

1           **Supporting Information for Observed Changes in Interannual**  
2                   **Precipitation Variability in the United States**

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## 22 *Sensitivity Analysis*

23       To explore the potential dependency of observed trends on methodological choices, we  
24 performed sensitivity analyses of the moving window width and the start date. Our findings  
25 are largely consistent regardless of the width of the moving window – analyzed at 5, 7, 9, 11, 13,  
26 and 15 years – when holding the start date constant at 1950. The direction of trend in either  
27 interannual variability or relative interannual variability flips for only three domains (Prairie  
28 Peninsula, interannual variability; Northeast and Southern Plains, relative interannual  
29 variability; Tables S1-S2).

30       Our findings on start year sensitivity – analyzed every ten years from 1920 to 1980 and  
31 holding window width constant at 11 years – are more varied with a clear east-west dichotomy.  
32 In the eastern U.S., trends in annual precipitation are consistent for all domains and the  
33 direction of trend in wet day frequency is start date dependent for just two domains (Central  
34 and Southern Plains). Metrics of interannual variability are relatively consistent as well, though  
35 there is increased variation in start date dependency across domains. As noted in the discussion  
36 section in the main text, the only consistent spatiotemporal pattern in the eastern U.S. is a  
37 change in the direction of interannual variability trends over the three Plains domains and the  
38 Ozarks Complex between a 1950 and 1960 start date. Similarly, results for the western U.S.  
39 show a distinct shift in precipitation trends between a 1950 or earlier start date and a 1960 or  
40 1970 start date. This shift occurs in trends for all metrics and across at least half of the western  
41 NEON domains (Tables S3-S6). Trend differences in starting date have a number of potential  
42 causes: differential station availability, multi-decadal climate variability, and record length, that

43 can impact the emergence of trends. Further work is necessary to provide attribution for these

44 differences.

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	Five	Seven	Nine	Eleven	Thirteen	Fifteen
Northeast	0.4	0.5	0.5	0.5	0.4	0.3
Mid-Atlantic	1.1	1.0	0.9	0.9	0.8	0.8
Southeast	-0.3	-0.2	-0.1	-0.1	-0.1	0.0
Atlantic Neotropical	-2.1	-2.2	-2.2	-2.1	-2.1	-2.1
Great Lakes	-0.2	-0.1	-0.1	-0.1	-0.1	0.0
Prairie Peninsula	-0.1	0.0	0.1	0.1	0.1	0.1
Appalachians and C.P.	0.7	0.8	0.8	0.8	0.8	0.8
Ozarks Complex	0.3	0.1	0.2	0.2	0.2	0.2
Northern Plains	0.2	0.2	0.2	0.2	0.2	0.2
Central Plains	0.0	-0.1	0.0	0.0	0.0	-0.1
Southern Plains	0.4	0.3	0.3	0.4	0.4	0.4
Northern Rockies	-0.1	0.0	0.0	0.0	0.0	0.0
Southern Rockies and C.P.	0.0	-0.1	-0.1	-0.1	-0.1	-0.1
Desert Southwest	0.1	0.1	0.1	0.2	0.2	0.2
Great Basin	0.3	0.3	0.3	0.3	0.3	0.3
Pacific Northwest	0.7	0.9	1.1	1.1	1.2	1.2
Pacific Southwest	0.6	0.7	0.6	0.7	0.6	0.6

47 Table S1: Moving Window Width Sensitivity Analysis of Interannual Variability of Precipitation.

48 Trends in relative interannual precipitation variability are shown for each NEON domain across six start

49 dates (every two years from five to fifteen) in mm/year for a 1950 start date. Purple fill and text indicates

50 statistically significant positive trends ( $p < 0.05$ ). Green fill and text indicates statistically significant  
51 negative trends. White fill indicates lack of statistically significant trend. Bold boxes highlight domains  
52 whose trends changed sign across start dates. To highlight spatial clustering of sensitivity analysis  
53 results, domains grouped above the dashed line are east of the Rocky Mountains and vice versa.

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	Five	Seven	Nine	Eleven	Thirteen	Fifteen
Northeast	0.0001	0.0001	0.0001	0.0000	0.0000	-0.0001
Mid-Atlantic	0.0008	0.0008	0.0007	0.0007	0.0007	0.0007
Southeast	-0.0004	-0.0003	-0.0002	-0.0002	-0.0002	-0.0001
Atlantic Neotropical	-0.0016	-0.0017	-0.0017	-0.0016	-0.0016	-0.0016
Great Lakes	-0.0005	-0.0005	-0.0004	-0.0004	-0.0004	-0.0004
Prairie Peninsula	-0.0006	-0.0006	-0.0005	-0.0004	-0.0004	-0.0004
Appalachians and C.P.	0.0004	0.0004	0.0005	0.0005	0.0005	0.0005
Ozarks Complex	-0.0002	-0.0003	-0.0002	-0.0002	-0.0002	-0.0002
Northern Plains	-0.0001	-0.0001	0.0000	0.0000	0.0000	0.0000
Central Plains	-0.0005	-0.0005	-0.0004	-0.0004	-0.0005	-0.0005
Southern Plains	-0.0001	-0.0002	-0.0001	0.0000	0.0001	0.0001
Northern Rockies	-0.0002	-0.0001	-0.0001	-0.0001	-0.0001	0.0000
Southern Rockies and C.P.	-0.0005	-0.0007	-0.0006	-0.0006	-0.0006	-0.0006
Desert Southwest	-0.0002	0.0000	0.0002	0.0004	0.0004	0.0005
Great Basin	0.0008	0.0008	0.0010	0.0010	0.0010	0.0010
Pacific Northwest	0.0007	0.0008	0.0009	0.0010	0.0010	0.0011
Pacific Southwest	0.0011	0.0014	0.0014	0.0014	0.0014	0.0014

57 Table S2: Moving Window Width Sensitivity Analysis of Relative Interannual Variability of  
 58 Precipitation. Trends in relative interannual precipitation variability are shown for each NEON domain  
 59 across six start dates (every two years from five to fifteen) in 1/year for a 1950 start date. Purple fill and

60 *text indicates statistically significant positive trends ( $p < 0.05$ ). Green fill and text indicates statistically*  
61 *significant negative trends. White fill indicates lack of statistically significant trend. Bold boxes highlight*  
62 *domains whose trends changed sign across start dates.*

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	1920	1930	1940	1950	1960	1970	1980
Northeast	1.48	1.93	2.07	2.26	3.28	1.84	3.88
Mid-Atlantic	0.44	0.68	0.86	1.34	1.27	0.85	3.62
Southeast	0.46	0.68	0.63	1.84	0.95	0.52	1.34
Atlantic Neotropical	-0.88	-0.42	1.67	2.19	2.74	4.50	2.08
Great Lakes	1.45	1.75	1.55	1.86	2.36	2.06	2.53
Prairie Peninsula	1.53	1.96	1.79	2.39	2.32	2.30	2.78
Appalachians and C.P.	1.45	1.95	2.09	2.40	2.93	2.37	5.77
Ozarks Complex	1.33	1.80	1.91	2.74	2.61	1.31	2.97
Northern Plains	0.75	0.98	0.64	1.04	0.94	1.05	1.42
Central Plains	0.63	0.87	0.43	0.87	0.53	0.58	-0.13
Southern Plains	0.92	1.15	1.29	2.10	1.25	0.92	0.20

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Northern Rockies	0.31	0.42	0.06	0.14	0.00	-0.07	-0.58
Southern Rockies and C.P.	0.00	0.11	0.17	0.41	0.05	-0.34	-2.37
Desert Southwest	0.17	0.17	0.33	0.36	-0.07	-0.63	-1.69
Great Basin	0.39	0.35	0.08	0.14	0.03	-0.27	-1.06
Pacific Northwest	0.26	0.03	-0.32	-0.97	-0.59	-0.96	-0.32



Pacific Southwest	<b>0.31</b>	0.06	0.00	0.01	-0.03	<b>-0.41</b>	<b>-1.53</b>
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65 *Table S3: Start Date Sensitivity Analysis of Annual Precipitation. Trends in annual precipitation are*  
66 *shown for each NEON domain across seven start dates (every ten years from 1920 to 1980) in mm/year.*  
67 *Blue fill and text indicates statistically significant positive trends ( $p < 0.05$ ). Red fill and text indicates*  
68 *statistically significant negative trends. White fill indicates lack of statistically significant trend. Bold*  
69 *boxes highlight domains whose trends changed sign across start dates. To highlight spatial clustering of*  
70 *sensitivity analysis results, domains grouped above the dashed line are east of the Rocky Mountains and*  
71 *vice versa.*

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	1920	1930	1940	1950	1960	1970	1980
Northeast	0.08	0.10	0.09	0.10	0.16	0.09	0.26
Mid-Atlantic	0.00	0.02	0.02	0.05	0.06	0.00	0.19
Southeast	-0.03	-0.04	-0.04	0.00	-0.06	-0.07	0.00
Atlantic Neotropical	0.00	0.07	0.16	0.17	0.18	0.25	0.23
Great Lakes	0.10	0.13	0.10	0.11	0.13	0.08	0.14
Prairie Peninsula	0.08	0.10	0.08	0.11	0.08	0.05	0.08
Appalachians and C.P.	0.03	0.07	0.07	0.07	0.09	0.00	0.27
Ozarks Complex	0.03	0.04	0.03	0.06	0.04	0.00	0.07
Northern Plains	0.07	0.09	0.04	0.07	0.07	0.06	0.10
Central Plains	0.03	0.04	0.00	0.02	0.00	0.00	-0.10
Southern Plains	0.02	0.03	0.02	0.07	0.00	-0.04	-0.06

