

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

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Revisions submitted to Geophysical Research Letters

11 May, 2023

Sensitivity Analysis

To explore the potential dependency of observed trends on methodological choices, we performed sensitivity analyses of the moving window width and the start date. Our findings are largely consistent regardless of the width of the moving window – analyzed at 5, 7, 9, 11, 13, and 15 years – when holding the start date constant at 1950. The direction of trend in either interannual variability or relative interannual variability flips for only three domains (Prairie Peninsula, interannual variability; Northeast and Southern Plains, relative interannual variability; Tables S2-S3).

Our findings on start year sensitivity – analyzed every ten years from 1920 to 1980 and holding window width constant at 11 years – are more varied with a clear east-west dichotomy. In the eastern U.S., trends in annual mean precipitation are consistent for all domains and the direction of trend in wet day frequency is start date dependent for just three domains (Ozarks Complex and the Central and Southern Plains). Metrics of interannual variability are relatively consistent as well, though there is increased variation in start date dependency across domains. As noted in the discussion section in the main text, the only consistent spatiotemporal pattern in the eastern U.S. is a change in the direction of interannual variability trends over the three Plains domains and the Ozarks Complex between a 1950 and 1960 start date. Similarly, results for the western U.S. show a distinct shift in precipitation trends between a 1950 or earlier start date and a 1960 or 1970 start date. This shift occurs in trends for all metrics and across at least half of the western NEON domains (Tables S4-S7). Trend differences in starting date have a number of potential causes: differential station availability, multi-decadal climate variability,

and record length, that can impact the emergence of trends. Further work is necessary to provide attribution for these differences.

	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

Table S1: Number of Qualifying Stations for Sensitivity Analysis Start Dates. Number of qualifying stations (90% or more observation availability for 90% or more of possible station-years).

	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	0.2	0.3	0.3	0.4	0.4
Northern Rockies	0.0	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

Table S2: Moving Window Width Sensitivity Analysis of Interannual Variability of Precipitation.

Trends in interannual precipitation variability are shown for each NEON domain across six start dates (every two years from five to fifteen) in mm/year for a 1950 start date. 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 borders 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.

	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	0.0000	0.0000	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

Table S3: Moving Window Width Sensitivity Analysis of Relative Interannual Variability of Precipitation. Trends in relative interannual precipitation variability are shown for each NEON domain across six start dates (every two years from five to fifteen) in 1/year for a 1950 start date. 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 borders highlight domains whose trends changed sign across start dates.

	1920	1930	1940	1950	1960	1970	1980
Northeast	1.43	1.75	1.97	2.86	2.78	2.08	4.42
Mid-Atlantic	0.31	0.11	0.28	0.33	0.81	0.33	2.40
Southeast	0.18	0.08	0.22	0.52	-0.08	-1.12	-1.96
Atlantic Neotropical	0.07	0.46	1.13	1.93	1.35	2.93	0.66
Great Lakes	1.30	1.26	1.30	1.80	1.03	1.23	1.80
Prairie Peninsula	1.46	1.57	1.70	2.20	1.56	2.27	2.82
Appalachians and C.P.	1.3	1.31	1.06	1.53	1.67	1.76	4.77
Ozarks Complex	1.22	1.36	1.27	1.87	1.06	0.73	0.29
Northern Plains	0.87	0.79	0.85	1.02	0.86	1.25	1.49
Central Plains	0.70	0.76	0.60	0.55	0.42	0.34	-0.96
Southern Plains	0.87	0.93	1.61	0.94	0.37	0.37	-3.79

Northern Rockies	0.27	0.20	0.11	-0.10	-0.31	-0.61	1.10
Southern Rockies and C.P.	0.17	0.19	0.50	0.51	-0.13	-0.49	-1.13
Desert Southwest	0.18	0.25	0.58	0.17	-0.54	-1.55	-1.80
Great Basin	0.40	0.21	0.12	0.07	-0.09	-0.47	0.88
Pacific Northwest	0.38	0.18	-1.08	-0.73	-0.13	1.34	5.48

Pacific Southwest	0.16	-0.39	0.34	-0.15	-0.81	-1.49	-0.61
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Table S4: Start Date Sensitivity Analysis of Annual Mean Precipitation. Trends in annual mean precipitation are shown for each NEON domain across seven start dates (every ten years from 1920 to 1980) in mm/year. Blue fill and text indicates statistically significant positive trends ($p < 0.05$). Red fill and text indicates statistically significant negative trends. White fill indicates lack of statistically significant trend. Bold borders 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.

	1920	1930	1940	1950	1960	1970	1980
Northeast	0.06	0.07	0.05	0.08	0.08	0.08	0.20
Mid-Atlantic	0.00	0.00	-0.03	0.00	0.00	0.00	0.13
Southeast	-0.05	-0.07	-0.08	-0.09	-0.13	-0.17	-0.20
Atlantic Neotropical	0.09	0.15	0.13	0.10	0.07	0.09	0.18
Great Lakes	0.09	0.08	0.08	0.10	0.00	0.04	0.11
Prairie Peninsula	0.08	0.07	0.08	0.09	0.00	0.00	0.08
Appalachians and C.P.	0.00	0.03	0.00	0.00	0.00	0.00	0.22
Ozarks Complex	0.02	0.00	0.00	0.00	-0.03	-0.05	-0.13
Northern Plains	0.07	0.06	0.05	0.06	0.03	0.04	0.11
Central Plains	0.04	0.02	0.00	0.00	0.00	0.00	-0.13
Southern Plains	0.00	0.02	0.03	0.00	-0.07	-0.11	-0.29

Northern Rockies	0.04	0.00	0.00	-0.03	-0.04	-0.09	0.39
Southern Rockies and C.P.	0.05	0.04	0.07	0.04	-0.03	-0.10	-0.12
Desert Southwest	0.00	0.00	0.05	0.00	-0.08	-0.20	-0.25
Great Basin	0.06	0.02	0.00	0.00	-0.02	-0.06	0.10
Pacific Northwest	0.07	0.05	-0.03	-0.04	0.00	0.00	0.20

Pacific Southwest	0.00	-0.03	0.00	0.00	-0.05	-0.08	-0.07
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Table S5: Start Date Sensitivity Analysis of Annual Wet Day Frequency. Trends in annual wet day frequency are shown for each NEON domain across seven start dates (every ten years from 1920 to 1980) in days/year. Blue fill and text indicates statistically significant positive trends ($p < 0.05$). Red fill and text indicates statistically significant negative trends. White fill indicates lack of statistically significant trend. Bold borders 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.

