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Supplemental Material

Journal of Hydrometeorology

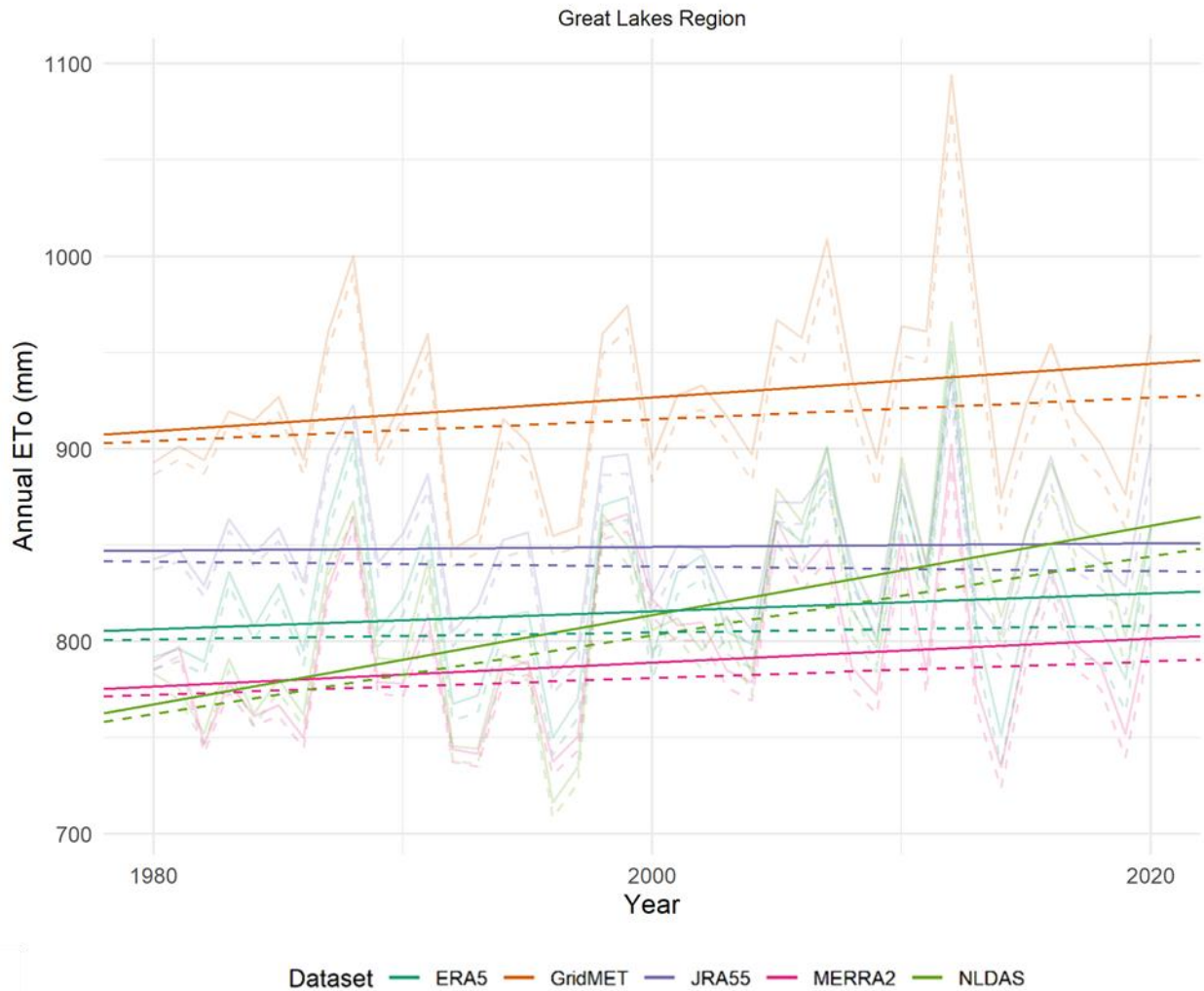
A Multidataset Assessment of Climatic Drivers and Uncertainties of Recent Trends in
Evaporative Demand across the Continental United States

<https://doi.org/10.1175/JHM-D-21-0163.1>

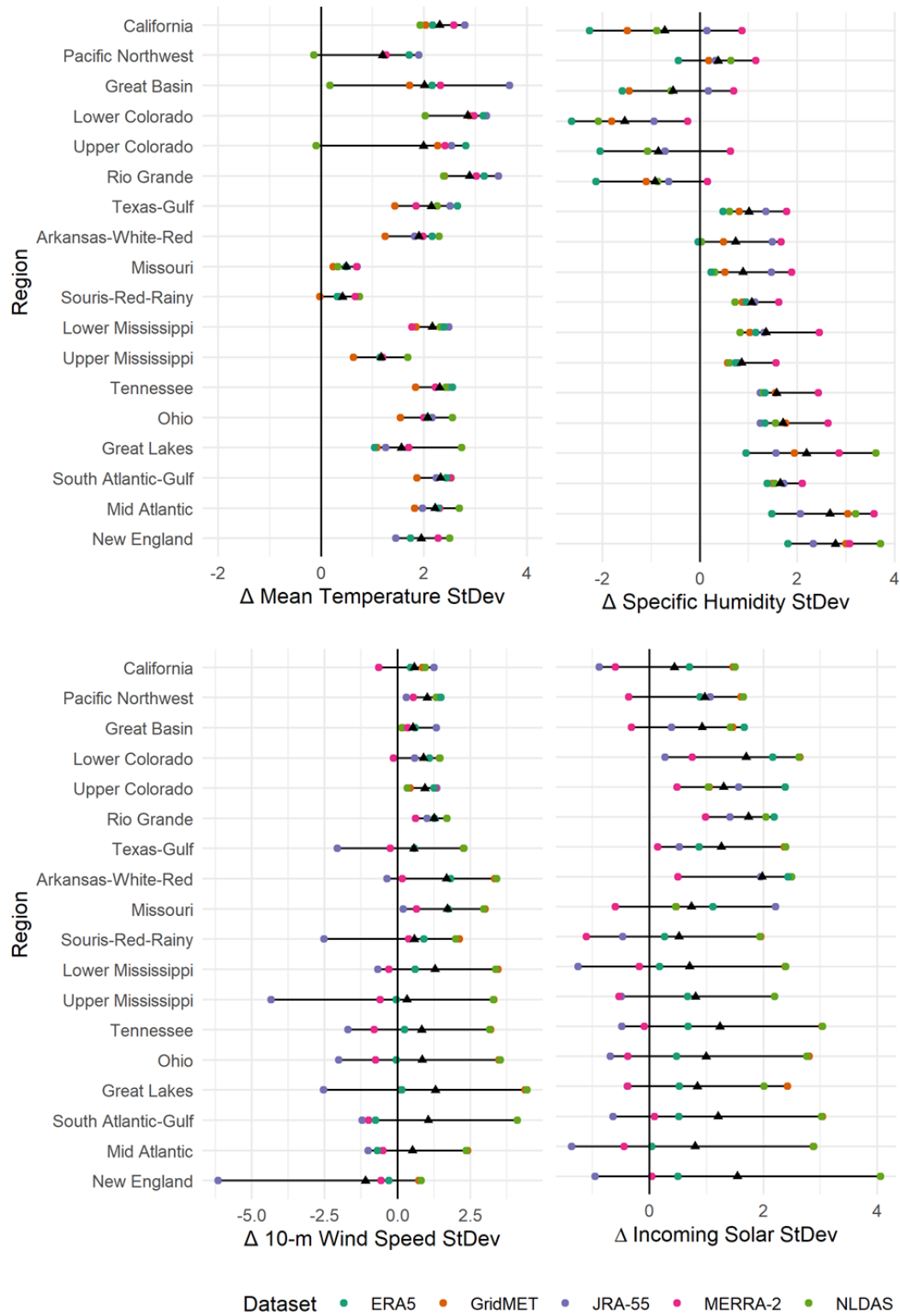
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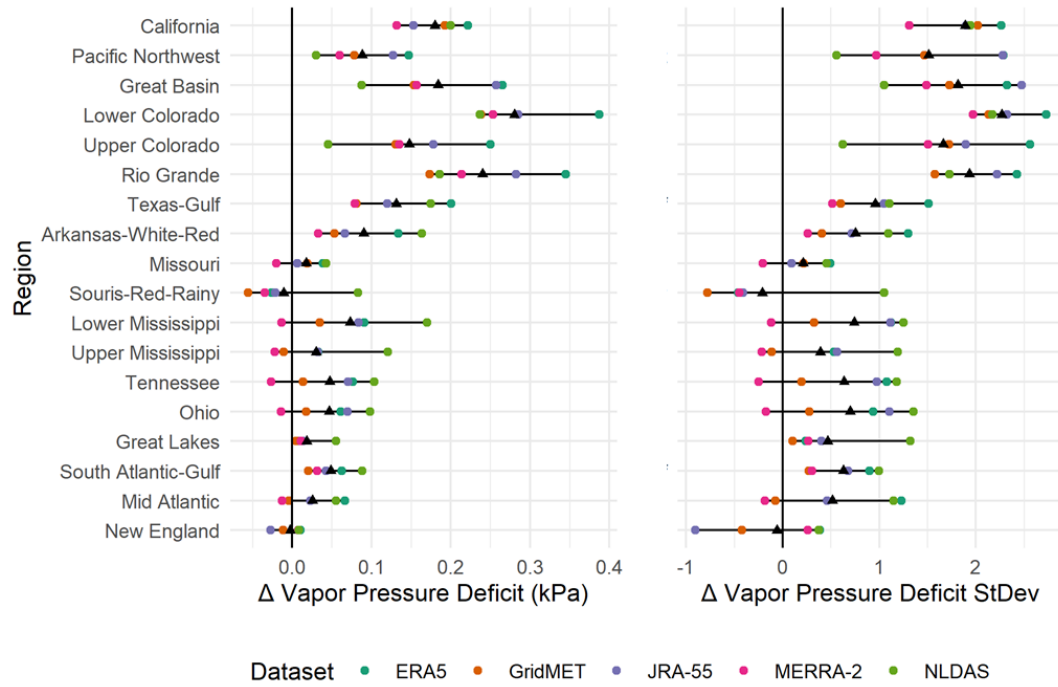
Supplemental Material