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Northern Rockies	0.05	0.06	0.00	0.00	0.00	0.00	0.13
Southern Rockies and C.P.	0.03	0.03	0.02	0.05	0.00	-0.06	-0.25
Desert Southwest	0.00	0.00	0.00	0.00	-0.04	-0.10	-0.23
Great Basin	0.06	0.04	0.00	0.00	0.00	-0.05	-0.10
Pacific Northwest	0.08	0.06	0.00	-0.03	-0.03	-0.02	-0.04

Pacific Southwest	0.00	0.00	0.00	0.00	0.00	-0.04	-0.14
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75 *Table S4: Start Date Sensitivity Analysis of Annual Frequency of Precipitation. Trends in annual*  
76 *precipitation frequency are shown for each NEON domain across seven start dates (every ten years from*  
77 *1920 to 1980) in days/year. Blue fill and text indicates statistically significant positive trends ( $p < 0.05$ ).*  
78 *Red fill and text indicates statistically significant negative trends. White fill indicates lack of statistically*  
79 *significant trend. Bold boxes highlight domains whose trends changed sign across start dates. To*  
80 *highlight spatial clustering of sensitivity analysis results, domains grouped above the dashed line are east*  
81 *of the Rocky Mountains and vice versa.*

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	1920	1930	1940	1950	1960	1970	1980
Northeast	0.23	0.28	0.35	0.45	0.34	0.40	0.47
Mid-Atlantic	0.11	0.39	0.71	0.87	0.80	0.89	1.40
Southeast	-0.04	-0.13	-0.28	-0.08	0.62	0.82	0.92
Atlantic Neotropical	-0.55	-0.86	-2.19	-2.12	-1.09	0.16	-1.68
Great Lakes	0.01	0.00	-0.08	-0.05	0.10	0.00	-0.22
Prairie Peninsula	0.32	0.21	0.11	0.06	0.12	-0.01	-0.37
Appalachians and C.P.	0.19	0.41	0.62	0.82	0.97	0.64	0.52
Ozarks Complex	0.22	0.11	0.01	0.17	0.50	0.21	1.82
Northern Plains	0.18	0.17	0.24	0.22	0.25	0.01	0.41
Central Plains	-0.20	-0.26	-0.15	-0.04	0.30	0.75	1.17
Southern Plains	0.27	0.10	0.15	0.35	1.41	1.99	2.31

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Northern Rockies	0.06	0.11	0.16	-0.01	-0.13	-0.35	-1.09
Southern Rockies and C.P.	-0.12	-0.14	-0.06	-0.10	0.02	0.04	-0.22
Desert Southwest	0.11	0.09	0.22	0.18	0.04	-0.41	-0.48
Great Basin	0.07	0.09	0.20	0.32	0.20	-0.09	-0.54
Pacific Northwest	-0.03	0.07	0.24	1.12	0.75	-0.24	-2.19

Pacific Southwest	0.37	0.28	0.57	0.66	0.07	-1.06	-0.96
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87 *Table S5: Start Date Sensitivity Analysis of Interannual Variability of Precipitation. Trends in*  
88 *interannual precipitation variability are shown for each NEON domain across seven start dates (every*  
89 *ten years from 1920 to 1980) in mm/year using an 11-year moving window width. Purple fill and text*  
90 *indicates statistically significant positive trends ( $p < 0.05$ ). Green fill and text indicates statistically*  
91 *significant negative trends. White fill indicates lack of statistically significant trend. Bold boxes highlight*  
92 *domains whose trends changed sign across start dates. To highlight spatial clustering of sensitivity*  
93 *analysis results, domains grouped above the dashed line are east of the Rocky Mountains and vice versa.*  
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	1920	1930	1940	1950	1960	1970	1980
Northeast	-0.00001	-0.00001	0.00001	0.00001	-0.00010	-0.00001	-0.00015
Mid-Atlantic	0.00006	0.00032	0.00057	0.00070	0.00065	0.00073	0.00101
Southeast	-0.00007	-0.00013	-0.00030	-0.00017	0.00048	0.00075	0.00090
Atlantic Neotropical	-0.00037	-0.00056	-0.00165	-0.00163	-0.00100	-0.00039	-0.00138
Great Lakes	-0.00026	-0.00025	-0.00034	-0.00037	-0.00014	-0.00022	-0.00061
Prairie Peninsula	0.00000	-0.00016	-0.00030	-0.00043	-0.00029	-0.00046	-0.00090
Appalachians and C.P.	-0.00004	0.00015	0.00035	0.00047	0.00062	0.00035	-0.00001
Ozarks Complex	-0.00003	-0.00015	-0.00027	-0.00022	0.00022	0.00013	0.00148
Northern Plains	-0.00003	-0.00002	0.00012	-0.00003	0.00012	-0.00062	0.00021
Central Plains	-0.00071	-0.00086	-0.00057	-0.00042	0.00031	0.00146	0.00271
Southern Plains	0.00009	-0.00020	-0.00035	0.00004	0.00159	0.00245	0.00348

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Northern Rockies	-0.00005	0.00013	0.00027	-0.00007	-0.00022	-0.00071	-0.00164
Southern Rockies and C.P.	-0.00046	-0.00063	-0.00053	-0.00059	0.00004	0.00057	0.00031
Desert Southwest	0.00014	-0.00010	0.00000	0.00039	0.00098	0.00080	0.00102
Great Basin	-0.00011	0.00008	0.00050	0.00095	0.00079	-0.00003	-0.00106
Pacific Northwest	-0.00008	0.00003	0.00027	0.00099	0.00068	-0.00021	-0.00170

Pacific Southwest	0.00067	0.00065	0.00097	0.00140	0.00068	-0.00084	-0.00068
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Table S6: Start Date Sensitivity Analysis of Relative Interannual Variability of Precipitation. Trends in relative interannual precipitation variability are shown for each NEON domain across seven start dates (every ten years from 1920 to 1980) in 1/year using an 11-year moving window width. Purple fill and text indicates statistically significant positive trends ( $p < 0.05$ ). Green fill and text indicates statistically significant negative trends. White fill indicates lack of statistically significant trend. Bold boxes highlight domains whose trends changed sign across start dates. To highlight spatial clustering of sensitivity analysis results, domains grouped above the dashed line are east of the Rocky Mountains and vice versa.

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	1920	1930	1940	1950	1960	1970	1980
Northeast	54	87	126	157	182	195	202
Mid-Atlantic	53	77	107	156	166	170	172
Southeast	41	48	72	96	110	114	132
Atlantic Neotropical	2	2	5	7	7	6	7
Great Lakes	70	87	112	155	165	166	167
Prairie Peninsula	177	201	264	351	366	375	384
Appalachians and C.P.	49	69	94	123	149	153	163
Ozarks Complex	96	117	169	204	227	236	237
Northern Plains	80	106	135	186	206	208	226
Central Plains	75	94	123	169	175	173	174
Southern Plains	57	61	88	133	146	158	164
Northern Rockies	15	20	29	43	47	48	180
Southern Rockies and C.P.	34	46	71	104	117	123	236
Desert Southwest	12	23	37	58	65	61	62
Great Basin	31	48	68	92	103	112	247
Pacific Northwest	28	40	55	72	83	92	149
Pacific Southwest	28	49	71	102	105	101	118
Tundra	3	3	4	4	4	4	4



Taiga	4	5	8	15	13	13	19
Pacific Tropical	8	7	14	32	37	34	35
Total	917	1190	1652	2259	2473	2542	3078

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110 *Table S7: Number of Qualifying Stations for Sensitivity Analysis Start Dates. Number of qualifying*

111 *stations (90% or more observation availability for 90% or more of possible station-years).*

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	1950	1970
Alaska	27	25
U.S. Caribbean	0	0
Hawaii and U.S.-Affiliated Islands	16	16
Midwest	498	529
Northeast	207	254
Northern Great Plains	287	318
Northwest	122	157
Southeast	444	519
Southern Great Plains	328	364
Southwest	330	360
Total	2259	2542

114 Table S8: Number of Qualifying Stations for NCA Regions for 1950 and 1970. Number of qualifying  
115 stations (90% or more observation availability for 90% or more of possible station-years).

