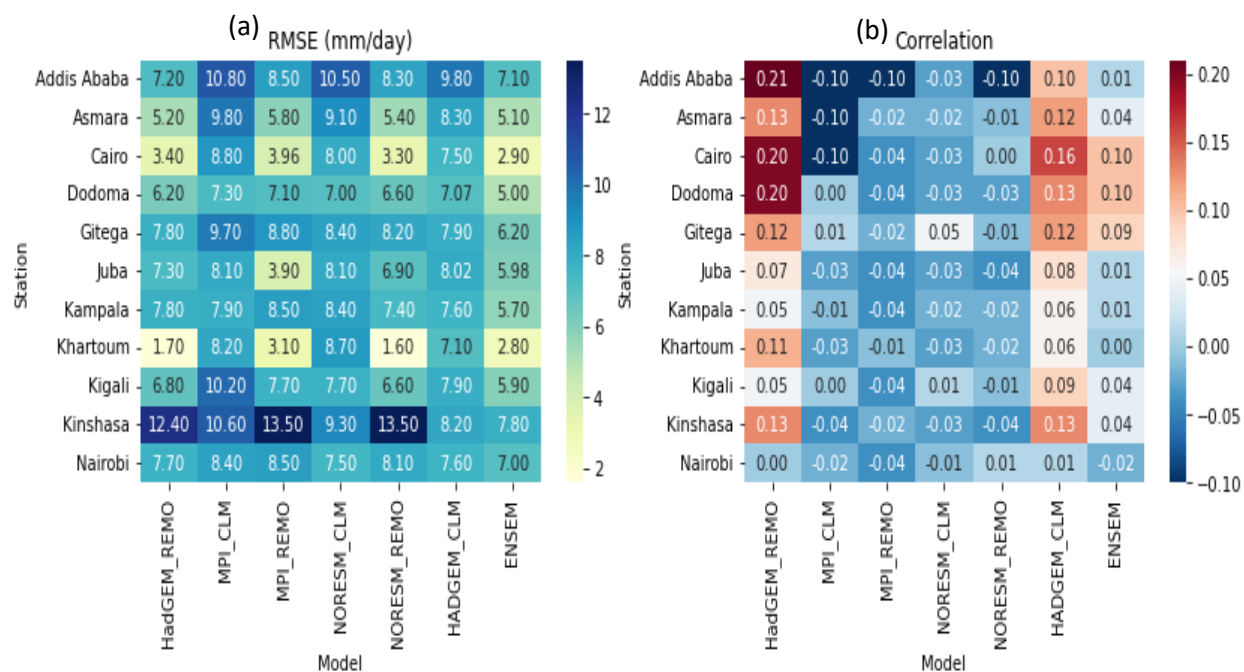


Figure S1. (a) The Root mean square error (RMSE), and (b) The correlation coefficient for the six models and ENSEM before bias correction