	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	-0.29	-0.08	0.62	0.82	0.92
Atlantic Neotropical	-0.83	-1.19	-2.19	-2.12	-1.09	0.16	-1.68
Great Lakes	0.01	0.00	-0.08	-0.05	0.11	0.00	-0.22
Prairie Peninsula	0.32	0.22	0.12	0.06	0.12	-0.02	-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

Northern Rockies	0.08	0.12	0.18	0.01	-0.11	-0.32	-1.07
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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Table S6: Start Date Sensitivity Analysis of Interannual Variability of Precipitation. Trends in interannual precipitation variability are shown for each NEON domain across seven start dates (every ten years from 1920 to 1980) in mm/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 borders 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.

	1920	1930	1940	1950	1960	1970	1980
Northeast	-0.00001	-0.00002	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	-0.00031	-0.00017	0.00048	0.00075	0.00090
Atlantic Neotropical	-0.00056	-0.00082	-0.00165	-0.00163	-0.00100	-0.00039	-0.00138
Great Lakes	-0.00026	-0.00025	-0.00035	-0.00038	-0.00014	-0.00022	-0.00060
Prairie Peninsula	0.00001	-0.00016	-0.00030	-0.00043	-0.00030	-0.00047	-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	0.00003	0.00158	0.00245	0.00348

Northern Rockies	0.00001	0.00017	0.00033	-0.00004	-0.00016	-0.00066	-0.00163
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 S7: 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 borders 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.

	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

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

	Annual Mean Precipitation (mm/decade)	Annual Wet Day Frequency (days/decade)	Interannual Variability of Precipitation (mm/decade)	Relative Interannual Variability of Precipitation (decade ⁻¹)
Northeast	20.8	0.8	4.0	-0.0001
Mid Atlantic	3.3	0.0	8.9	0.0073
Southeast	-11.2	-1.7	8.2	0.0075
Atlantic Neotropical	29.3	0.9	1.6	-0.0039
Great Lakes	12.3	0.4	0.0	-0.0022
Prairie Peninsula	22.7	0.0	-0.2	-0.0047
Appalachians and Cumberland Plateau	17.6	0.0	6.4	0.0035
Ozarks Complex	7.3	-0.5	2.1	0.0013
Northern Plains	12.5	0.4	0.1	-0.0062
Central Plains	3.4	0.0	7.5	0.0146
Southern Plains	3.7	-1.1	19.9	0.0245
Northern Rockies	-6.1	-0.9	-3.2	-0.0066
Southern Rockies and Colorado Plateau	-4.9	-1.0	0.4	0.0057
Desert Southwest	-15.5	-2.0	-4.1	0.0080

Great Basin	-4.7	-0.6	-0.9	-0.0003
Pacific Northwest	13.4	0.0	-2.4	-0.0021
Pacific Southwest	-14.9	-0.8	-10.6	-0.0084
Tundra	20.9	3.2	-0.4	-0.0168
Taiga	5.4	0.0	-1.3	-0.0049
Pacific Tropical	2.0	-0.6	-7.8	-0.0041

Table S9: Non-Normalized Domain Trends in Annual Precipitation Metrics from 1970 to Present for NEON Domains. Trends in annual mean precipitation (mm/decade), annual wet day frequency (days/decade), interannual precipitation variability (mm/decade), and relative interannual precipitation variability (decade⁻¹) are shown for each domain. Bolded values denote statistical significance at the $p < 0.05$ level. Values are presented visually in Figure 2 in the main text.

	Annual Mean Precipitation (%/decade)	Annual Wet Day Frequency (%/decade)	Interannual Variability of Precipitation (%/decade)	Relative Interannual Variability of Precipitation (%/decade)
Northeast	1.9	0.7	2.4	0.0
Mid Atlantic	0.3	0.0	4.3	4.1
Southeast	-0.8	-1.8	3.1	3.9
Atlantic Neotropical	2.0	0.8	0.7	-2.4
Great Lakes	1.4	0.4	0.0	-1.4
Prairie Peninsula	2.5	0.0	-0.1	-2.3
Appalachians and Cumberland Plateau	1.4	0.0	3.1	2.1
Ozarks Complex	0.6	-0.5	0.8	0.7
Northern Plains	2.7	0.7	0.1	-2.5
Central Plains	0.7	0.0	6.2	6.1
Southern Plains	0.4	-1.8	9.5	9.6
Northern Rockies	-1.5	-1.1	-3.7	-3.0
Southern Rockies and Colorado Plateau	-1.4	-1.8	0.4	2.3
Desert Southwest	-5.8	-6.3	-4.0	2.0
Great Basin	-1.4	-1.0	-1.1	-0.1

Pacific Northwest	0.9	0.0	-0.8	-1.0
Pacific Southwest	-2.4	-1.8	-4.4	-2.1
Tundra	5.8	3.9	-0.6	-7.2
Taiga	1.2	0.0	-1.4	-2.3
Pacific Tropical	0.2	-0.5	-2.7	-1.6

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

Domains. Trends in annual mean precipitation, annual wet day frequency, interannual precipitation variability, and relative interannual precipitation variability are shown for each domain. Trends are normalized against the mean value within each domain to produce trends in percent change/decade.

Bolded values denote statistical significance at the $p < 0.05$ level. Values are presented visually in Figure 3 in the main text.