SI 1. Example timeseries and trends of ET₀, by dataset, for the Great Lakes Water Resource Region. Timeseries are based on fixed (solid lines; following Allen et al. 2005) and CO₂-adjusted (dashed lines; following Yang et al. 2019) surface resistance parameterizations. Trends are based on the Thiel-Sen slope estimator. On average, the predicted CO₂-adjusted ET₀ for this region in 2020 is 1.8% less than the predicted fixed surface resistance ET₀. Across all water resource regions and datasets, the CO₂-adjusted ET₀ in 2020 is 1.5% less than the fixed, on average. Annual mean CO₂ concentrations used for these calculations are available at <https://gml.noaa.gov/ccgg/trends/graph.html>.



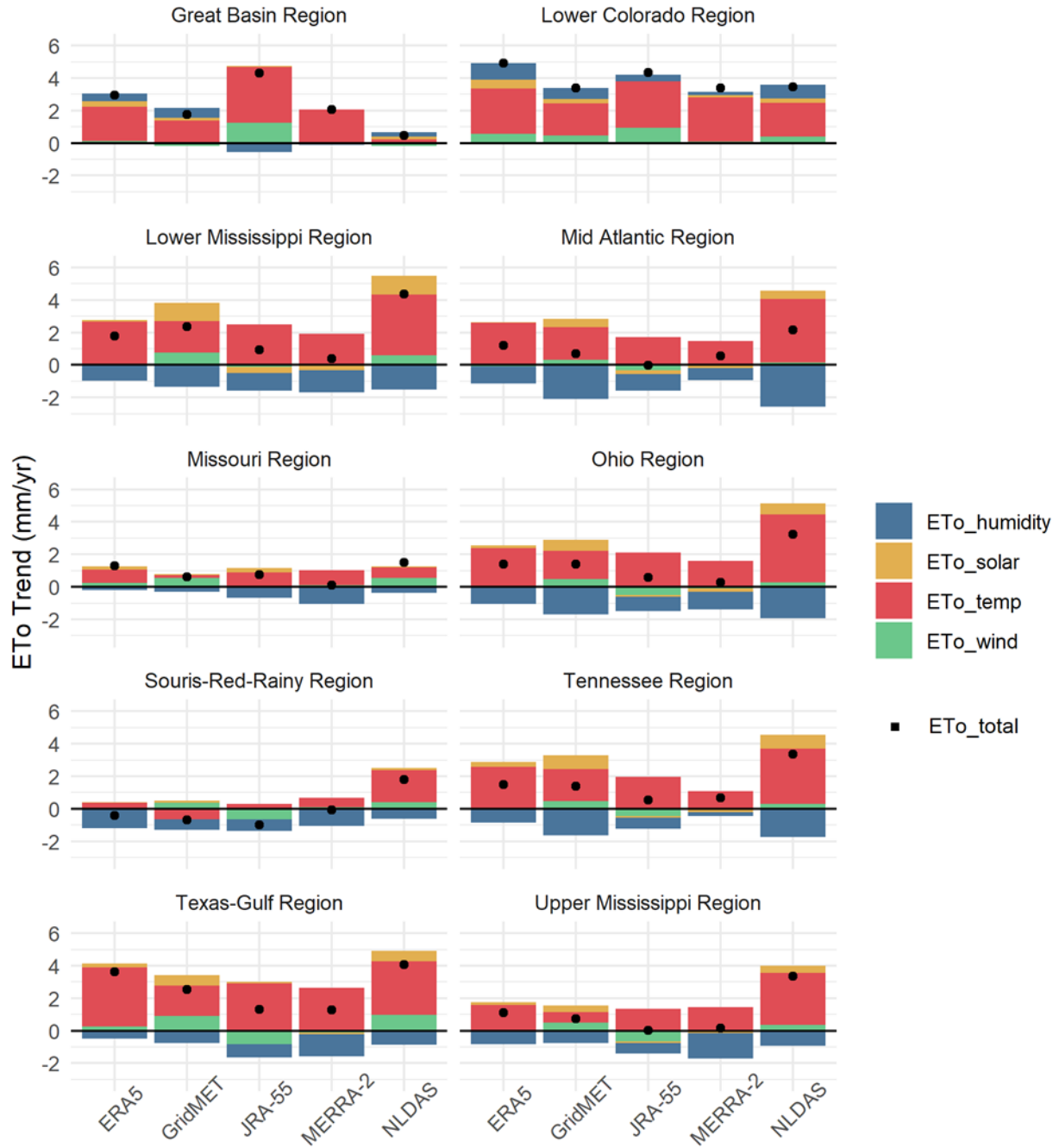
SI 2. Total change in annual values of each climate variable in units of standard deviations by USGS Water Resource Region and dataset. Trends in z-scores (1980-2000 baseline) of spatially averaged annual averages of each variable were calculated for each region and multiplied by 41 years. Black triangles indicate the average change among datasets.