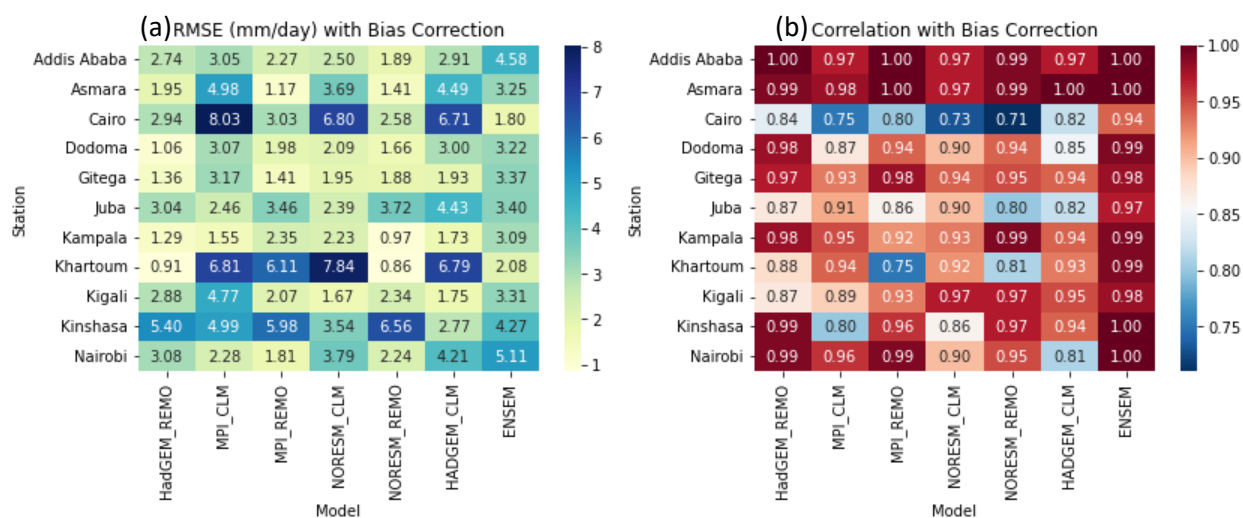


Figure S2. (a) The Root mean square error (RMSE), and (b) The correlation coefficient for the six models and ENSEM after bias correction

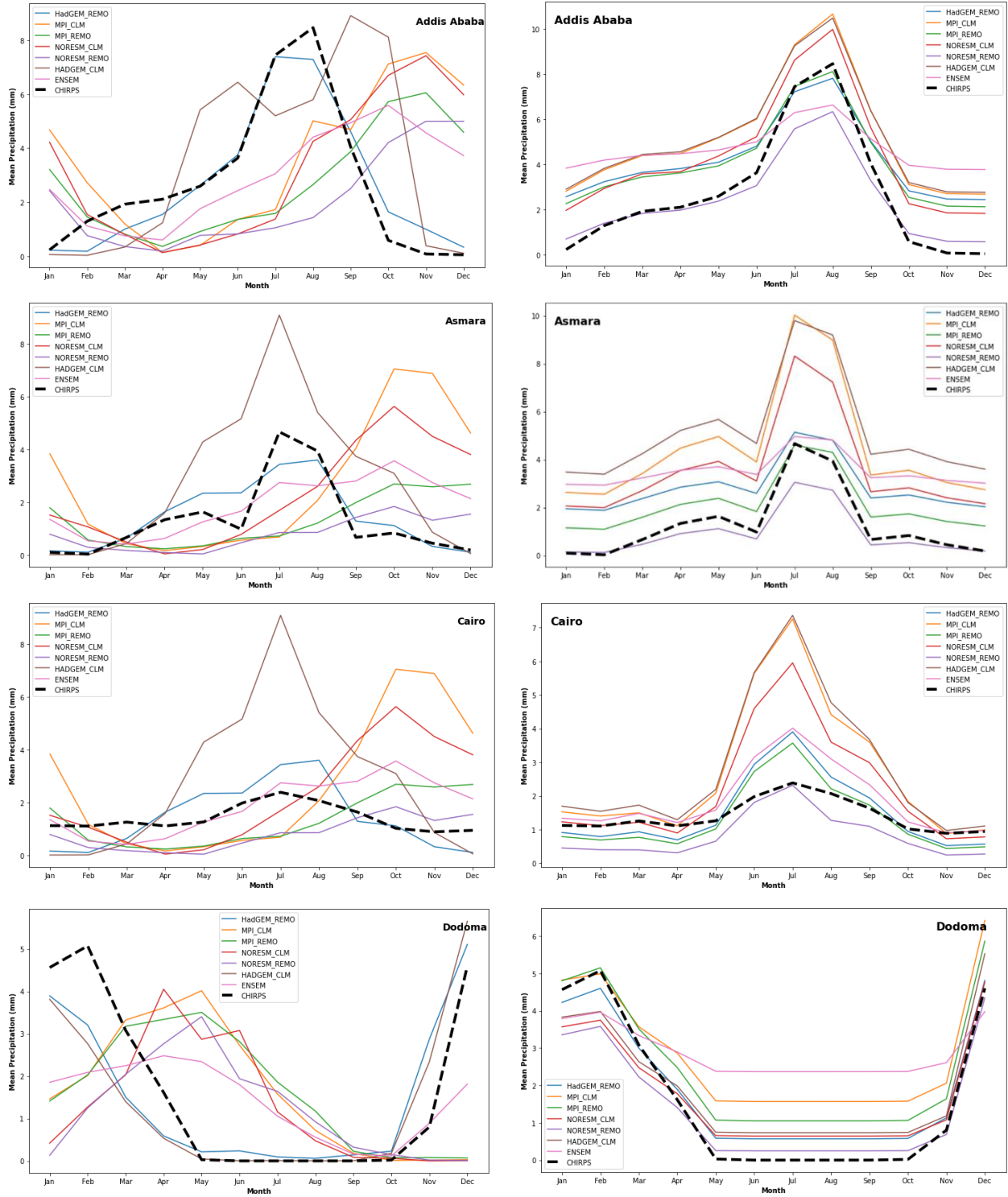


Figure S3. The seasonal variation of precipitation for stations (Addis Ababa, Asmara, Cairo, and Dodoma), before BC (left) and after BC (right).