	Annual Precipitation (mm/decade)	Precipitation Frequency (days/decade)	Interannual Variability of Precipitation (mm/decade)	Relative Interannual Variability of Precipitation (decade <sup>-1</sup> )
Northeast	<b>18.4</b>	<b>0.9</b>	<b>4.0</b>	-0.0001
Mid Atlantic	<b>8.5</b>	0.0	<b>8.9</b>	<b>0.0073</b>
Southeast	<b>5.2</b>	<b>-0.7</b>	<b>8.2</b>	<b>0.0075</b>
Atlantic Neotropical	<b>45.0</b>	<b>2.5</b>	1.6	<b>-0.0039</b>
Great Lakes	<b>20.6</b>	<b>0.8</b>	0.0	<b>-0.0022</b>
Prairie Peninsula	<b>23.0</b>	<b>0.5</b>	-0.1	<b>-0.0046</b>
Appalachians and Cumberland Plateau	<b>23.7</b>	0.0	<b>6.4</b>	<b>0.0035</b>
Ozarks Complex	<b>13.1</b>	0.0	<b>2.1</b>	<b>0.0013</b>
Northern Plains	<b>10.5</b>	<b>0.6</b>	0.1	<b>-0.0062</b>
Central Plains	<b>5.8</b>	0.0	<b>7.5</b>	<b>0.0146</b>
Southern Plains	<b>9.2</b>	<b>-0.4</b>	<b>19.9</b>	<b>0.0245</b>
Northern Rockies	-0.7	0.0	<b>-3.5</b>	<b>-0.0071</b>
Southern Rockies and Colorado Plateau	<b>-3.4</b>	<b>-0.6</b>	0.4	<b>0.0057</b>
Desert Southwest	<b>-6.3</b>	<b>-1.0</b>	<b>-4.1</b>	<b>0.0080</b>

Great Basin	<b>-2.7</b>	<b>-0.5</b>	<b>-0.9</b>	-0.0003
Pacific Northwest	<b>-9.6</b>	-0.2	<b>-2.4</b>	<b>-0.0021</b>
Pacific Southwest	<b>-4.1</b>	<b>-0.4</b>	<b>-10.6</b>	<b>-0.0084</b>
Tundra	<b>23.9</b>	<b>4.6</b>	-0.4	<b>-0.0168</b>
Taiga	<b>11.3</b>	<b>1.4</b>	<b>-1.3</b>	<b>-0.0049</b>
Pacific Tropical	7.0	-0.3	<b>-7.8</b>	<b>-0.0041</b>

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118 *Table S9: Non-Normalized Domain Trends in Annual Precipitation Metrics from 1970 to Present for*

119 *NEON Domains. Trends in annual precipitation (mm/decade), annual precipitation frequency*

120 *(days/decade), interannual precipitation variability (mm/decade), and relative interannual precipitation*

121 *variability (decade<sup>-1</sup>) are shown for each domain. Bolded values denote statistical significance at the  $p <$*

122 *0.05 level. Values are presented visually in Figure 2 in the main text.*

	Annual Precipitation (%/decade)	Annual Precipitation Frequency (%/decade)	Interannual Variability of Precipitation (%/decade)	Relative Interannual Variability of Precipitation (%/decade)
Northeast	<b>1.6</b>	<b>0.7</b>	<b>2.4</b>	0.0
Mid Atlantic	<b>0.7</b>	0.0	<b>4.3</b>	<b>4.1</b>
Southeast	<b>0.4</b>	<b>-0.8</b>	<b>3.1</b>	<b>3.9</b>
Atlantic Neotropical	<b>3.0</b>	<b>2.3</b>	0.7	<b>-2.4</b>
Great Lakes	<b>2.4</b>	<b>0.8</b>	0.0	<b>-1.4</b>
Prairie Peninsula	<b>2.5</b>	<b>0.5</b>	-0.1	<b>-2.3</b>
Appalachians and Cumberland Plateau	<b>1.9</b>	0.0	<b>3.1</b>	<b>2.1</b>
Ozarks Complex	<b>1.0</b>	0.0	<b>0.8</b>	<b>0.7</b>
Northern Plains	<b>2.3</b>	<b>1.0</b>	0.1	<b>-2.5</b>
Central Plains	<b>1.1</b>	0.0	<b>6.2</b>	<b>6.1</b>
Southern Plains	<b>1.1</b>	<b>-0.6</b>	<b>9.5</b>	<b>9.6</b>
Northern Rockies	-0.2	0.0	<b>-4.0</b>	<b>-3.2</b>
Southern Rockies and Colorado Plateau	<b>-1.0</b>	<b>-1.1</b>	0.4	<b>2.3</b>
Desert Southwest	<b>-2.4</b>	<b>-3.3</b>	<b>-4.0</b>	<b>2.0</b>
Great Basin	<b>-0.8</b>	<b>-0.9</b>	<b>-1.1</b>	-0.1

Pacific Northwest	<b>-0.6</b>	-0.2	<b>-0.8</b>	<b>-1.0</b>
Pacific Southwest	<b>-0.7</b>	<b>-0.8</b>	<b>-4.4</b>	<b>-2.1</b>
Tundra	<b>6.7</b>	<b>5.7</b>	-0.6	<b>-7.2</b>
Taiga	<b>2.6</b>	<b>1.6</b>	<b>-1.4</b>	<b>-2.3</b>
Pacific Tropical	0.5	-0.3	<b>-2.7</b>	<b>-1.6</b>

124 *Table S10: Normalized Domain Trends in Annual Precipitation Metrics from 1970 to Present for NEON*

125 *Domains. Trends in annual precipitation, annual precipitation frequency, interannual precipitation*

126 *variability, and relative interannual precipitation variability are shown for each domain. Trends are*

127 *normalized against the mean value within each domain to produce trends in percent change/decade.*

128 *Bolded values denote statistical significance at the  $p < 0.05$  level. Values are presented visually in Figure*

129 *3 in the main text.*

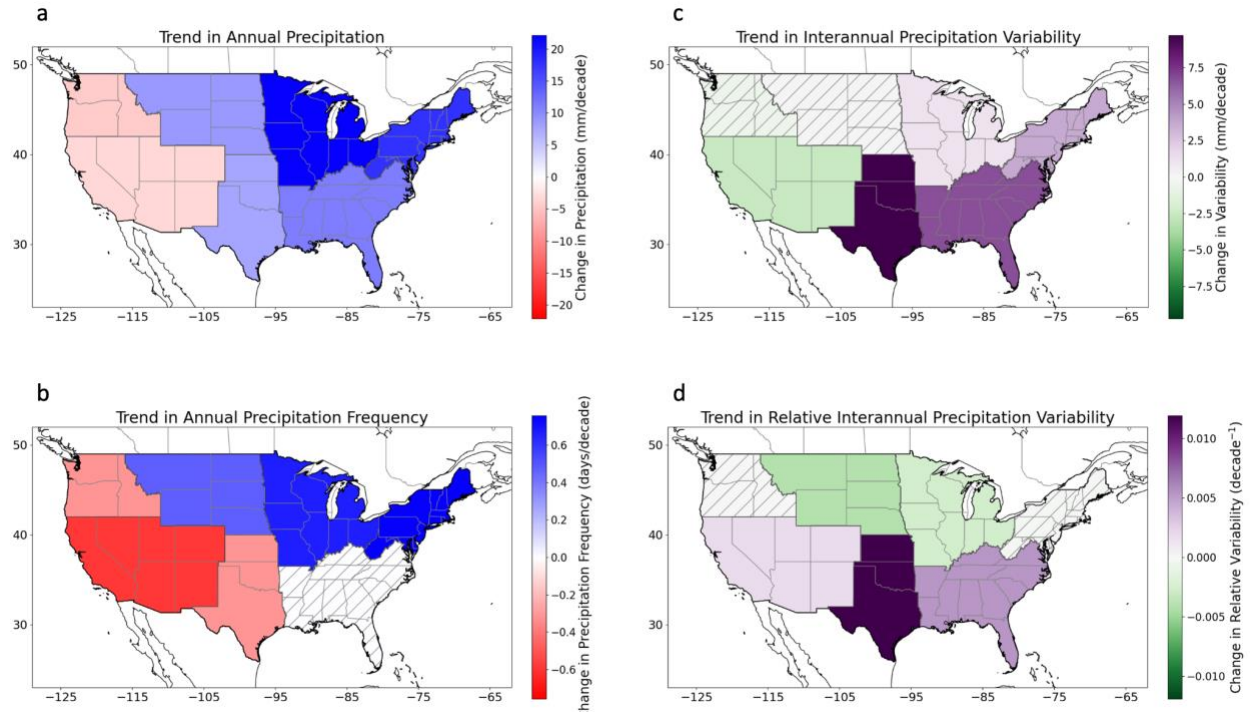


Figure S1: U.S. NCA Region Trends in Various Precipitation Metrics from 1970 to Present. (a) Map of changes in annual precipitation for each NCA region within the contiguous U.S. Red-blue fill indicates domain-level trends in annual precipitation in mm/decade (dark grey borders). Hatching indicates domain trends not reaching statistical significance. (b) Same as (a) but for annual precipitation frequency and units of days/decade. (c) Same as (a) but for interannual precipitation variability with purple-green fill and units of mm/decade. (d) Same as (c) but for relative interannual precipitation variability and units of decade<sup>-1</sup>.