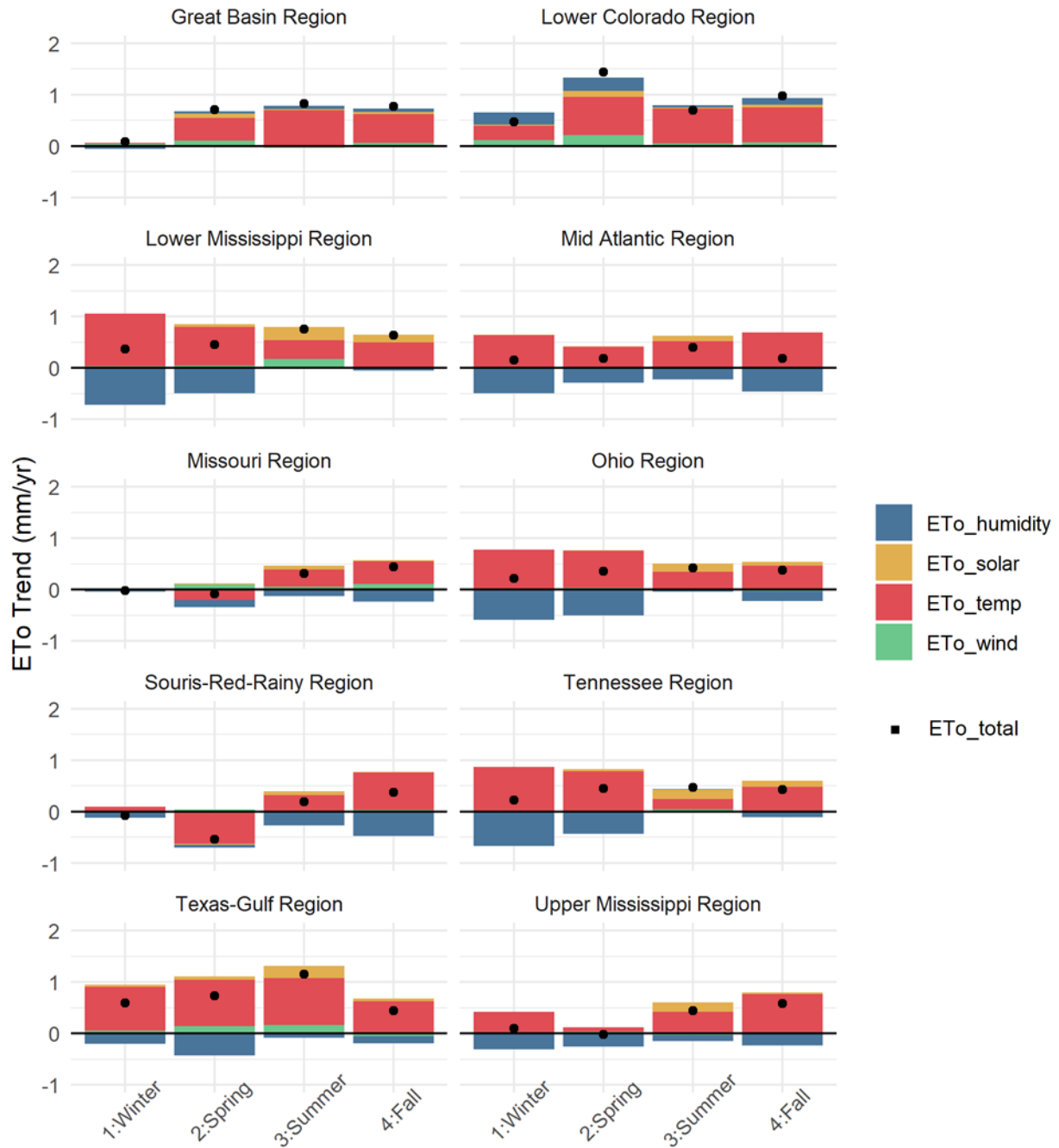
SI 3. Total change in annual values of vapor pressure deficit in raw units (left) and units of standard deviations (right) by USGS Water Resource Region and dataset. Trends (1980-2020) were calculated for each region and multiplied by 41 years. Black triangles indicate the average change among datasets.