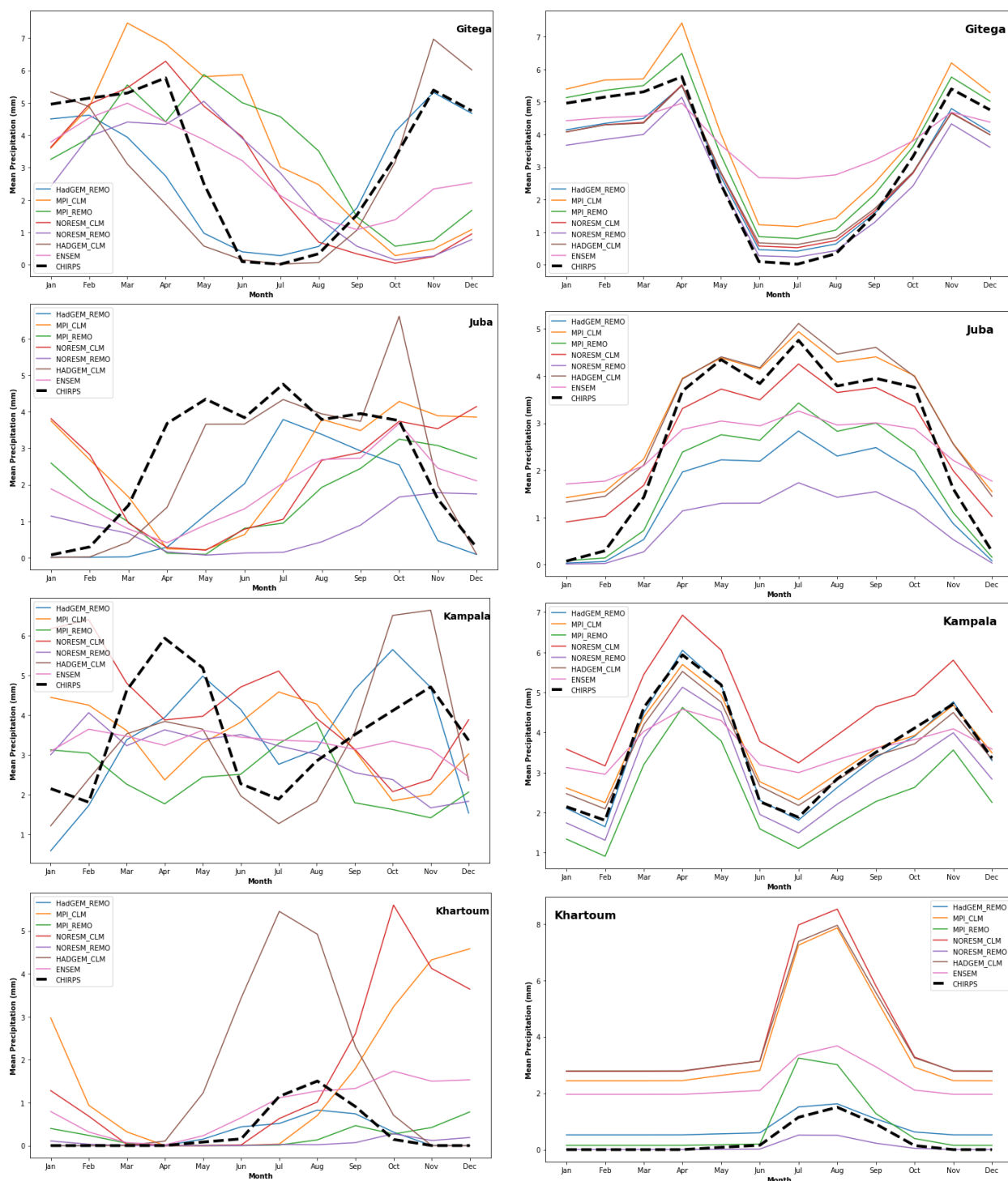


Figure S4. as S3 but for stations (Gitega, Juba, Kampala, and Khartoum), before BC (left) and after BC (right).