	Annual Precipitation (mm/decade)	Precipitation Frequency (days/decade)	Interannual Variability of Precipitation (mm/decade)	Relative Interannual Variability of Precipitation (decade <sup>-1</sup> )
Alaska	<b>15.3</b>	<b>1.4</b>	<b>-2.8</b>	<b>-0.0082</b>
U.S. Caribbean	–	–	–	–
Hawaii and U.S.-Affiliated Islands	<b>-29.0</b>	<b>-2.3</b>	<b>-14.8</b>	<b>-0.0004</b>
Midwest	<b>24.1</b>	<b>0.7</b>	<b>1.1</b>	<b>-0.0026</b>
Northeast	<b>17.7</b>	<b>0.8</b>	<b>3.7</b>	<b>-0.0001</b>
Northern Great Plains	<b>8.7</b>	<b>0.5</b>	0.1	<b>-0.0041</b>
Northwest	<b>-4.5</b>	<b>-0.3</b>	-0.5	<b>0.0000</b>
Southeast	<b>11.2</b>	<b>0.0</b>	<b>6.7</b>	<b>0.0054</b>
Southern Great Plains	<b>7.7</b>	<b>-0.3</b>	<b>11.0</b>	<b>0.0148</b>
Southwest	<b>-3.4</b>	<b>-0.6</b>	<b>-2.5</b>	<b>0.0018</b>

141 *Table S11: Non-Normalized Domain Trends in Annual Precipitation Metrics from 1970 to Present for*

142 *NCA Regions. Trends in annual precipitation (mm/decade), annual precipitation frequency*

143 *(days/decade), interannual precipitation variability (mm/decade), and relative interannual precipitation*

144 *variability (decade<sup>-1</sup>) are shown for each domain. Bolded values denote statistical significance at the  $p <$*

145 *0.05 level.*



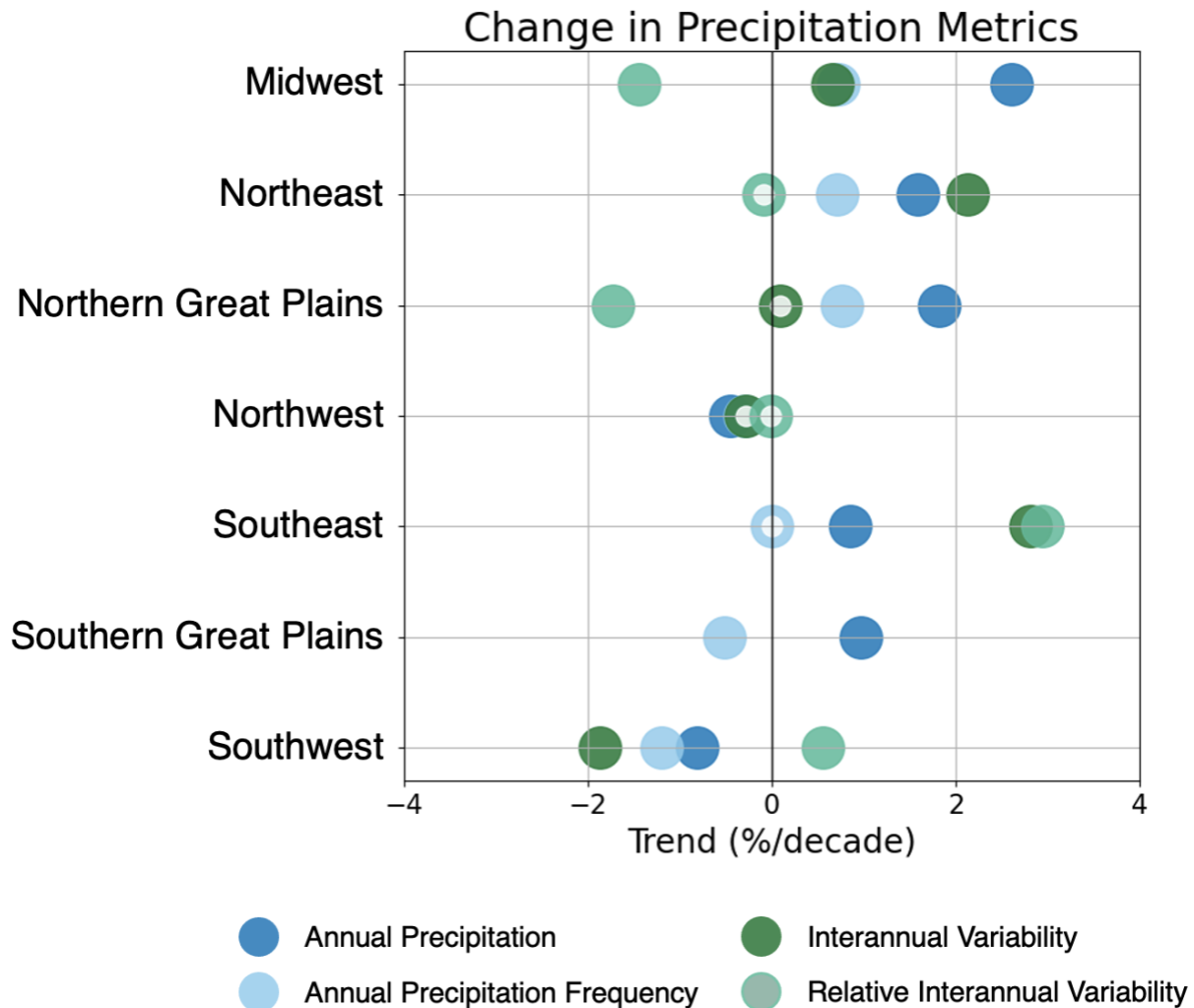


Figure S2: U.S. NCA Region Trends in Annual Precipitation Metrics from 1970 to Present. Trends in annual precipitation (dark blue), annual precipitation frequency (light blue), interannual precipitation variability (dark green), and relative interannual precipitation variability (light green) for each domain. Trends are normalized against the mean value within each domain to produce trends in percent change/decade. Non-filled circles indicate non-significant domain-trends ( $p < 0.05$ ). Note outlying trends in both metrics of interannual variability for the Southern Great Plains region are not displayed.

	Annual Precipitation (%/decade)	Annual Precipitation Frequency (%/decade)	Interannual Variability of Precipitation (%/decade)	Relative Interannual Variability of Precipitation (%/decade)
Alaska	<b>1.6</b>	<b>1.3</b>	<b>-1.7</b>	<b>-4.0</b>
U.S. Caribbean	–	–	–	–
Hawaii and U.S.-Affiliated Islands	<b>-1.9</b>	<b>-1.7</b>	<b>-3.9</b>	<b>-0.1</b>
Midwest	<b>2.6</b>	<b>0.7</b>	<b>0.7</b>	<b>-1.4</b>
Northeast	<b>1.6</b>	<b>0.7</b>	<b>2.1</b>	<b>-0.1</b>
Northern Great Plains	<b>1.8</b>	<b>0.8</b>	0.1	<b>-1.7</b>
Northwest	<b>-0.5</b>	<b>-0.3</b>	-0.3	0.0
Southeast	<b>0.8</b>	0.0	<b>2.8</b>	<b>2.9</b>
Southern Great Plains	<b>1.0</b>	<b>-0.5</b>	<b>5.7</b>	<b>6.0</b>
Southwest	<b>-0.8</b>	<b>-1.2</b>	<b>-1.9</b>	<b>0.6</b>

156 Table S12: Normalized Domain Trends in Annual Precipitation Metrics from 1970 to Present for NCA

157 Regions. Trends in annual precipitation, annual precipitation frequency, interannual precipitation

158 variability, and relative interannual precipitation variability are shown for each domain. Trends are

159 normalized against the mean value within each domain to produce trends in percent change/decade.

160 Bolded values denote statistical significance at the  $p < 0.05$  level.

# **Responses of Annual Precipitation and Interannual Variability of Precipitation to Changes in Wet Day Frequency and Intensity (Standard Deviation of Wet Day Intensity Unchanged)**