	Temperature						Specific Humidity					
	ERA5	GridMET	JRA-55	MERRA-2	NLDAS	Average	ERA5	GridMET	JRA-55	MERRA-2	NLDAS	Average
California	0.64	0.66	0.69	0.83	0.75	0.71	0.24	0.24	0.06	0.10	0.16	0.16
Pacific Northwest	0.72	0.72	0.75	0.80	0.10	0.62	0.08	0.13	0.13	0.17	0.50	0.20
Great Basin	0.69	0.58	0.65	0.94	0.26	0.62	0.15	0.27	0.10	0.03	0.31	0.17
Lower Colorado	0.57	0.58	0.68	0.86	0.58	0.65	0.21	0.20	0.10	0.07	0.24	0.16
Upper Colorado	0.61	0.73	0.61	0.85	0.10	0.58	0.19	0.22	0.06	0.00	0.76	0.25
Rio Grande	0.61	0.59	0.69	0.89	0.68	0.69	0.18	0.14	0.08	0.01	0.08	0.10
Texas-Gulf	0.78	0.45	0.62	0.63	0.57	0.61	0.11	0.18	0.18	0.32	0.15	0.19
Arkansas-White-Red	0.71	0.49	0.70	0.65	0.74	0.66	0.01	0.09	0.20	0.32	0.04	0.13
Missouri	0.56	0.14	0.47	0.44	0.40	0.40	0.13	0.27	0.37	0.50	0.22	0.30
Souris-Red-Rainy	0.21	0.37	0.17	0.33	0.63	0.34	0.74	0.34	0.44	0.57	0.19	0.46
Lower Mississippi	0.69	0.37	0.61	0.53	0.53	0.55	0.26	0.26	0.27	0.38	0.22	0.28
Upper Mississippi	0.61	0.28	0.49	0.46	0.65	0.50	0.30	0.33	0.24	0.50	0.19	0.31
Tennessee	0.69	0.40	0.61	0.71	0.54	0.59	0.23	0.33	0.22	0.16	0.28	0.24
Ohio	0.67	0.38	0.59	0.54	0.59	0.55	0.27	0.37	0.24	0.36	0.27	0.30
Great Lakes	0.55	0.40	0.56	0.58	0.56	0.53	0.34	0.40	0.36	0.40	0.37	0.37
South Atlantic-Gulf	0.64	0.39	0.58	0.65	0.51	0.55	0.30	0.26	0.28	0.31	0.24	0.28
Mid Atlantic	0.69	0.41	0.52	0.61	0.54	0.56	0.28	0.43	0.31	0.31	0.36	0.34
New England	0.52	0.41	0.33	0.77	0.50	0.51	0.41	0.47	0.33	0.15	0.42	0.35
	Wind Speed						Solar Radiation					
	ERA5	GridMET	JRA-55	MERRA-2	NLDAS	Average	ERA5	GridMET	JRA-55	MERRA-2	NLDAS	Average
California	0.06	0.02	0.21	0.01	0.02	0.07	0.06	0.08	0.04	0.05	0.07	0.06
