MDSCO-2023-4S

Maryland Climate Bulletin
Fall 2023

Prepared by
Dr. Alfredo Ruiz-Barradas
Maryland State Climatologist

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DEPARTMENT OF
ATMOSPHERIC &
OCEANIC SCIENCE
Sumant Nigam, Chair

Maryland
State
Climatologist
Office

Summary

Fall 2023 was warmer and drier than normal (i.e., 1991-2020 averages) after a season of changes that started with a warmer and wetter September, followed by a warmer and drier October, and ended with a colder and drier than normal November. Seasonal mean temperatures were in the 50 to 62°F range; maximum temperatures were between 60 and 72°F; minimum temperatures were in the 39 to 52°F range. Seasonal accumulated total precipitation was in the 7 to 10.3 inches range.

Maryland Regional Features (Figures 1-5, C1, and E1)

- Mean temperature was warmer than normal almost everywhere, notably in southern Dorchester, Calvert, and Saint Mary's counties (above 1.6°F), Howard, Anne Arundel, and Baltimore counties (above 1.4°F), and Garrett County (above 1.0°F). It was slightly colder than normal over Washington County.

- Maximum temperature was warmer than normal, especially over southern Dorchester, Calvert, Saint Mary's, Howard, Anne Arundel, and Baltimore counties (above 2.0°F) and Garrett County (above 1.0°F).

- Minimum temperature was warmer than normal over large areas of the state, particularly over southern Dorchester, Calvert, Saint Mary's, western Montgomery, and Garrett counties (above 1.0°F), over Howard, Anne Arundel, and Baltimore counties (above 0.6°F). It was slightly colder than normal over Washington and northern Frederick counties.

- Precipitation was below normal everywhere, notably over Harford, Cecil, and Kent counties (above 4.3 in deficit), Somerset and Worcester counties (above 4.0 in deficit), and over northern Carroll and Baltimore counties (above 3.1 in deficit).

- The partial water year 2024 (October 2023−November 2023) started below normal everywhere, especially over portions of Somerset, Worcester, and Wicomico counties (around 90 in deficit), northern Prince George's, Montgomery, Howard, Carroll, Baltimore, and northern Harford, Cecil, Caroline and Dorchester counties, (around 80 in deficit). These regions have between 50 to 60% of their climatological amounts at this time of the year.

Maryland Climate Divisions (Figures 6-7, B1, and B2)

- All the eight climate divisions were warmer and drier than normal; the Southeastern Shore climate division 1 had the largest precipitation deficit from normal (3.35 in; climate divisions 5 and 6 were close behind), while the Central Eastern Shore climate division 2, had the largest mean temperature departure from normal (1.2°F; climate divisions 3 and 4 were close behind).

- Statewide dry anomalies have persisted since last winter, but the drying in spring was the largest (−3.89 in). Statewide temperature anomalies were the warmest in fall (0.9°F, comparable to spring) after a colder-than-normal summer.

Historical Context (Figure 8, Tables A1 and A2)

- Fall 2023's statewide mean, maximum, and minimum temperatures (58.1, 68.8, and 47.4°F) were above the long-term (1895-2022) average and within 25% of the largest values on record. However, they remained far from the records established for the mean and maximum temperatures in 1931 (60.4 and 71.7°F) and the minimum temperature in 2018 (50.4°F). Statewide accumulated total precipitation (8.74 in) was below the long-term average, far from the driest fall in 1930 (3.51 in).
- Fall 2023's maximum temperatures at the county level reached the tenth warmest in Baltimore City and Worcester County, the eighth warmest in Howard County, the sixth warmest in Somerset and Wicomico counties, and the fifth warmest in Dorchester County.

Century-Plus Trends (Figures 9, 10)

- Statewide mean temperature in fall showed a significant warming trend (1.7°F/century), while the heating degree-days had a significant decreasing trend (139.49°F degree-days/century). Statewide accumulated total precipitation in fall showed a significant increasing trend (2.44 in/century), and the partial water (October−November) year also had a significant increasing trend (1.51 in/century).
- Regionally, fall mean temperatures showed significant warming trends everywhere in the state. It varies from ~1.0°F/century over Garrett and Allegany counties to around 2.0°F on the eastern shore and the counties in the Piedmont and northern Prince George's and Anne Arundel counties, with maximum values between Baltimore and Ellicott cities (2.4°F/century).
- Regionally, accumulated total precipitation in fall showed significant increasing trends throughout the state. The largest trends were over Saint Mary's Couty and Howard, Baltimore, and Harford counties (above 3 in/century).