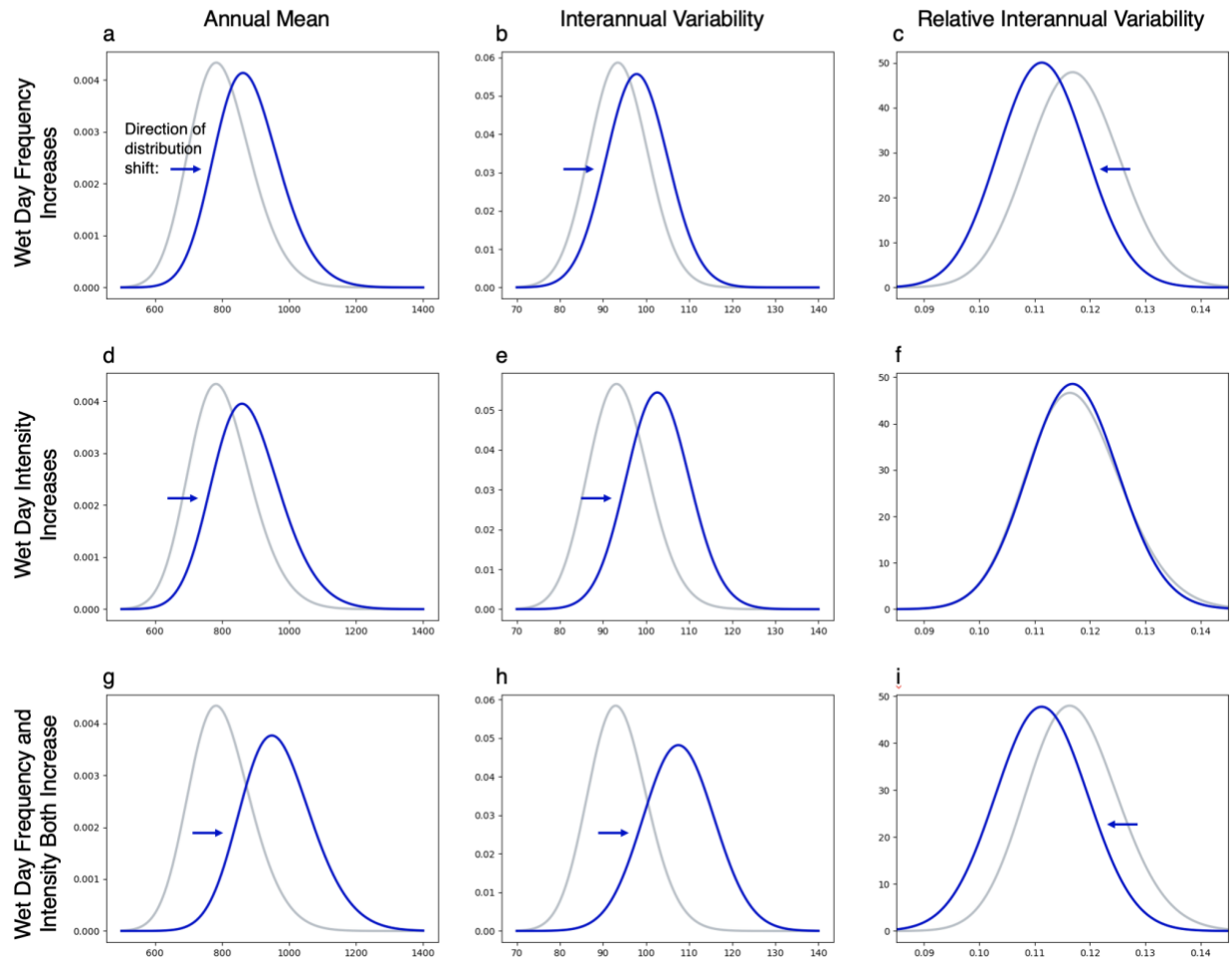
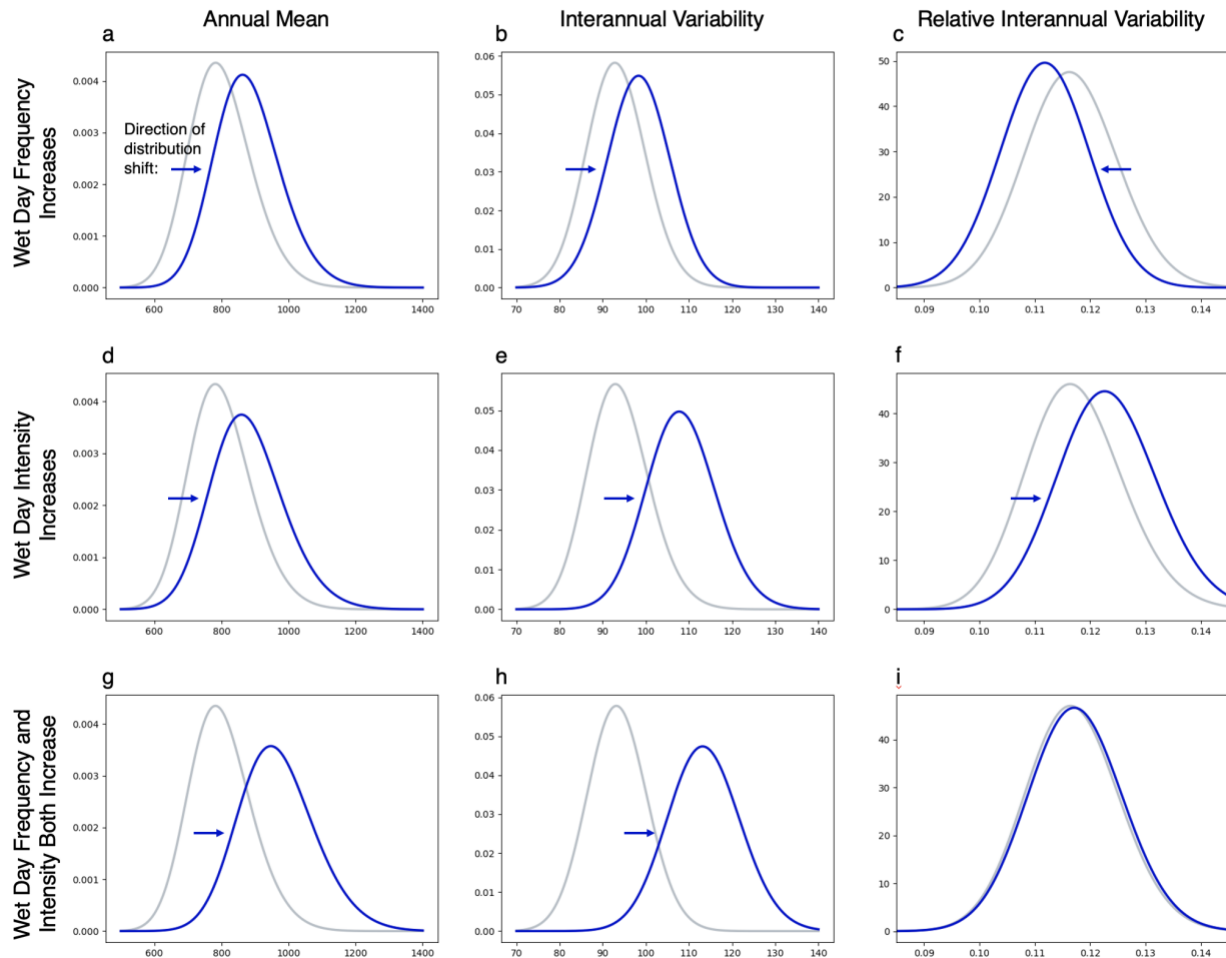


Figure S3: Responses of Annual Precipitation and Interannual Variability of Precipitation to Changes in Wet Day Frequency and Intensity (Standard Deviation of Wet Day Intensity Unchanged). (a) Initial probability distribution function (light grey) of annual precipitation based on Great Lakes domain precipitation intensity distribution. Projected probability distribution function (blue) after incorporating 10% increase in wet day frequency. (b) Same as (a) but for interannual variability of precipitation. (c) Same as (a) but for relative interannual variability of precipitation. (d-f) Same as (a-c) but projected probability distribution function incorporates a 10% increase in mean wet day intensity while the

169     *standard deviation of precipitation intensity distribution remains the same. (g-i) Same as (a-c) but*  
170     *projected distribution function incorporates both a 10% increase in wet day frequency and a 10%*  
171     *increase in mean wet day intensity.*

172

# **Responses of Annual Precipitation and Interannual Variability of Precipitation to Changes in Wet Day Frequency and Intensity (Standard Deviation of Wet Day Intensity Increased)**