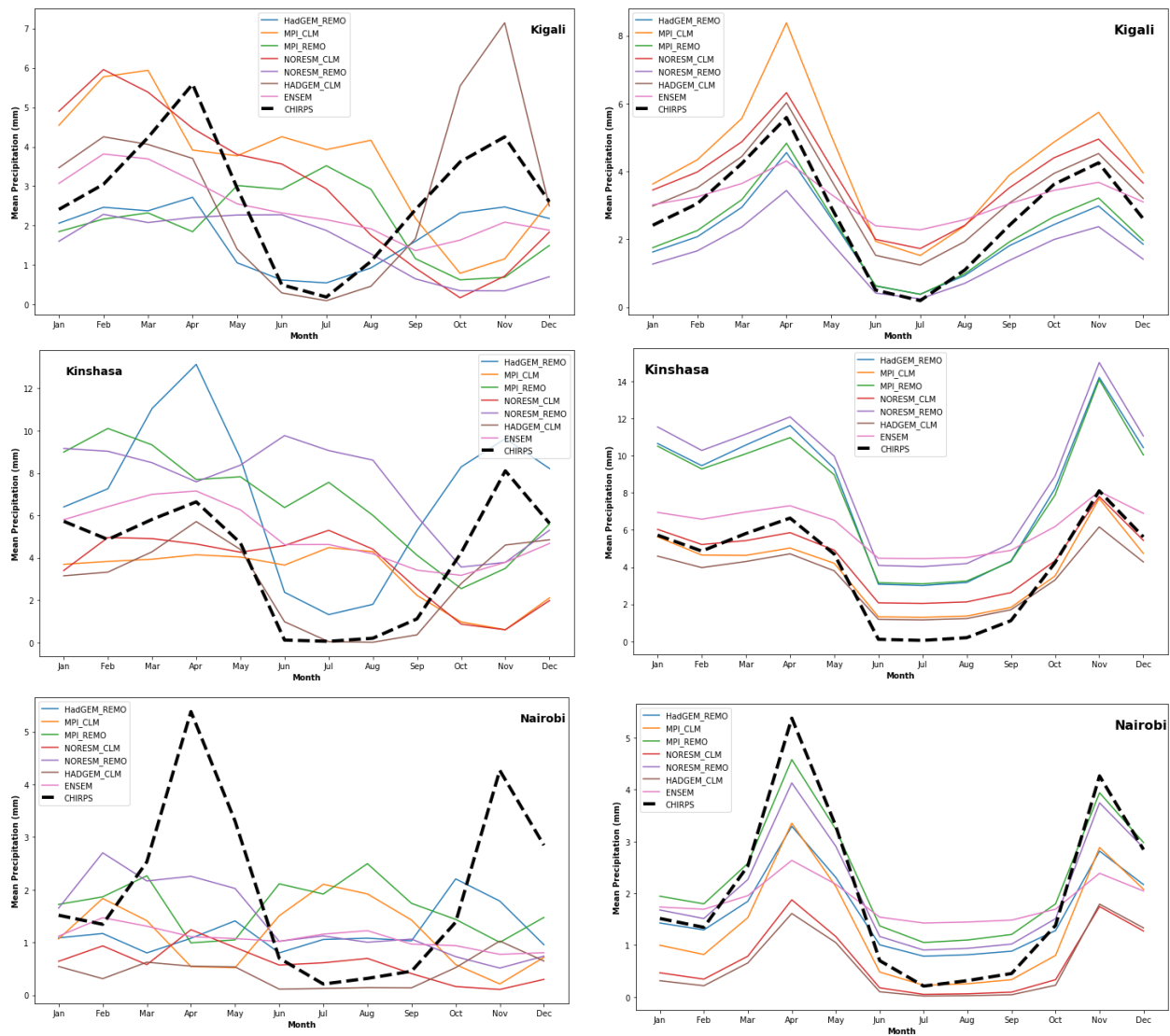


Figure S5. as S3 but for stations (Kigali, Kinshasa, and Nairobi), before BC (left) and after BC (right).