Pacific Northwest	0.06	0.07	0.05	0.00	0.19	0.07	0.13	0.08	0.07	0.03	0.21	0.10
Great Basin	0.04	0.08	0.23	0.02	0.23	0.12	0.12	0.08	0.01	0.01	0.20	0.08
Lower Colorado	0.12	0.14	0.23	0.03	0.11	0.13	0.11	0.08	0.00	0.04	0.07	0.06
Upper Colorado	0.09	0.02	0.28	0.10	0.05	0.11	0.11	0.03	0.05	0.05	0.09	0.07
Rio Grande	0.10	0.21	0.17	0.08	0.19	0.15	0.11	0.06	0.06	0.02	0.05	0.06
Texas-Gulf	0.06	0.21	0.18	0.03	0.17	0.13	0.06	0.16	0.02	0.03	0.11	0.08
Arkansas-White-Red	0.12	0.28	0.02	0.01	0.14	0.11	0.16	0.14	0.09	0.02	0.08	0.10
Missouri	0.17	0.52	0.03	0.06	0.33	0.22	0.14	0.07	0.14	0.01	0.04	0.08
Souris-Red-Rainy	0.03	0.21	0.39	0.07	0.13	0.16	0.02	0.08	0.00	0.04	0.05	0.04
Lower Mississippi	0.03	0.15	0.03	0.01	0.09	0.06	0.03	0.22	0.09	0.08	0.17	0.12
Upper Mississippi	0.02	0.21	0.24	0.03	0.07	0.12	0.07	0.18	0.03	0.01	0.09	0.08
Tennessee	0.00	0.10	0.14	0.03	0.05	0.06	0.08	0.17	0.03	0.10	0.14	0.10
Ohio	0.02	0.10	0.14	0.03	0.04	0.07	0.04	0.14	0.03	0.07	0.10	0.08
Great Lakes	0.03	0.11	0.08	0.01	0.03	0.05	0.09	0.09	0.00	0.01	0.04	0.04
South Atlantic-Gulf	0.02	0.12	0.09	0.01	0.06	0.06	0.04	0.23	0.06	0.04	0.18	0.11
Mid Atlantic	0.02	0.07	0.10	0.00	0.02	0.04	0.01	0.10	0.08	0.07	0.07	0.07
New England	0.01	0.01	0.32	0.01	0.00	0.07	0.06	0.11	0.02	0.06	0.08	0.07

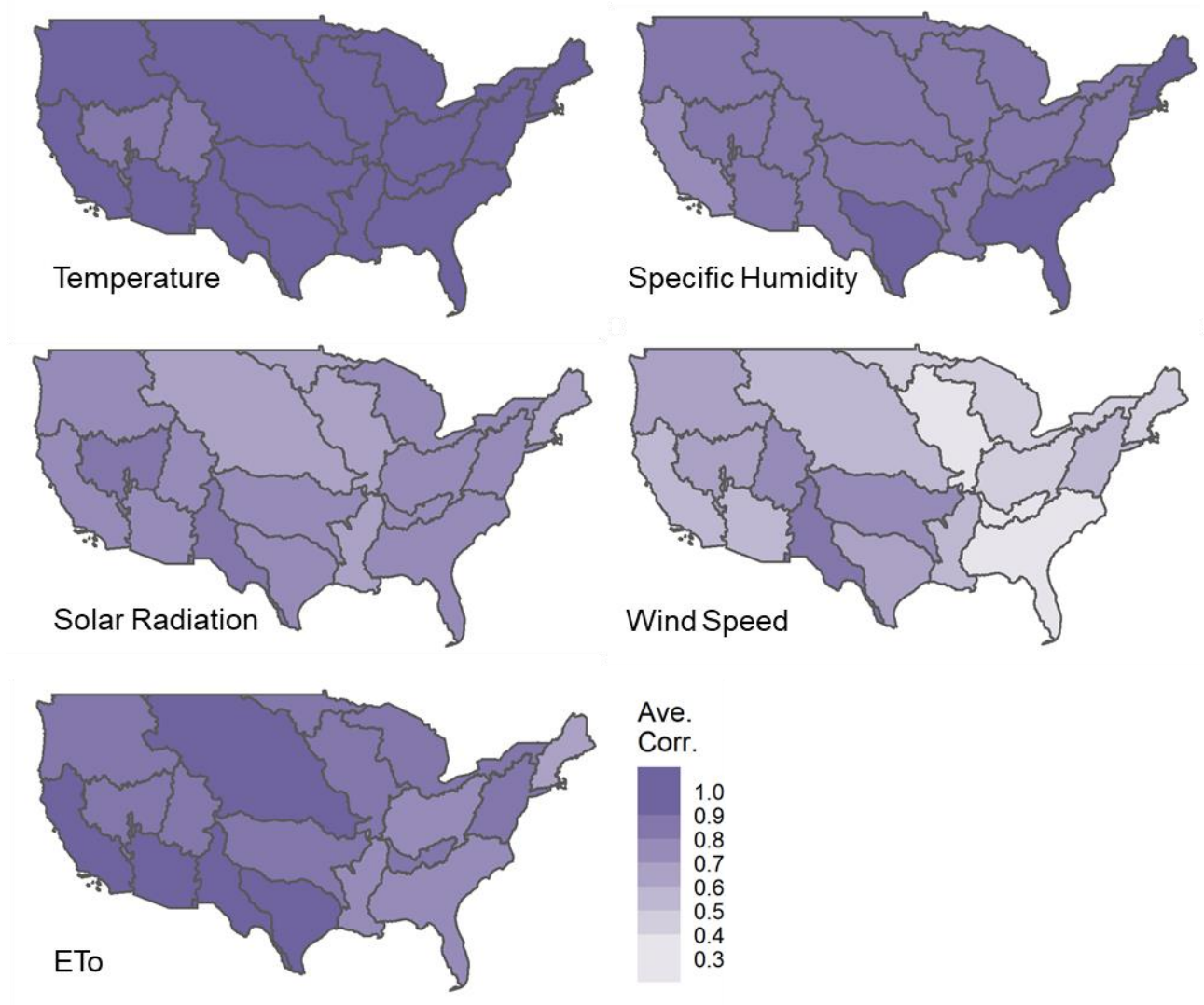
SI 4. Proportional contributions of climate drivers to ETo trends based on sensitivity analysis. To account for both positive and negative contributions, proportions are calculated as the absolute value of the trend contribution of the focal driver of interest (e.g., temperature) divided by the sum of absolute values of the trend contributions from all four drivers.