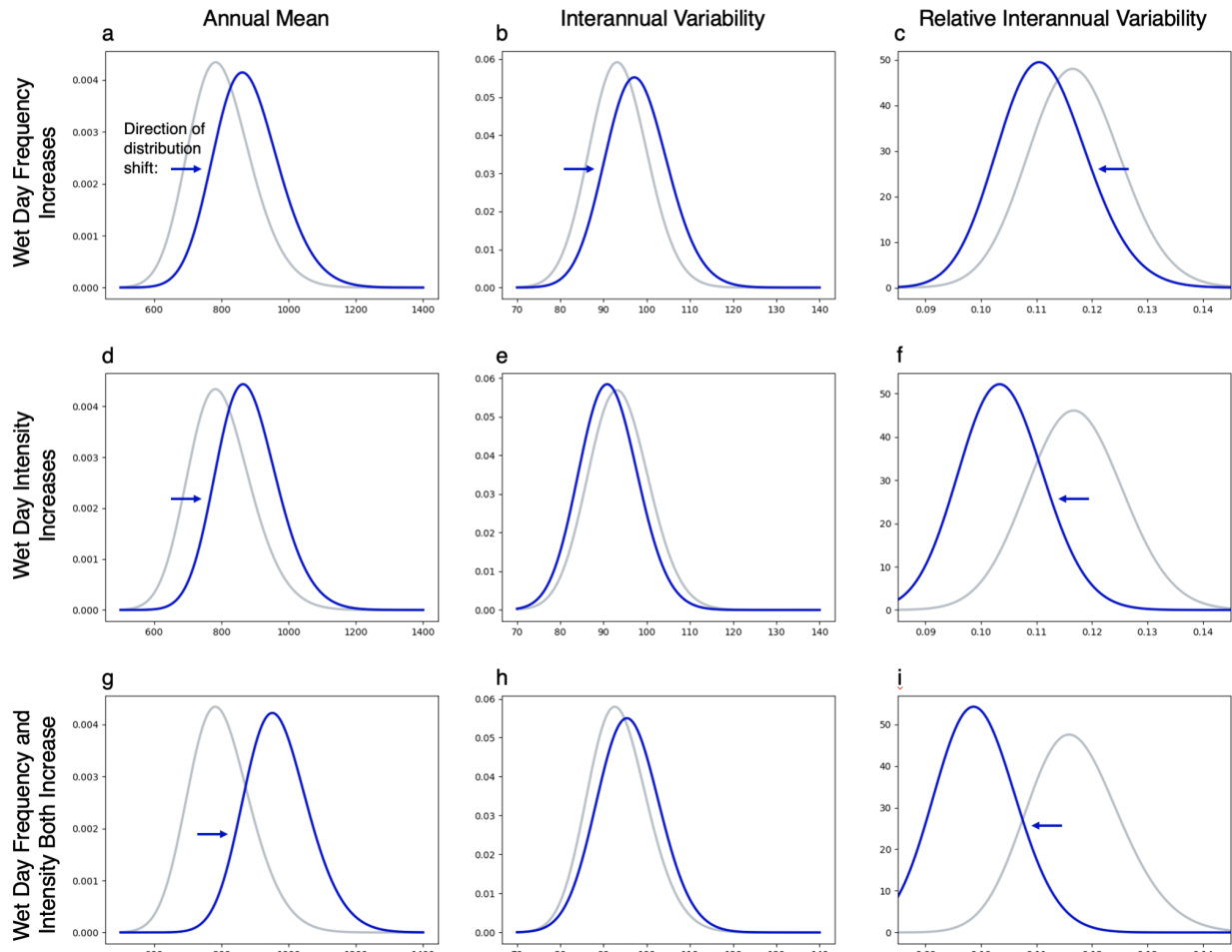


173

174 *Figure S4: Responses of Annual Precipitation and Interannual Variability of Precipitation to Changes in*  
 175 *Wet Day Frequency and Intensity (Standard Deviation of Wet Day Intensity Increased). (a) Initial*  
 176 *probability distribution function (light grey) of annual precipitation based on Great Lakes domain*  
 177 *precipitation intensity distribution. Projected probability distribution function (blue) after incorporating*  
 178 *10% increase in wet day frequency. (b) Same as (a) but for interannual variability of precipitation. (c)*  
 179 *Same as (a) but for relative interannual variability of precipitation. (d-f) Same as (a-c) but projected*  
 180 *probability distribution function incorporates a 10% increase in mean wet day intensity while the*

181     *standard deviation of precipitation intensity distribution increases. (g-i) Same as (a-c) but projected*  
182     *distribution function incorporates both a 10% increase in wet day frequency and a 10% increase in mean*  
183     *wet day intensity.*  
184

**Responses of Annual Precipitation and Interannual Variability of  
Precipitation to Changes in Wet Day Frequency and Intensity  
(Standard Deviation of Wet Day Intensity Decreased)**



186

187 *Figure S5: Responses of Annual Precipitation and Interannual Variability of Precipitation to Changes in*  
 188 *Wet Day Frequency and Intensity (Standard Deviation of Wet Day Intensity Unchanged). (a) Initial*  
 189 *probability distribution function (light grey) of annual precipitation based on Great Lakes domain*  
 190 *precipitation intensity distribution. Projected probability distribution function (blue) after incorporating*  
 191 *10% increase in wet day frequency. (b) Same as (a) but for interannual variability of precipitation. (c)*  
 192 *Same as (a) but for relative interannual variability of precipitation. (d-f) Same as (a-c) but projected*

193 *probability distribution function incorporates a 10% increase in mean wet day intensity while the*  
194 *standard deviation of precipitation intensity distribution decreases. (g-i) Same as (a-c) but projected*  
195 *distribution function incorporates both a 10% increase in wet day frequency and a 10% increase in mean*  
196 *wet day intensity.*

197



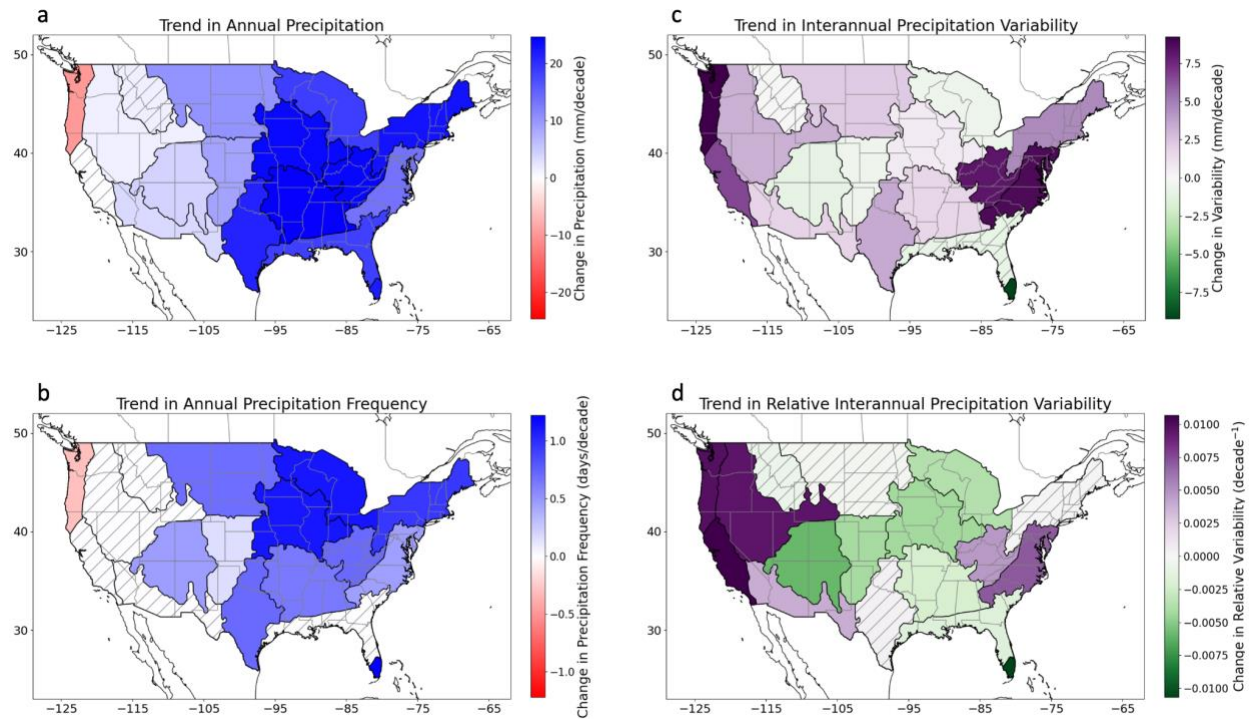
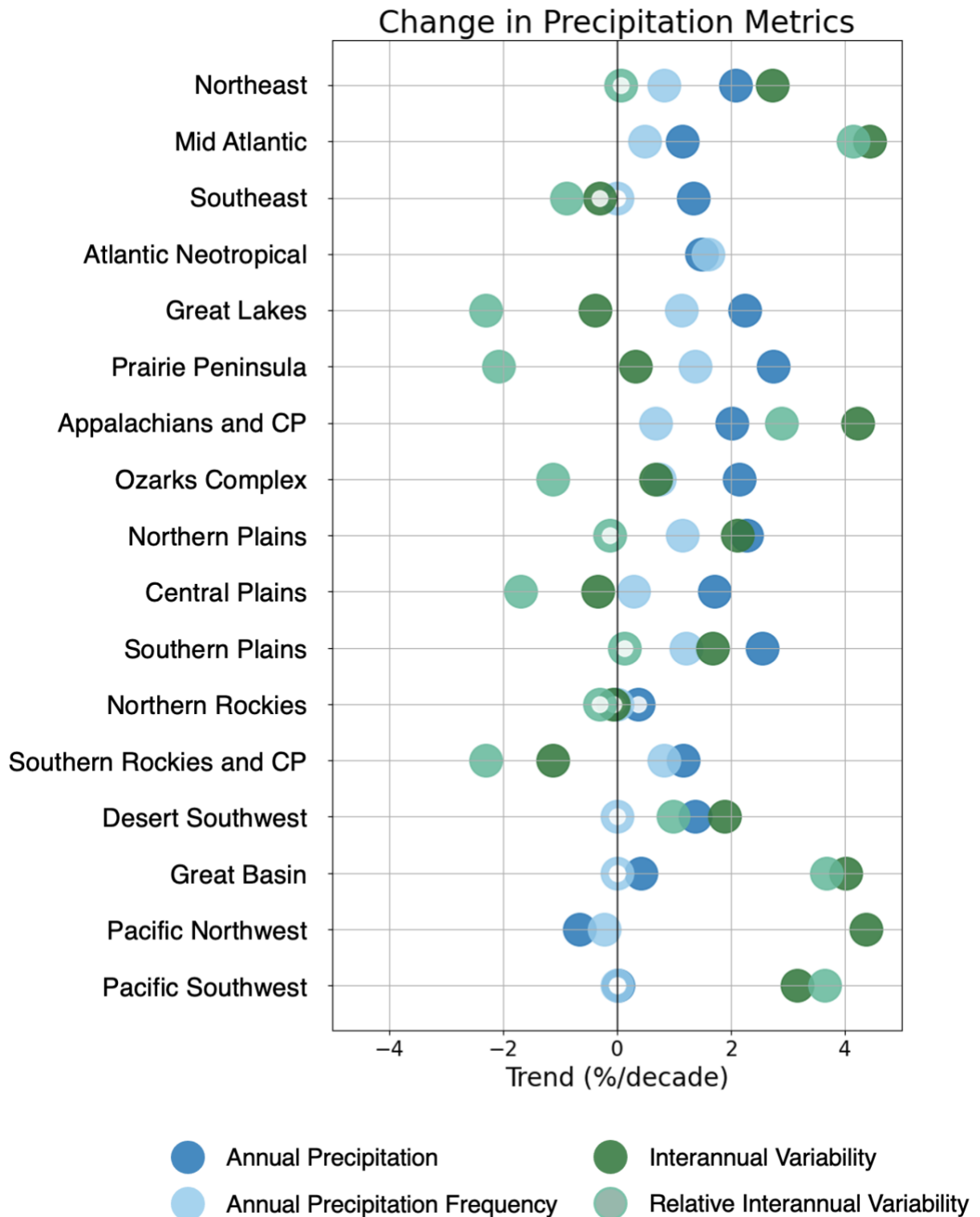


Figure S6: NEON Domain Trends in Various Precipitation Metrics from 1950 to Present. (a) Map of changes in annual precipitation for each NEON domain within the contiguous U.S. Red-blue fill indicates domain-level trends in annual precipitation in mm/decade (dark grey borders). Hatching indicates domain trends not reaching statistical significance. (b) Same as (a) but for annual precipitation frequency and units of days/decade. (c) Same as (a) but for interannual precipitation variability with purple-green fill and units of mm/decade. (d) Same as (c) but for relative interannual precipitation variability and units of decade<sup>-1</sup>.