Table S2. The relative change in precipitation for the first period (2041-2060) and the second period (2081-2100) under RCP2.6 and RCP8.5 scenarios

Station	2041-2060		2081-2100	
	RCP2.6	RCP8.5	RCP2.6	RCP8.5
Addis Ababa	8.36*	9.97*	8.26*	15.23*
Asmara	14.53*	11.48*	4.68	3.21
Cairo	-92.12*	-91.85*	-91.63*	-93.11*
Dodoma	-6.88*	0.57	3.99	14.68*
Gitega	1.25	1.32	4.98*	9.01*
Juba	0.29	4.81*	6.64*	2.42
Kampala	0.39	1.17	7.93*	2.36
Khartoum	26.35*	49.08*	17.09*	-6.70
Kigali	13.59*	13.66*	15.06*	27.93*
Kinshasa	-11.17*	-16.36*	-13.30*	-38.93*
Nairobi	4.39*	8.14*	11.31*	79.80



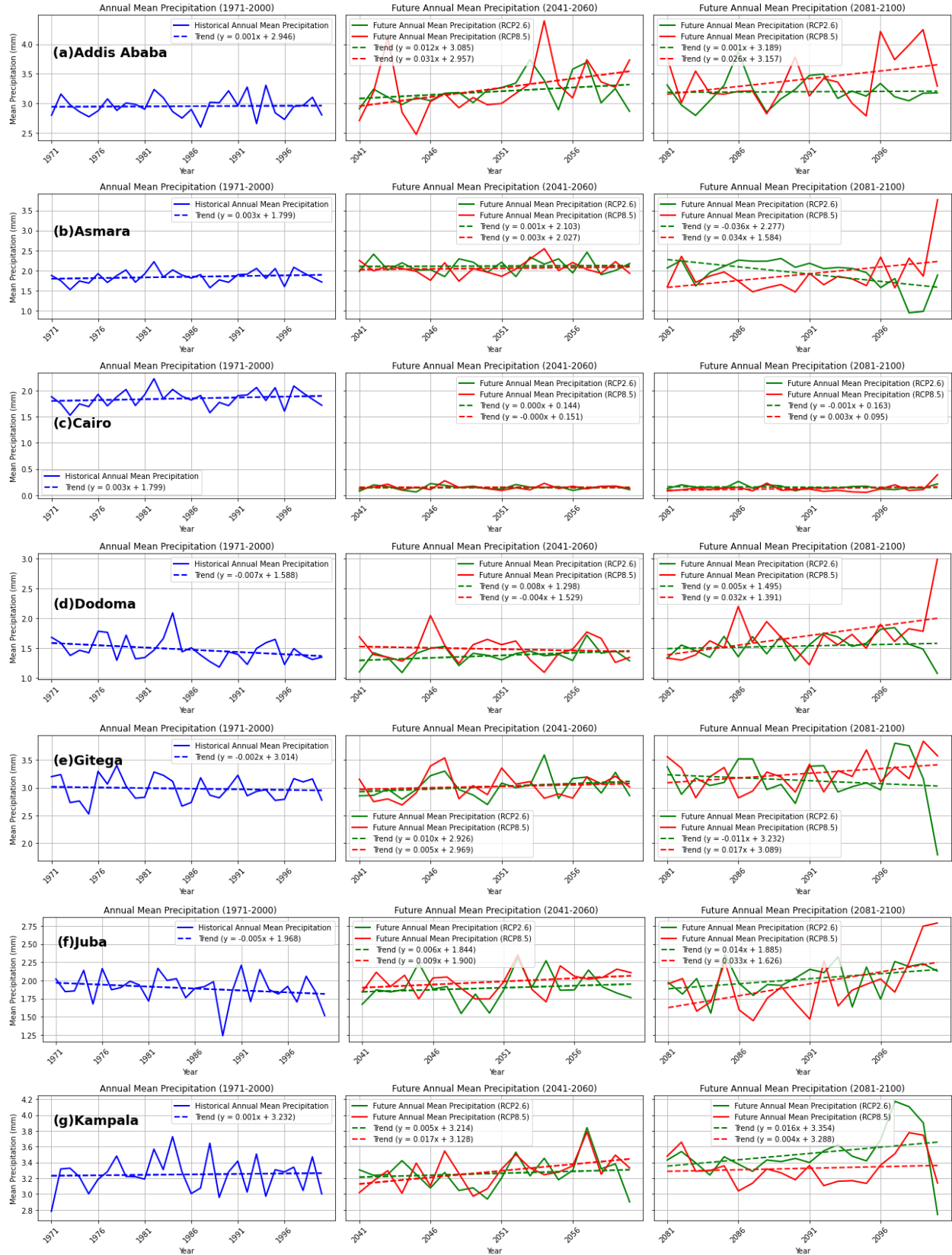


Figure S6, Time-series plot of precipitation for (a) Addis Ababa, (b) Asmara, (c) Cairo, (d) Dodoma, (e) Gitega, (f) Juba, and (g) Kampala

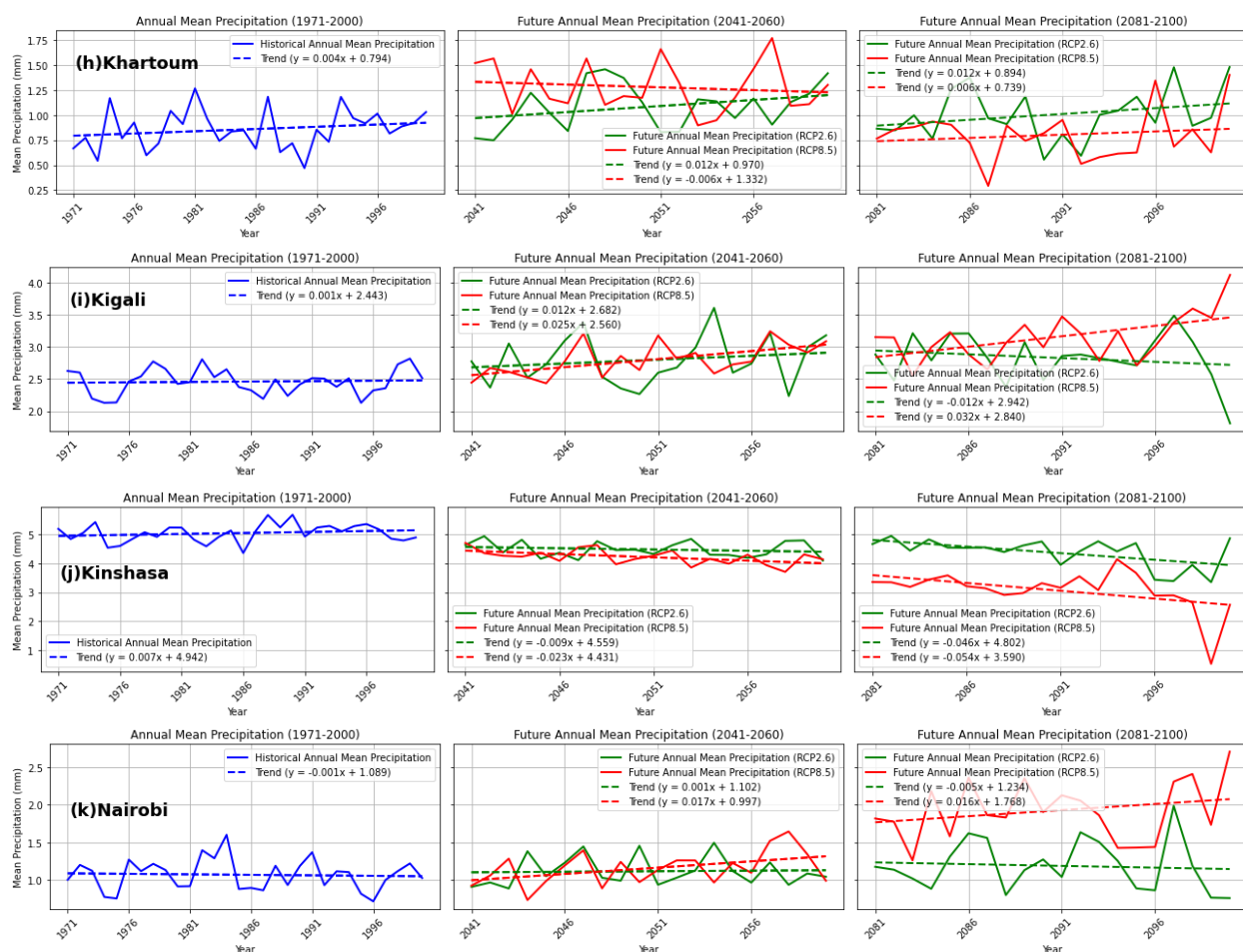


Figure S7, Time-series plot of precipitation for (h) Khartoum, (i) Kigali, (j) Kinshasa, and (k) Nairobi