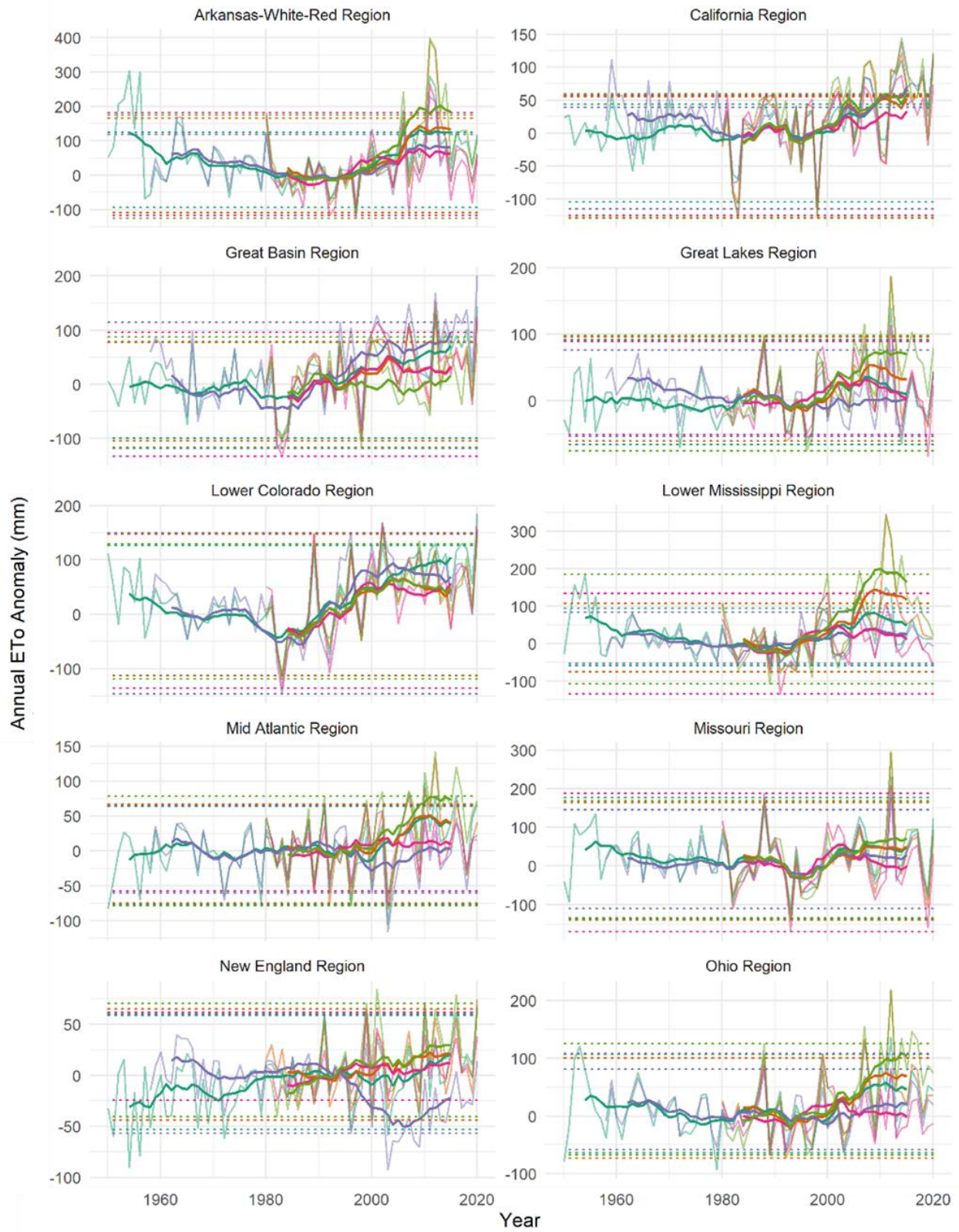
SI 5. Contributions of individual drivers to observed ETo trends by dataset, as determined through sensitivity analysis, for select USGS Water Resource Regions not included in main manuscript (see Fig. 1 for map locations). The black dots indicate the spatially-averaged ETo trend for each region and dataset as a point of reference.