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1. Introduction

The Maryland Climate Bulletin is issued by the Maryland State Climatologist Office (MDSCO), which resides in the Department of Atmospheric and Oceanic Science at the University of Maryland, College Park. This is the seasonal version of the bulletin.

Maryland's geography is challenging, with the Allegheny and Blue Ridge mountains to the west, Piedmont Plateau in the center, the Chesapeake Bay, and the Atlantic Coastal Plain to the east. The range of physiographic features and the eastern placement of the state within the expansive North American continent contribute to a comparatively wide range of climatic conditions.

The bulletin seeks to document and characterize seasonal surface climate conditions statewide, and climate division and county-wise, placing them in the context of regional and continental climate variability and change to help Marylanders interpret and understand recent climate conditions.

The seasonal surface climate conditions for fall 2023 are presented via maps of key variables, such as average surface air temperature, maximum surface air temperature, minimum surface air temperature, accumulated total precipitation, and their anomalies (i.e., departures from normal); they are complemented by partial water year conditions for the state (Section 3). Statewide and climate division averages for the season are compared against each other via scatter plots (Section 4). The seasonal statewide averages are placed in the context of the historical record via box and whisker plots in Section 5. Century-plus trends in statewide air temperature, heating degree-days, accumulated total precipitation, partial water year, and state maps of air temperature and accumulated total precipitation are presented in Section 6. Ancillary statewide, climate division, and county-level information is provided via tables and plots in Appendices A-B; climatology and variability maps are in Appendices C-E.

2. Data

Surface air temperatures, total precipitation, and heating degree-days data in this report are from the following sources:

- NOAA Monthly U.S. Climate *Gridded* Dataset at 5-km horizontal resolution (NClimGrid – Vose et al. 2014), which is available in a preliminary status at: https://www.ncei.noaa.gov/data/nclimgrid-monthly/access/
  Data was downloaded on 12/14/2023.

- NOAA Monthly U.S. Climate *Divisional* Dataset (NClimDiv – Vose et al. 2014), which is available in a preliminary status (v1.0.0-20231106) at: https://www.ncei.noaa.gov/pub/data/cirs/climdiv/
  Data was downloaded on 12/11/2023.

Water year data is calculated from the monthly total precipitation.

Some definitions:

About the seasons: Seasons are defined following the common three-month meteorological definitions as follows. Spring includes March, April, and May; summer includes June, July, and August; fall includes September, October, and November; and winter includes December, January, and February. Seasonal temperatures are obtained as the mean of the temperatures in the three months, while seasonal precipitation and degree days are obtained as the sum of their values in the three months (which in turn were obtained as the sum of their daily values).

About the anomalies: Anomalies for a given season (e.g., fall 2023) are the departures of the seasonal value from the corresponding season's 30-year average (i.e., from the average of 30 falls) during 1991-2020; the 30-year average (or mean) is the climate normal, or just the climatology. When the observed seasonal value exceeds its climatological value, it is referred to as above-normal (e.g., warmer than normal or wetter than normal) or a positive anomaly. In contrast, when this value is smaller than its climatological value, it is referred to as below-normal (e.g., colder than normal or dryer than normal) or negative anomaly.

About NOAA's Climate Divisions. The term "climate division" refers to one of the eight divisions in the state that represent climatically homogeneous regions, as determined by NOAA: https://www.ncei.noaa.gov/access/monitoring/dyk/us-climate-divisions

The eight climate divisions in Maryland are:

- Climate Division 1: Southeastern Shore. It includes the counties of Somerset, Wicomico, and Worcester.
- Climate Division 2: Central Eastern Shore. It includes the counties of Caroline, Dorchester, and Talbot.
- Climate Division 3: Lower Southern. It includes the counties of Calvert, Charles, and St. Mary's.
- Climate Division 4: Upper Southern. It includes the counties of Anne Arundel and Prince George's.
- Climate Division 5: Northeastern Shore. It includes the counties of Kent and Queen Anne's.
- Climate Division 6: North Central. It includes the counties of Baltimore, Carroll, Cecil, Frederick, Harford, Howard, Montgomery, and the city of Baltimore.
- Climate Division 7: Appalachian Mountains. It includes the counties of Allegany and Washington.
- Climate Division 8: Allegheny Plateau. It includes Garrett County.