	Annual Precipitation (mm/decade)	Precipitation Frequency (days/decade)	Interannual Variability of Precipitation (mm/decade)	Relative Interannual Variability of Precipitation (decade <sup>-1</sup> )
Northeast	<b>22.6</b>	<b>1.0</b>	<b>4.5</b>	0.0001
Mid Atlantic	<b>13.4</b>	<b>0.5</b>	<b>8.7</b>	<b>0.0070</b>
Southeast	<b>18.4</b>	0.0	-0.8	<b>-0.0017</b>
Atlantic Neotropical	<b>21.9</b>	<b>1.7</b>	<b>-21.2</b>	<b>-0.0163</b>
Great Lakes	<b>18.6</b>	<b>1.1</b>	<b>-0.5</b>	<b>-0.0037</b>
Prairie Peninsula	<b>23.9</b>	<b>1.1</b>	<b>0.6</b>	<b>-0.0043</b>
Appalachians and Cumberland Plateau	<b>24.0</b>	<b>0.7</b>	<b>8.2</b>	<b>0.0047</b>
Ozarks Complex	<b>27.4</b>	<b>0.6</b>	<b>1.7</b>	<b>-0.0022</b>
Northern Plains	<b>10.4</b>	<b>0.7</b>	<b>2.2</b>	<b>-0.0003</b>
Central Plains	<b>8.7</b>	<b>0.2</b>	<b>-0.4</b>	<b>-0.0042</b>
Southern Plains	<b>21.0</b>	<b>0.7</b>	<b>3.5</b>	0.0004
Northern Rockies	1.4	0.0	-0.1	-0.0007
Southern Rockies and Colorado Plateau	<b>4.1</b>	<b>0.5</b>	<b>-1.0</b>	<b>-0.0059</b>
Desert Southwest	<b>3.6</b>	0.0	<b>1.8</b>	<b>0.0039</b>
Great Basin	<b>1.4</b>	0.0	<b>3.2</b>	<b>0.0095</b>

Pacific Northwest	<b>-9.7</b>	<b>-0.3</b>	<b>11.2</b>	<b>0.0099</b>
Pacific Southwest	0.1	0.0	<b>6.6</b>	<b>0.0140</b>
Tundra	<b>11.1</b>	<b>2.4</b>	<b>-2.1</b>	<b>-0.0172</b>
Taiga	<b>6.2</b>	<b>1.1</b>	<b>-2.5</b>	<b>-0.0086</b>
Pacific Tropical	3.5	0.0	<b>-2.0</b>	-0.0001

208 *Table S13: Non-Normalized Domain Trends in Annual Precipitation Metrics from 1950 to Present for*  
 209 *NEON Domains. Trends in annual precipitation (mm/decade), annual precipitation frequency*  
 210 *(days/decade), interannual precipitation variability (mm/decade), and relative interannual precipitation*  
 211 *variability (decade<sup>-1</sup>) are shown for each domain. Bolded values denote statistical significance at the  $p <$*   
 212 *0.05 level.*



213

214 *Figure S7: NEON Domain Trends in Annual Precipitation Metrics from 1950 to Present. Trends in*

215 *annual precipitation (dark blue), annual precipitation frequency (light blue), interannual precipitation*

216     *variability (dark green), and relative interannual precipitation variability (light green) for each domain.*  
217     *Trends are normalized against the mean value within each domain to produce trends in percent*  
218     *change/decade. Non-filled circles indicate non-significant domain-trends ( $p < 0.05$ ). Note outlying trends*  
219     *in both metrics of interannual variability for the Atlantic Neotropical domain, and relative interannual*  
220     *variability for the Pacific Northwest, are not displayed.*

221

	Annual Precipitation (%/decade)	Annual Precipitation Frequency (%/decade)	Interannual Variability of Precipitation (%/decade)	Relative Interannual Variability of Precipitation (%/decade)
Northeast	<b>2.1</b>	<b>0.8</b>	<b>2.7</b>	0.1
Mid Atlantic	<b>1.1</b>	<b>0.5</b>	<b>4.4</b>	<b>4.1</b>
Southeast	<b>1.3</b>	0.0	-0.3	<b>-0.9</b>
Atlantic Neotropical	<b>1.5</b>	<b>1.6</b>	<b>-7.7</b>	<b>-8.7</b>
Great Lakes	<b>2.2</b>	<b>1.1</b>	<b>-0.4</b>	<b>-2.3</b>
Prairie Peninsula	<b>2.7</b>	<b>1.4</b>	<b>0.3</b>	<b>-2.1</b>
Appalachians and Cumberland Plateau	<b>2.0</b>	<b>0.7</b>	<b>4.2</b>	<b>2.9</b>
Ozarks Complex	<b>2.2</b>	<b>0.7</b>	<b>0.7</b>	<b>-1.1</b>
Northern Plains	<b>2.3</b>	<b>1.1</b>	<b>2.1</b>	-0.1
Central Plains	<b>1.7</b>	<b>0.3</b>	<b>-0.3</b>	<b>-1.7</b>
Southern Plains	<b>2.6</b>	<b>1.2</b>	<b>1.7</b>	0.1
Northern Rockies	0.4	0.0	-0.1	-0.3
Southern Rockies and Colorado Plateau	<b>1.2</b>	<b>0.8</b>	<b>-1.1</b>	<b>-2.3</b>
Desert Southwest	<b>1.4</b>	0.0	<b>1.9</b>	<b>1.0</b>
Great Basin	<b>0.4</b>	0.0	<b>4.0</b>	<b>3.7</b>

Pacific Northwest	<b>-0.7</b>	<b>-0.2</b>	<b>4.4</b>	<b>5.4</b>
Pacific Southwest	0.0	0.0	<b>3.2</b>	<b>3.6</b>
Tundra	<b>3.2</b>	<b>3.0</b>	<b>-2.8</b>	<b>-6.8</b>
Taiga	<b>1.5</b>	<b>1.3</b>	<b>-2.7</b>	<b>-3.7</b>
Pacific Tropical	0.3	0.0	<b>-0.7</b>	-0.1

223 *Table S14: Normalized Domain Trends in Annual Precipitation Metrics from 1950 to Present for NEON*

224 *Domains. Trends in annual precipitation, annual precipitation frequency, interannual precipitation*

225 *variability, and relative interannual precipitation variability are shown for each domain. Trends are*

226 *normalized against the mean value within each domain to produce trends in percent change/decade.*

227 *Bolded values denote statistical significance at the  $p < 0.05$  level.*

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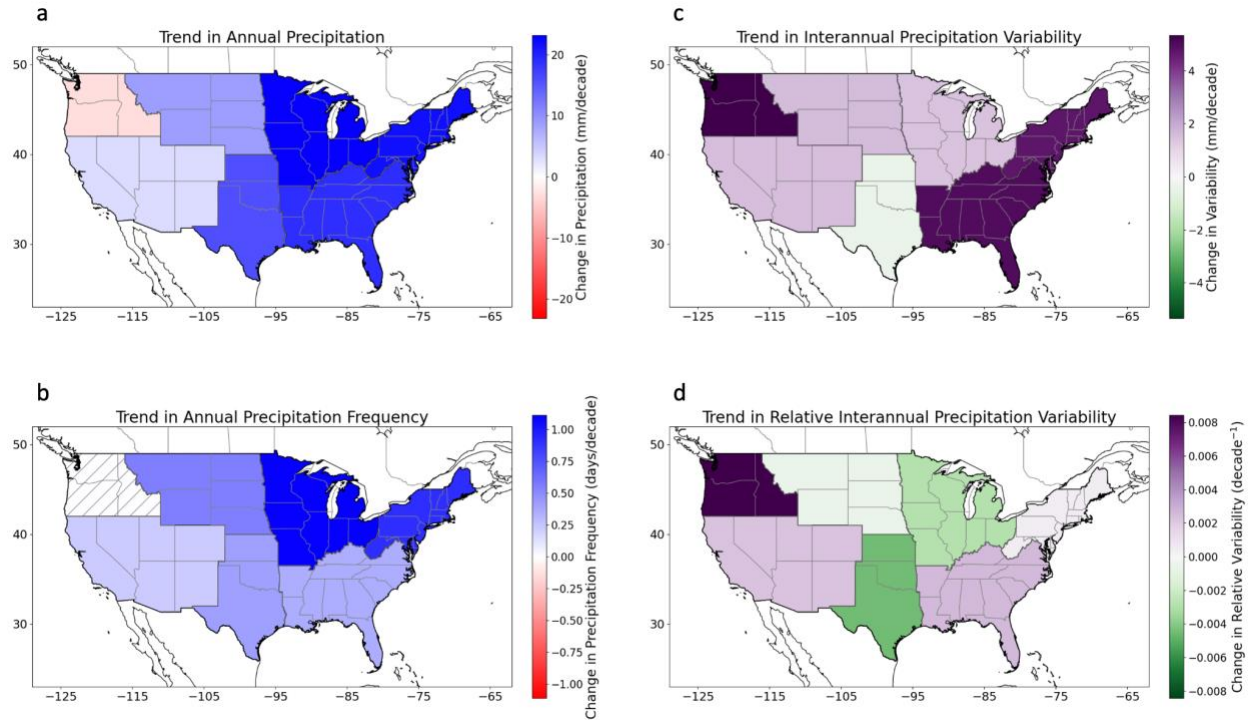