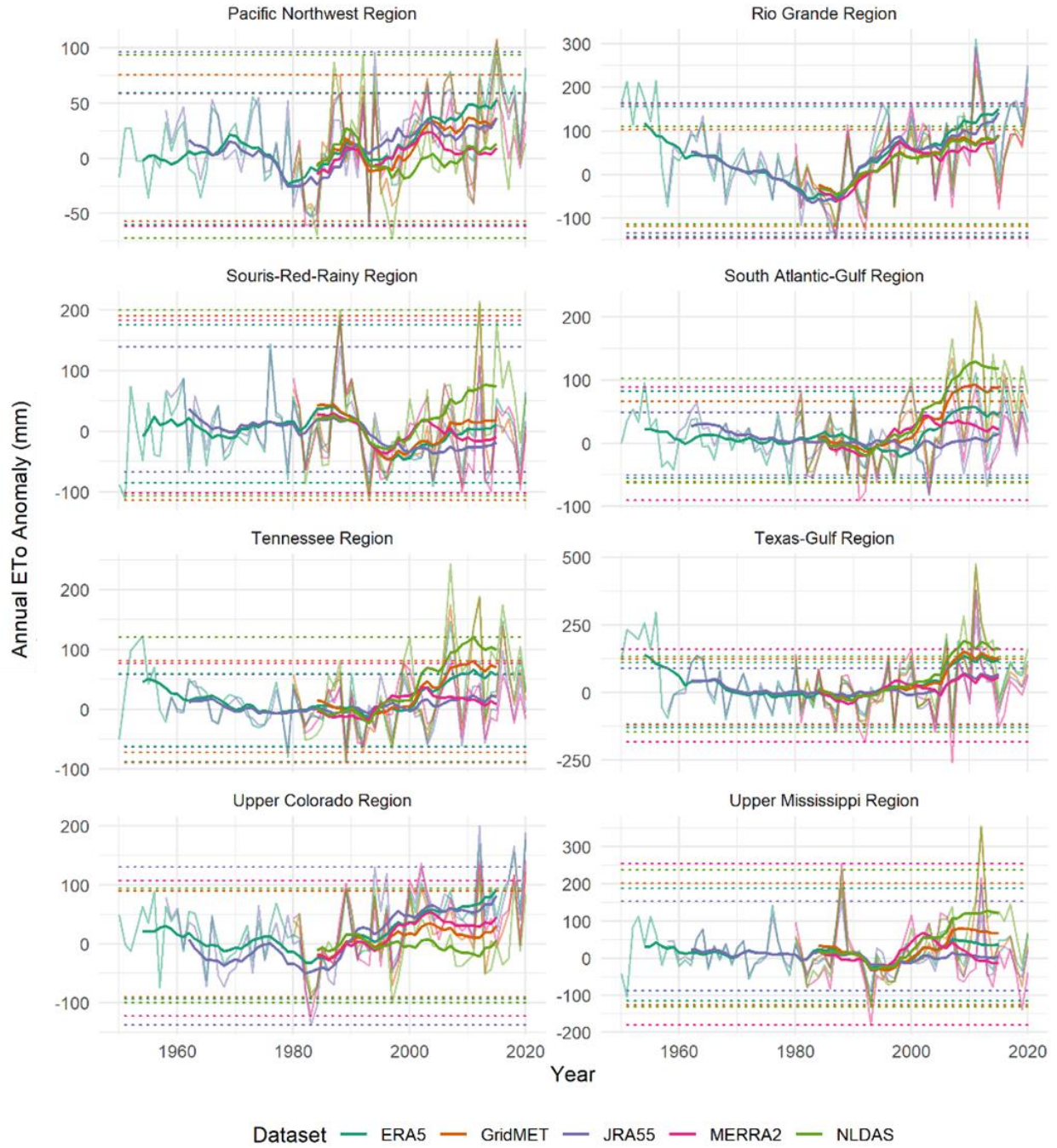
SI 6. Average contribution of individual drivers to observed ETo trends by season, as determined through sensitivity analysis, for select USGS Water Resource Regions not included in main manuscript (see Fig 1 for map locations). The black dots indicate the spatially-averaged ETo trend for each quarter and region as a point of reference.



SI 7. Average of (n=10) pairwise correlations among the 5 datasets for 1980-2020 annual values of each climate variable. Because wind and solar radiation are the same for NLDAS-2 and GridMET, pairwise correlations with GridMET are not included in the averages for these two variables.



Dataset — ERA5 — GridMET — JRA55 — MERRA2 — NLDAS



SI 8. Annual timeseries of ETo anomalies from the 1980-2000 average by water resource region and dataset. Dark lines show the 5-year running mean for each dataset. Dotted lines indicate the range of variability of the 1980-2000 baseline period for each dataset.