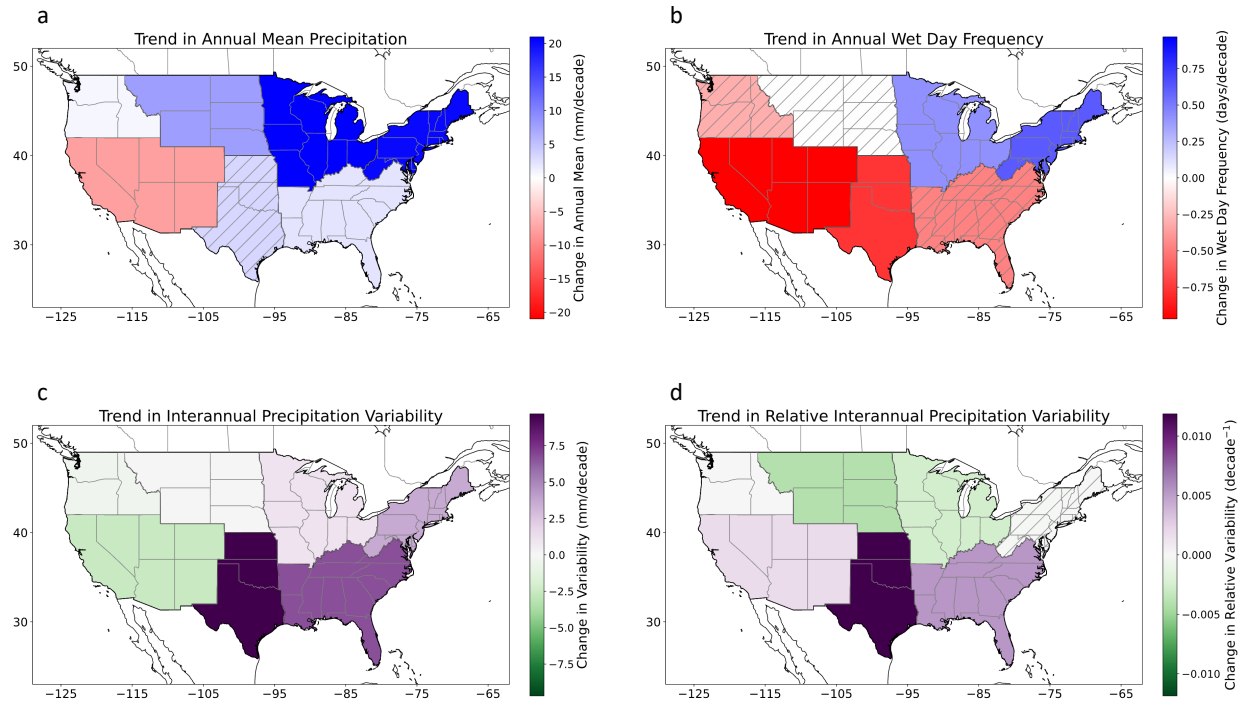


Figure S1: U.S. NCA Region Trends in Various Precipitation Metrics from 1970 to Present. (a) Map of changes in annual mean precipitation for each NCA region within the contiguous U.S. Red-blue fill indicates domain-level trends in annual mean precipitation in mm/decade (dark grey borders). Hatching indicates domain trends not reaching statistical significance. (b) Same as (a) but for annual wet day 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⁻¹.

	Annual Mean Precipitation (mm/decade)	Annual Wet Day Frequency (days/decade)	Interannual Variability of Precipitation (mm/decade)	Relative Interannual Variability of Precipitation (decade ⁻¹)
Alaska	9.2	0.3	-2.8	-0.0082
U.S. Caribbean	–	–	–	–
Hawaii and U.S.-Affiliated Islands	-38.8	-2.9	-14.8	-0.0004
Midwest	21.3	0.4	1.1	-0.0026
Northeast	20.2	0.6	3.7	-0.0001
Northern Great Plains	8.0	0.0	0.1	-0.0041
Northwest	0.7	-0.3	-0.5	0.0000
Southeast	2.1	-0.5	6.7	0.0054
Southern Great Plains	3.3	-0.8	11.0	0.0146
Southwest	-7.7	-1.1	-2.5	0.0018

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

NCA Regions. Trends in annual mean precipitation (mm/decade), annual wet day frequency

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

variability (decade⁻¹) are shown for each domain. Bolded values denote statistical significance at the $p <$

0.05 level.