Note that these Climate Divisions do not correspond with the *Physiographic Provinces* in the state, as the former follow county lines. Climate Division 8 follows the *Appalachian Plateau*

Province, Climate Division 7 follows the *Ridge and Valley Province*; however, Climate Division 6 includes the *Blue Ridge and the Piedmont Plateau provinces*, Climate Divisions 3, 4, and a portion of 6 include the *Upper Coastal Plain Province*, and Climate Divisions 1, 2, 5, and a portion of 6 include the *Lower Coastal Plain (or Atlantic Continental Shelf) Province*.

3. Fall 2023 Maps

A. Mean Temperatures

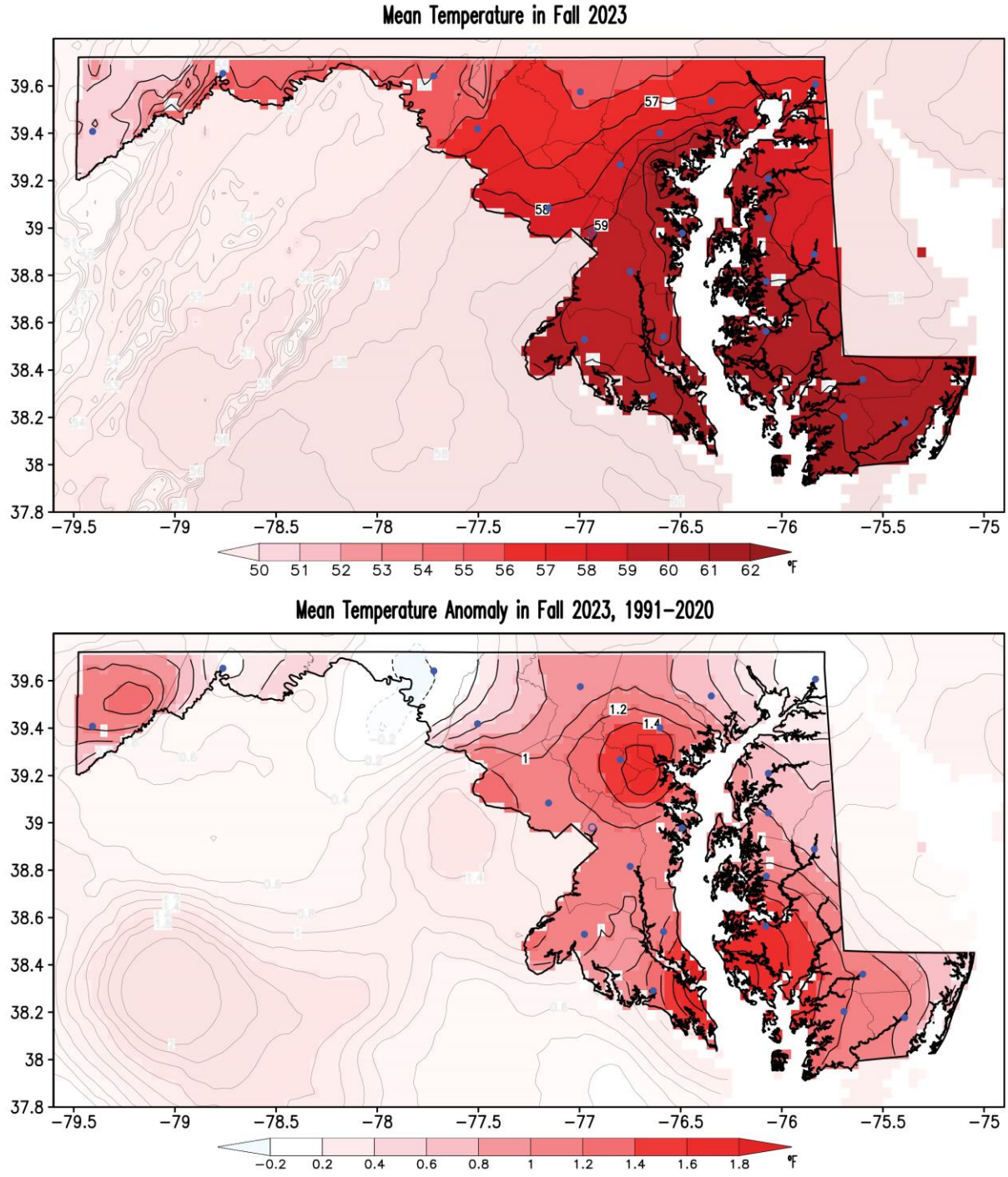

Figure 1. Seasonal mean surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for fall 2023. Temperatures are in °F following the color bar. Blue/red shading in the anomaly map marks colder/warmer than normal conditions. Note shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