Table S3. The relative change in RX1Day and RX5Day for each station under RCP2.6 and RCP8.5 scenarios for mid-future (2041-2060) and far-future (2081-2100)

Station	RX1Day				RX5Day			
	2041-2060		2081-2100		2041-2060		2081-2100	
	RCP2.6	RCP8.5	RCP2.6	RCP8.5	RCP2.6	RCP8.5	RCP2.6	RCP8.5
<b>Addis Ababa</b>	1.15*	19.52*	66.15*	98.06*	8.18*	9.87*	45.93*	67.46*
<b>Asmara</b>	27.02*	65.76*	24.88	108.65	8.21*	35.45*	47.52	123.54
<b>Cairo</b>	-15.10*	-13.63*	-42.74*	24.84*	-48.65*	-14.11*	-70.22*	-35.97*
<b>Dodoma</b>	-12.19	46.38	17.13	268.05*	-9.29	1.76	34.22	221.17*
<b>Gitega</b>	-8.33	0.27	57.53*	125.82*	28.97	13.26	38.95*	80.42*
<b>Juba</b>	61.65	43.01*	80.54*	167.66	7.95	2.43*	29.72*	131.75
<b>Kampala</b>	33.23	33.87	71.39*	206.21	-1.26	17.22	11.62*	84.79
<b>Khartoum</b>	94.05*	77.02*	55.75*	40.34	44.30*	19.20*	70.05*	84.02
<b>Kigali</b>	56.21*	0.11*	21.59*	90.46*	56.12*	26.86*	33.30*	69.87*
<b>Kinshasa</b>	46.59*	38.98*	59.64*	61.60*	-8.19*	-21.85*	57.81*	19.45*
<b>Nairobi</b>	-4.8	9.98	27.75*	87.53*	-7.52	-17.60	18.51*	53.33*

Note: Positive values indicate an increase in extreme precipitation events, while negative values indicate a decrease. The asterisk (\*) indicates that the change is statistically significant (P-value < 0.05).

Table S4. The relative change in CWD and CDD for each station under RCP2.6 and RCP8.5 scenarios for mid-future (2041-2060) and far-future (2081-2100)

Station	CWD				CDD			
	2041-2060		2081-2100		2041-2060		2081-2100	
	RCP2.6	RCP8.5	RCP2.6	RCP8.5	RCP2.6	RCP8.5	RCP2.6	RCP8.5
<b>Addis Ababa</b>	-41.5*	-41.5*	6.12*	-12.24*	-55.75*	-70.8*	-12.39*	-15.04*
<b>Asmara</b>	-30*	-44*	-8	-38	-38.39*	-41.96*	39.29	26.79
<b>Cairo</b>	-92*	90*	-90*	-94*	65.18*	139.29*	51.79*	143.75*
<b>Dodoma</b>	-22.73	-31.82	0.0	-27.27*	-35.26	-23.72	14.10	9.62*
<b>Gitega</b>	-37.06	-50	-25.29*	-35.88*	-64.10	-73.08	61.54*	51.28*
<b>Juba</b>	-27.42	-12.9*	78.10*	-20.97	-64.57	-75.59*	0.0*	-23.62
<b>Kampala</b>	0.0	-12.3	4.92*	9.02	0.0	0.0	-7.69*	100
<b>Khartoum</b>	27.27*	22.73*	104.55*	-4.55	-31.67*	-44.8*	1.81*	-4.52
<b>Kigali</b>	10.98*	-14.63*	21.95*	17.07*	-46.34*	-36.59*	95.12*	78.05*
<b>Kinshasa</b>	-28.28*	-52.05*	-11.07*	-68.03*	-81.25*	-71.88*	28.12*	603.12*
<b>Nairobi</b>	-55.81	-55.81	-34.88*	32.56*	70.21	51.06	140.43*	129.79*

The asterisk (\*) indicates that the change is statistically significant (P-value < 0.05).