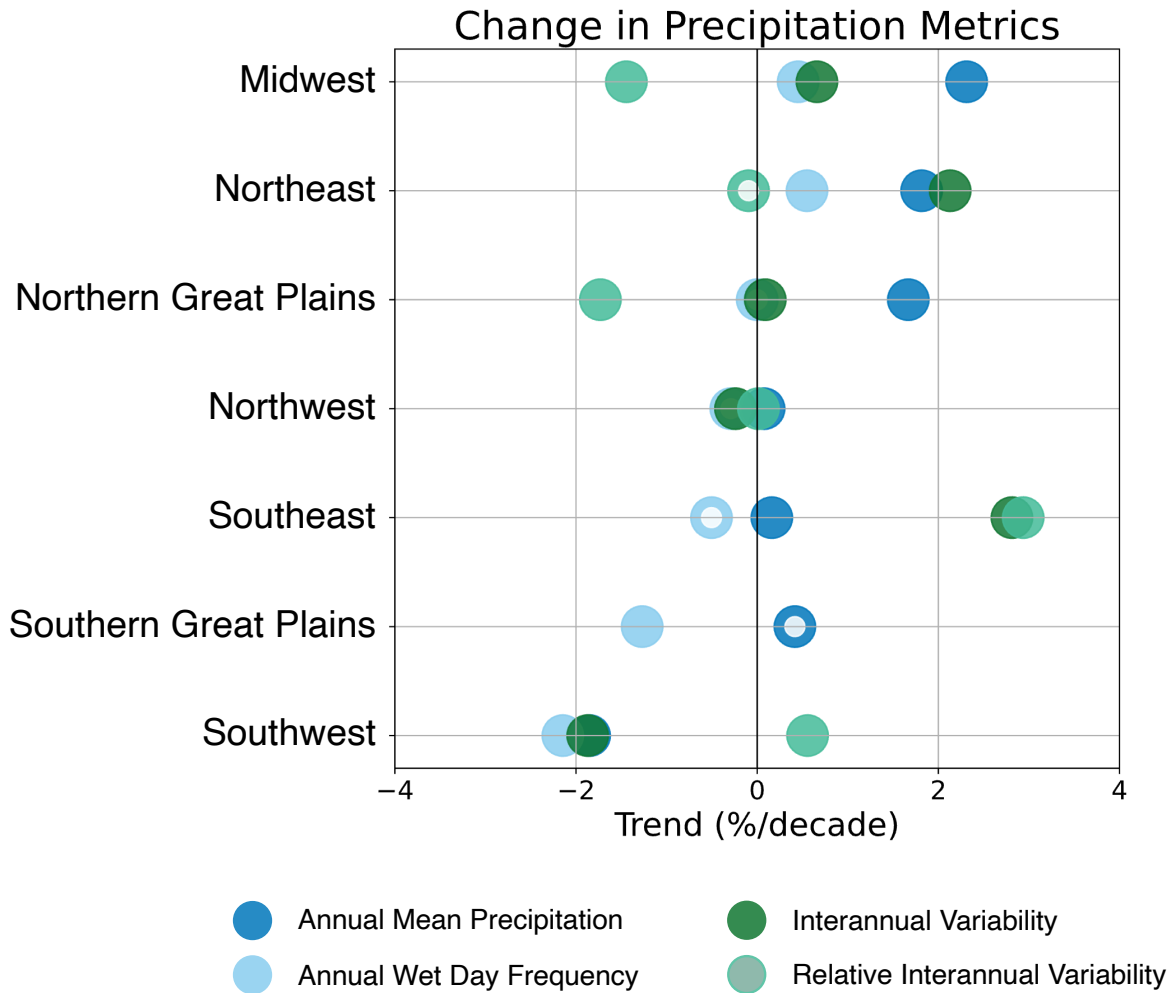


Figure S2: U.S. NCA Region Trends in Annual Precipitation Metrics from 1970 to Present. Trends in annual mean precipitation (dark blue), annual wet day frequency (light blue), interannual precipitation variability (dark green), and relative interannual precipitation variability (light green) for each 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 Mean Precipitation (%/decade)	Annual Wet Day Frequency (%/decade)	Interannual Variability of Precipitation (%/decade)	Relative Interannual Variability of Precipitation (%/decade)
Alaska	1.0	0.3	-1.7	-4.0
U.S. Caribbean	–	–	–	–
Hawaii and U.S.-Affiliated Islands	-2.6	-2.1	-3.9	-0.1
Midwest	2.3	0.5	0.7	-1.4
Northeast	1.8	0.5	2.1	-0.1
Northern Great Plains	1.7	0.0	0.1	-1.7
Northwest	0.1	-0.3	-0.2	0.0
Southeast	0.2	-0.5	2.8	2.9
Southern Great Plains	0.4	-1.3	5.7	6.0
Southwest	-1.8	-2.1	-1.9	0.6

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

Regions. Trends in annual mean precipitation, annual wet day frequency, interannual precipitation variability, and relative interannual precipitation variability are shown for each domain. Trends are normalized against the mean value within each domain to produce trends in percent change/decade.

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 Increased)**

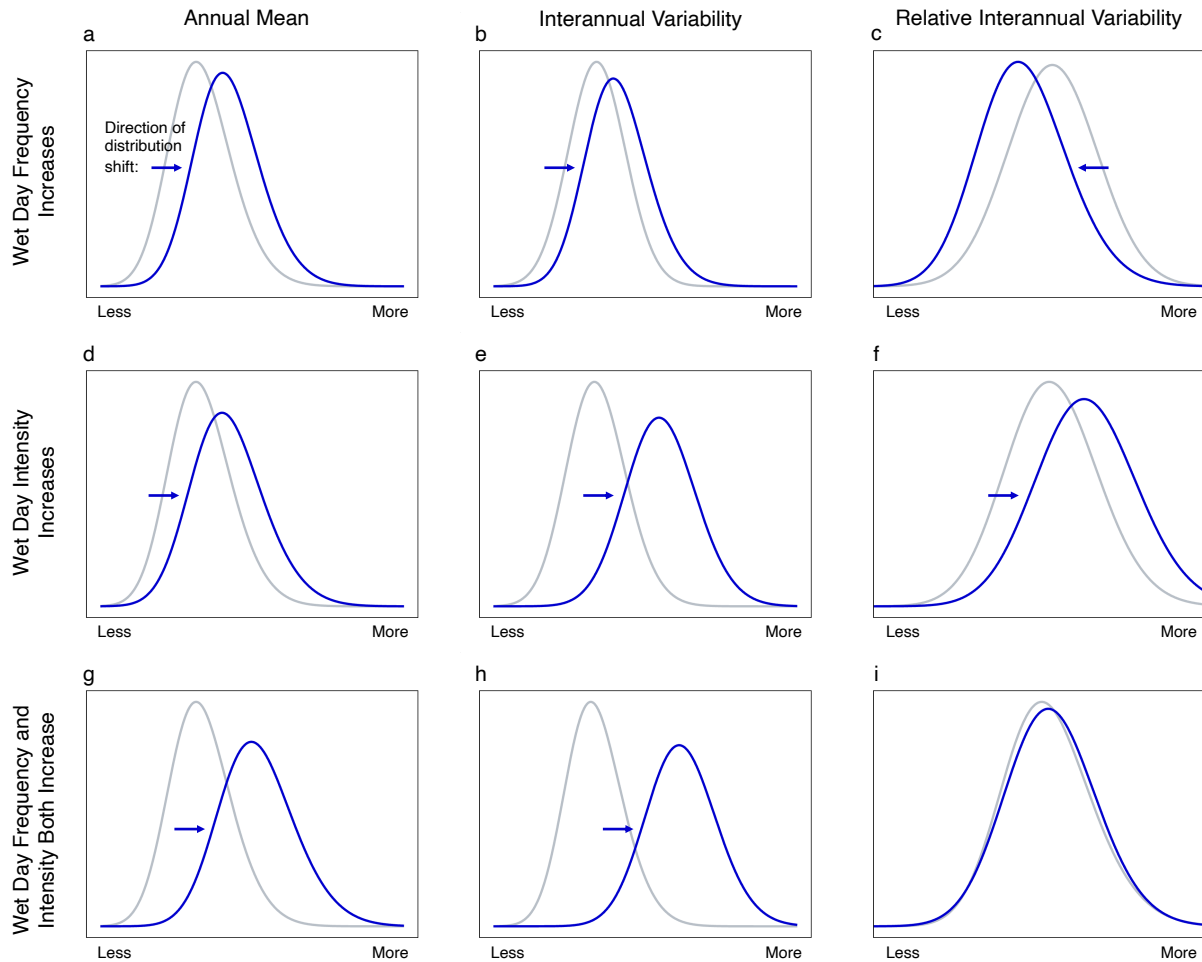


Figure S3: Responses of Annual Precipitation Totals and Interannual Variability of Precipitation to Changes in Wet Day Frequency and Intensity (Standard Deviation of Wet Day Intensity Increased). (a) Initial probability distribution function (light grey) of annual precipitation totals based on Great 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 standard deviation of precipitation intensity distribution increases. (g-i) Same as (a-c) but projected distribution function incorporates both a 10% increase in wet day frequency and a 10% increase in mean wet day intensity.