Figure S8: U.S. NCA Region Trends in Various Precipitation Metrics from 1950 to Present. (a) Map of changes in annual precipitation for each NCA region within the contiguous U.S. Red-blue fill indicates domain-level trends in annual precipitation in mm/decade (dark grey borders). Hatching indicates domain trends not reaching statistical significance. (b) Same as (a) but for annual precipitation frequency and units of days/decade. (c) Same as (a) but for interannual precipitation variability with purple-green fill and units of mm/decade. (d) Same as (c) but for relative interannual precipitation variability and units of  $\text{decade}^{-1}$ .



	Annual Precipitation (mm/decade)	Precipitation Frequency (days/decade)	Interannual Variability of Precipitation (mm/decade)	Relative Interannual Variability of Precipitation (decade <sup>-1</sup> )
Alaska	<b>9.1</b>	<b>1.2</b>	<b>-2.2</b>	<b>-0.0079</b>
U.S. Caribbean	–	–	–	–
Hawaii and U.S.-Affiliated Islands	<b>-24.5</b>	<b>-1.4</b>	-1.1	<b>0.0069</b>
Midwest	<b>23.9</b>	<b>1.2</b>	<b>1.4</b>	<b>-0.0029</b>
Northeast	<b>21.7</b>	<b>0.9</b>	<b>4.7</b>	<b>0.0005</b>
Northern Great Plains	<b>8.8</b>	<b>0.6</b>	<b>1.6</b>	<b>-0.0006</b>
Northwest	<b>-3.0</b>	0.0	<b>5.5</b>	<b>0.0109</b>
Southeast	<b>18.9</b>	<b>0.4</b>	<b>5.0</b>	<b>0.0026</b>
Southern Great Plains	<b>15.8</b>	<b>0.4</b>	<b>-0.4</b>	<b>-0.0045</b>
Southwest	<b>3.3</b>	<b>0.2</b>	<b>1.6</b>	<b>0.0023</b>

240 Table S15: Non-Normalized Domain Trends in Annual Precipitation Metrics from 1950 to Present for

241 NCA Regions. Trends in annual precipitation (mm/decade), annual precipitation frequency

242 (days/decade), interannual precipitation variability (mm/decade), and relative interannual precipitation

243 variability (decade<sup>-1</sup>) are shown for each domain. Bolded values denote statistical significance at the  $p <$

244 0.05 level.

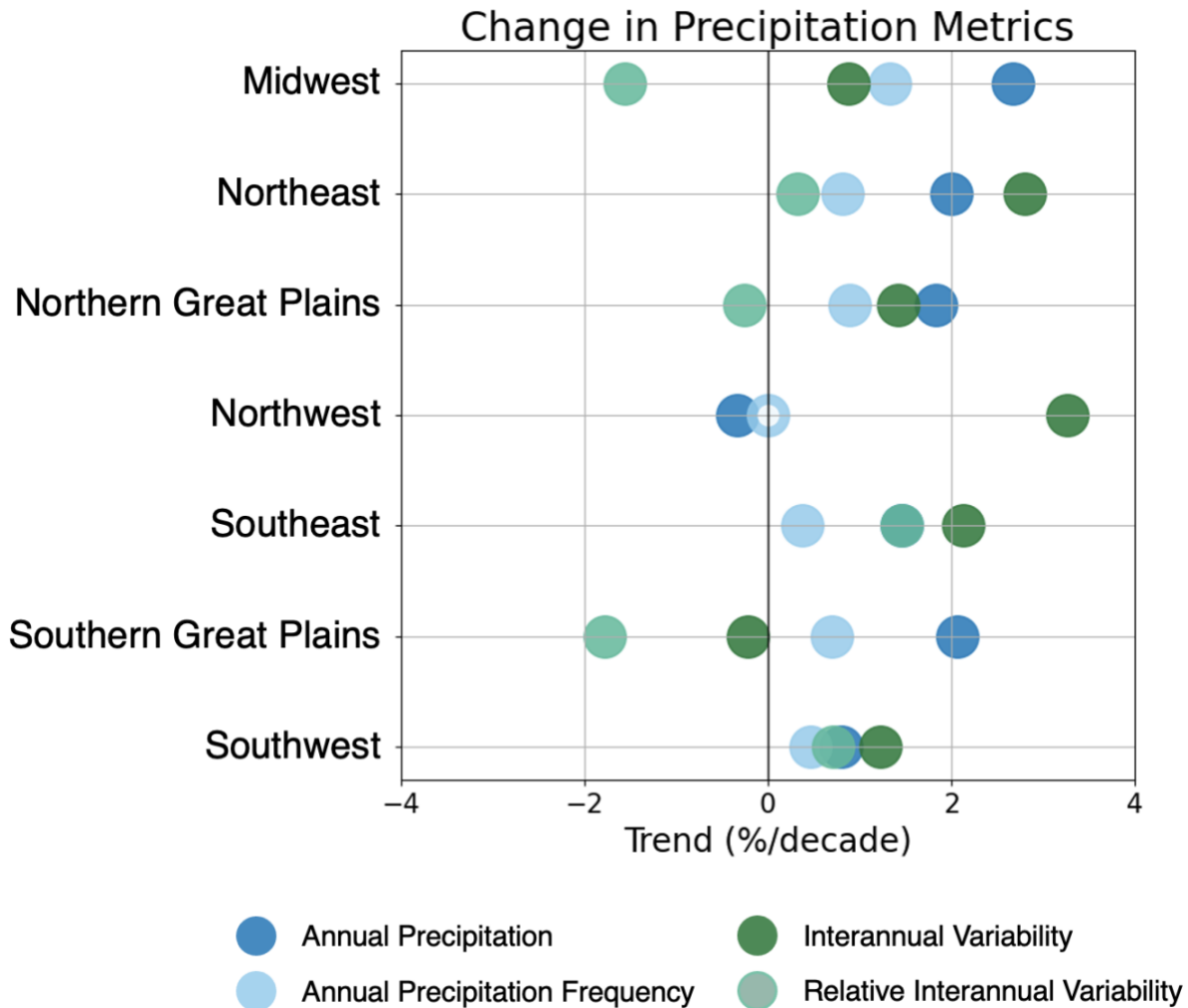


Figure S9: U.S. NCA Region Trends in Annual Precipitation Metrics from 1950 to Present. Trends in annual precipitation (dark blue), annual precipitation frequency (light blue), interannual precipitation variability (dark green), and relative interannual precipitation variability (light green) for each domain. Trends are normalized against the mean value within each domain to produce trends in percent change/decade. Non-filled circles indicate non-significant domain-trends ( $p < 0.05$ ). Note outlying trend relative interannual variability for the Northwest is not displayed.

	Annual Precipitation (%/decade)	Annual Precipitation Frequency (%/decade)	Interannual Variability of Precipitation (%/decade)	Relative Interannual Variability of Precipitation (%/decade)
Alaska	<b>1.0</b>	<b>1.1</b>	<b>-1.3</b>	<b>-3.7</b>
U.S. Caribbean	–	–	–	–
Hawaii and U.S.-Affiliated Islands	<b>-1.6</b>	<b>-1.1</b>	-0.3	<b>2.2</b>
Midwest	<b>2.7</b>	<b>1.3</b>	<b>0.9</b>	<b>-1.6</b>
Northeast	<b>2.0</b>	<b>0.8</b>	<b>2.8</b>	<b>0.3</b>
Northern Great Plains	<b>1.8</b>	<b>0.9</b>	<b>1.4</b>	<b>-0.3</b>
Northwest	<b>-0.3</b>	0.0	<b>3.3</b>	<b>5.3</b>
Southeast	<b>1.5</b>	<b>0.4</b>	<b>2.1</b>	<b>1.5</b>
Southern Great Plains	<b>2.1</b>	<b>0.7</b>	<b>-0.2</b>	<b>-1.8</b>
Southwest	<b>0.8</b>	<b>0.5</b>	<b>1.2</b>	<b>0.7</b>

254 Table S16: Normalized Domain Trends in Annual Precipitation Metrics from 1950 to Present for NCA

255 Regions. Trends in annual precipitation, annual precipitation frequency, interannual precipitation

256 variability, and relative interannual precipitation variability are shown for each domain. Trends are

257 normalized against the mean value within each domain to produce trends in percent change/decade.

258 Bolded values denote statistical significance at the  $p < 0.05$  level.