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

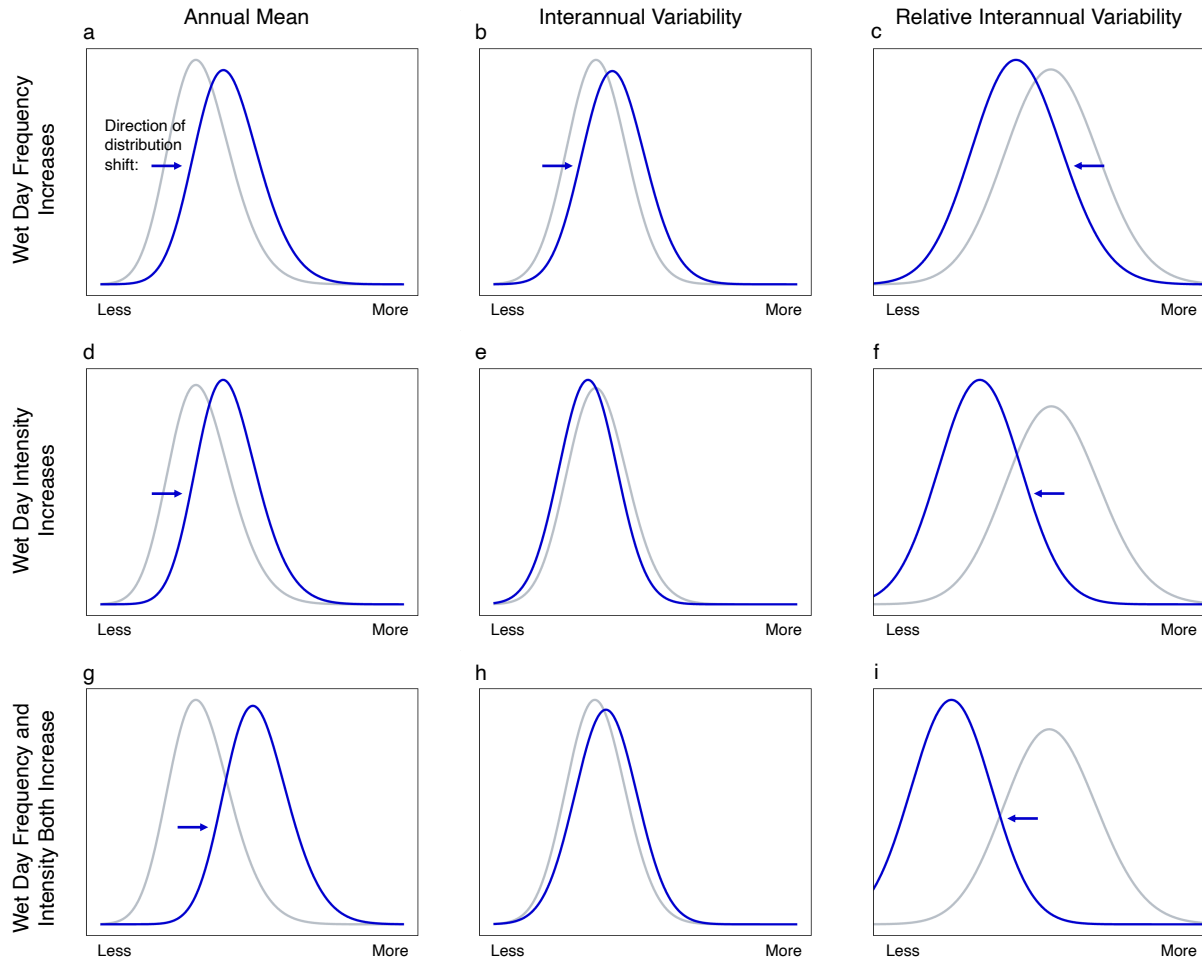


Figure S4: Responses of Annual Precipitation Totals and Interannual Variability of Precipitation to Changes in Wet Day Frequency and Intensity (Standard Deviation of Wet Day Intensity Decreased). (a) Initial probability distribution function (light grey) of annual mean precipitation based on Great Lakes 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 standard deviation of precipitation intensity distribution decreases. (g-i) Same as (a-c) but projected distribution function incorporates both a 10% increase in wet day frequency and a 10% increase in mean wet day intensity.

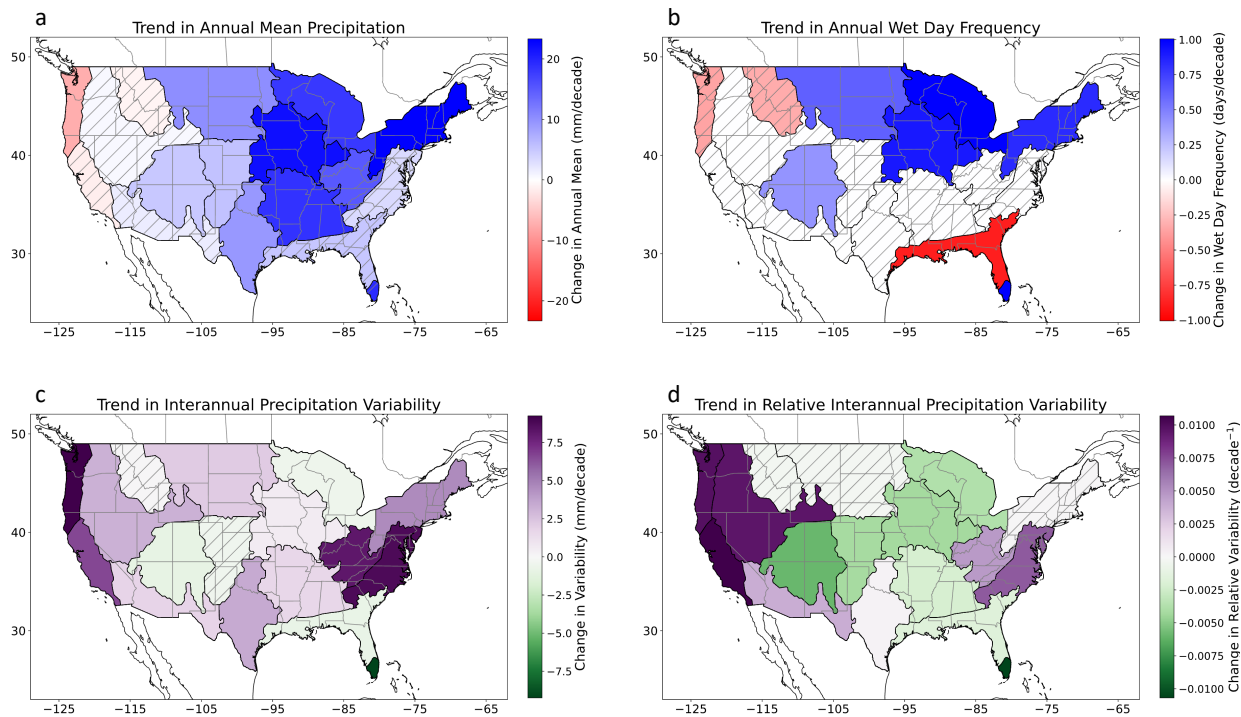


Figure S5: NEON Domain Trends in Various Precipitation Metrics from 1950 to Present. (a) Map of changes in annual precipitation for each NEON domain within the contiguous U.S. Red-blue fill indicates domain-level trends in annual mean precipitation in mm/decade (dark grey borders). Hatching indicates domain trends not reaching statistical significance. (b) Same as (a) but for annual wet day 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⁻¹.

	Annual Mean Precipitation (mm/decade)	Annual Wet Day Frequency (days/decade)	Interannual Variability of Precipitation (mm/decade)	Relative Interannual Variability of Precipitation (decade ⁻¹)
Northeast	25.8	1.1	4.4	0.0009
Mid Atlantic	7.8	0.2	11.0	0.0083
Southeast	14.4	-0.4	-2.6	-0.0041
Atlantic Neotropical	11.5	1.1	-20.6	-0.0164
Great Lakes	20.0	1.3	-1.8	-0.0054
Prairie Peninsula	26.1	1.2	-0.7	-0.0062
Appalachians and Cumberland Plateau	23.1	0.7	7.3	0.0036
Ozarks Complex	27.8	0.5	2.5	-0.0017
Northern Plains	11.3	0.8	1.9	-0.0009
Central Plains	11.6	0.3	-0.4	-0.0048
Southern Plains	20.5	0.6	3.8	-0.0007
Northern Rockies	2.4	0.2	-0.4	-0.0017
Southern Rockies and Colorado Plateau	4.4	0.4	-0.4	-0.0047
Desert Southwest	3.2	0.0	0.9	-0.0019
Great Basin	2.6	0.2	2.7	0.0075

Pacific Northwest	-4.0	0.0	7.4	0.0066
Pacific Southwest	0.7	0.0	5.7	0.0111
Tundra	11.8	2.4	-1.7	-0.0142
Taiga	5.1	0.8	-2.3	-0.0079
Pacific Tropical	5.2	0.0	-3.7	-0.0030

Table S13: Non-Normalized Domain Trends in Annual Precipitation Metrics from 1950 to Present for

NEON Domains. Trends in annual mean precipitation (mm/decade), annual wet day frequency

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

variability (decade⁻¹) are shown for each domain. Bolded values denote statistical significance at the $p <$

0.05 level.

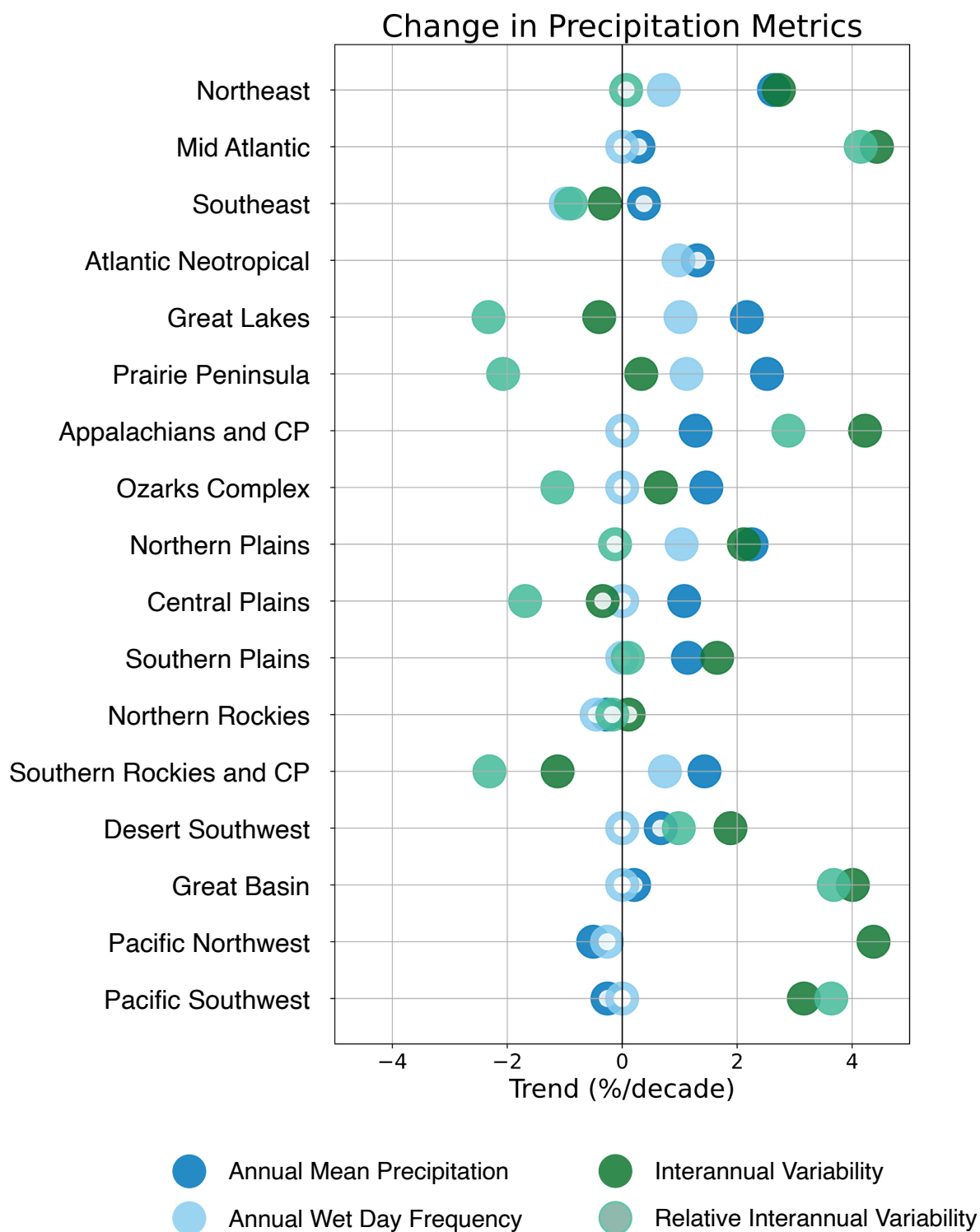


Figure S6: NEON Domain Trends in Annual Precipitation Metrics from 1950 to Present. Trends in annual mean precipitation (dark blue), annual wet day frequency (light blue), interannual precipitation

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 Atlantic Neotropical domain, and relative interannual variability for the Pacific Northwest, are not displayed.

	Annual Mean Precipitation (%/decade)	Annual Wet Day Frequency (%/decade)	Interannual Variability of Precipitation (%/decade)	Relative Interannual Variability of Precipitation (%/decade)
Northeast	2.4	0.9	2.8	0.6
Mid Atlantic	0.7	0.2	5.8	5.1
Southeast	1.0	-0.4	-1.0	-2.2
Atlantic Neotropical	0.8	1.1	-7.9	-9.2
Great Lakes	2.4	1.3	-1.4	-3.5
Prairie Peninsula	3.0	1.5	-0.4	-3.1
Appalachians and Cumberland Plateau	1.9	0.7	3.9	2.3
Ozarks Complex	2.2	0.6	1.0	-0.9
Northern Plains	2.5	1.4	1.9	-0.4
Central Plains	2.3	0.6	-0.3	-2.0
Southern Plains	2.5	0.9	1.9	-0.3
Northern Rockies	0.6	0.3	-0.5	-0.8
Southern Rockies and Colorado Plateau	1.2	0.8	-0.5	-1.9
Desert Southwest	1.2	0.0	1.0	-0.5
Great Basin	0.8	0.4	3.6	3.1

Pacific Northwest	-0.3	0.0	3.1	3.9
Pacific Southwest	0.1	0.0	2.9	3.1
Tundra	3.3	3.0	-2.4	-6.0
Taiga	1.2	1.0	-2.8	-3.8
Pacific Tropical	0.4	0.0	-1.4	-1.2

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

Domains. Trends in annual mean precipitation, annual wet day frequency, interannual precipitation variability, and relative interannual precipitation variability are shown for each domain. Trends are normalized against the mean value within each domain to produce trends in percent change/decade.

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

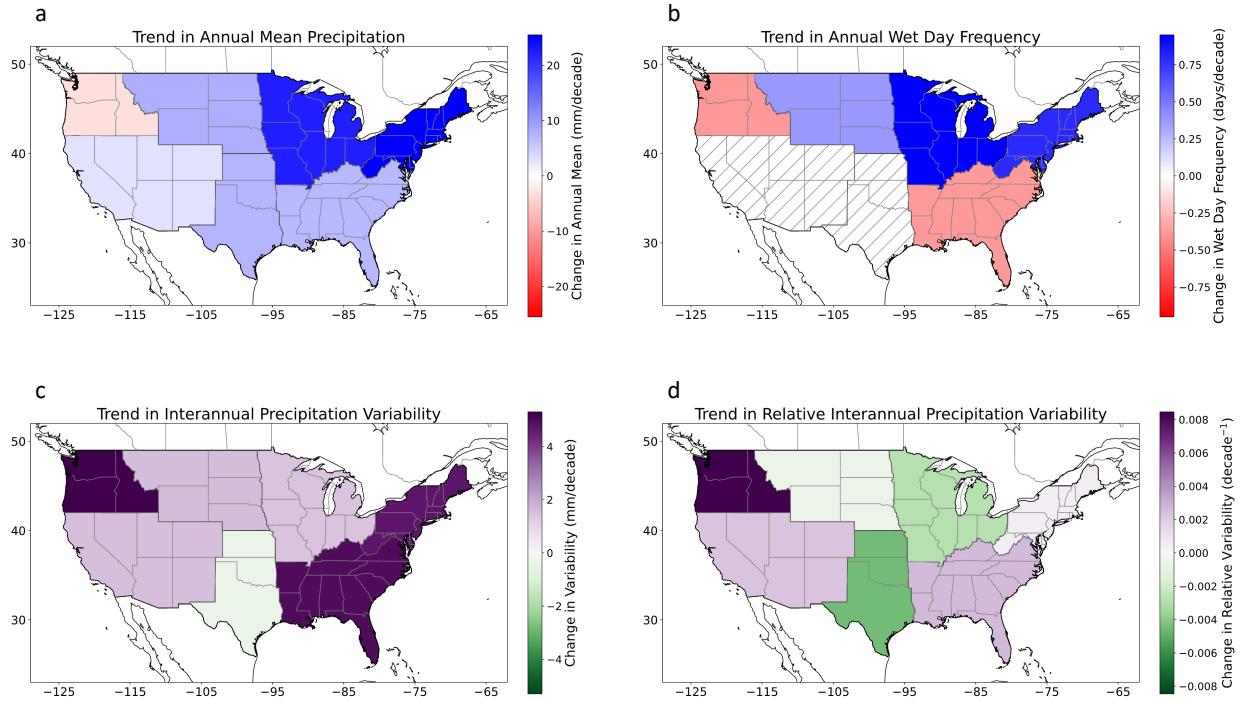


Figure S7: U.S. NCA Region Trends in Various Precipitation Metrics from 1950 to Present. (a) Map of changes in annual mean precipitation for each NCA region within the contiguous U.S. Red-blue fill indicates domain-level trends in annual mean precipitation in mm/decade (dark grey borders). Hatching indicates domain trends not reaching statistical significance. (b) Same as (a) but for annual wet day 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⁻¹.

	Annual Mean Precipitation (mm/decade)	Annual Wet Day Frequency (days/decade)	Interannual Variability of Precipitation (mm/decade)	Relative Interannual Variability of Precipitation (decade ⁻¹)
Alaska	7.6	0.8	-2.2	-0.0079
U.S. Caribbean	–	–	–	–
Hawaii and U.S.-Affiliated Islands	-26.3	-1.5	-1.1	0.0069
Midwest	22.5	1.0	1.4	-0.0029
Northeast	26.8	0.8	4.7	0.0005
Northern Great Plains	8.0	0.4	1.6	-0.0006
Northwest	-3.3	-0.4	5.4	0.0110
Southeast	7.1	-0.4	5.0	0.0026
Southern Great Plains	7.6	0.0	-0.4	-0.0046
Southwest	2.9	0.0	1.6	0.0023

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

NCA Regions. Trends in annual mean precipitation (mm/decade), annual wet day frequency

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

variability (decade⁻¹) are shown for each domain. Bolded values denote statistical significance at the $p <$

0.05 level.

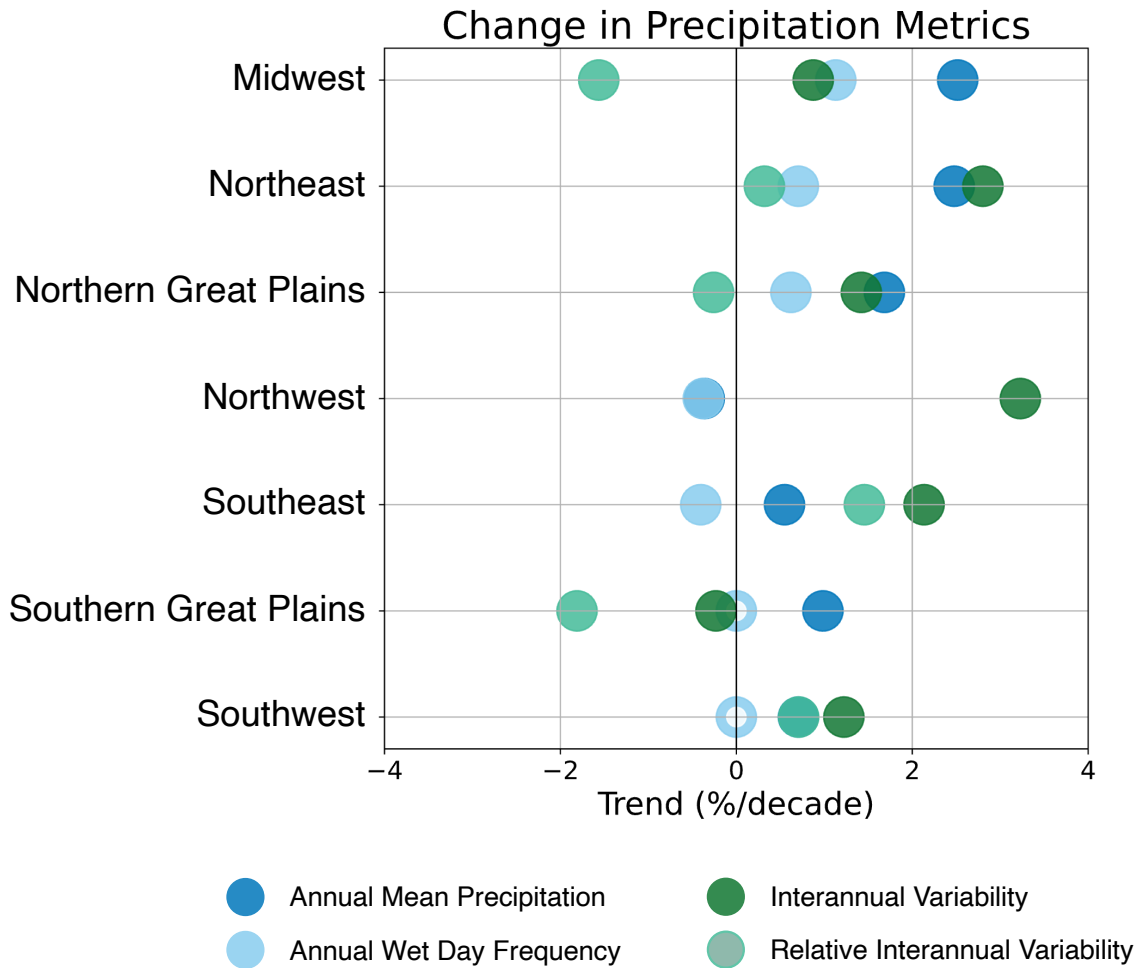


Figure S8: U.S. NCA Region Trends in Annual Precipitation Metrics from 1950 to Present. Trends in annual mean precipitation (dark blue), annual wet day frequency (light blue), interannual precipitation variability (dark green), and relative interannual precipitation variability (light green) for each 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 Mean Precipitation (%/decade)	Annual Wet Day Frequency (%/decade)	Interannual Variability of Precipitation (%/decade)	Relative Interannual Variability of Precipitation (%/decade)
Alaska	0.9	0.7	-1.3	-3.7
U.S. Caribbean	–	–	–	–
Hawaii and U.S.-Affiliated Islands	-1.7	-1.2	-0.3	2.2
Midwest	2.5	1.1	0.9	-1.6
Northeast	2.5	0.7	2.8	0.3
Northern Great Plains	1.7	0.6	1.4	-0.3
Northwest	-0.4	-0.4	3.2	5.3
Southeast	0.5	-0.4	2.1	1.5
Southern Great Plains	1.0	0.0	-0.2	-1.8
Southwest	0.7	0.0	1.2	0.7

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

Regions. Trends in annual mean precipitation, annual wet day frequency, interannual precipitation variability, and relative interannual precipitation variability are shown for each domain. Trends are normalized against the mean value within each domain to produce trends in percent change/decade.

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