B. Maximum Temperatures

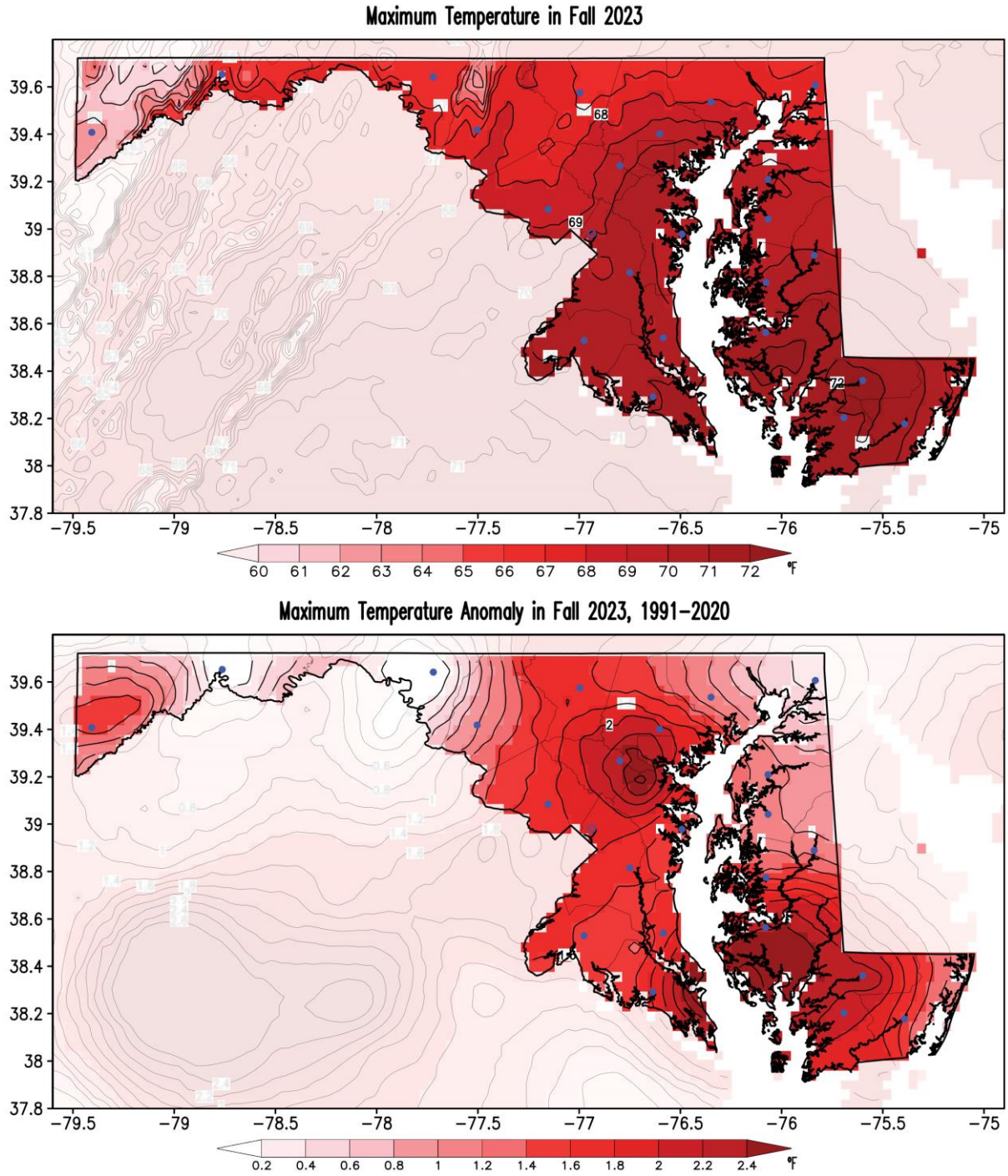

Figure 2. Seasonal maximum surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for fall 2023. Temperatures are in °F following the color bar. Red shading in the anomaly map marks warmer than normal conditions. Note shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

C. Minimum Temperatures

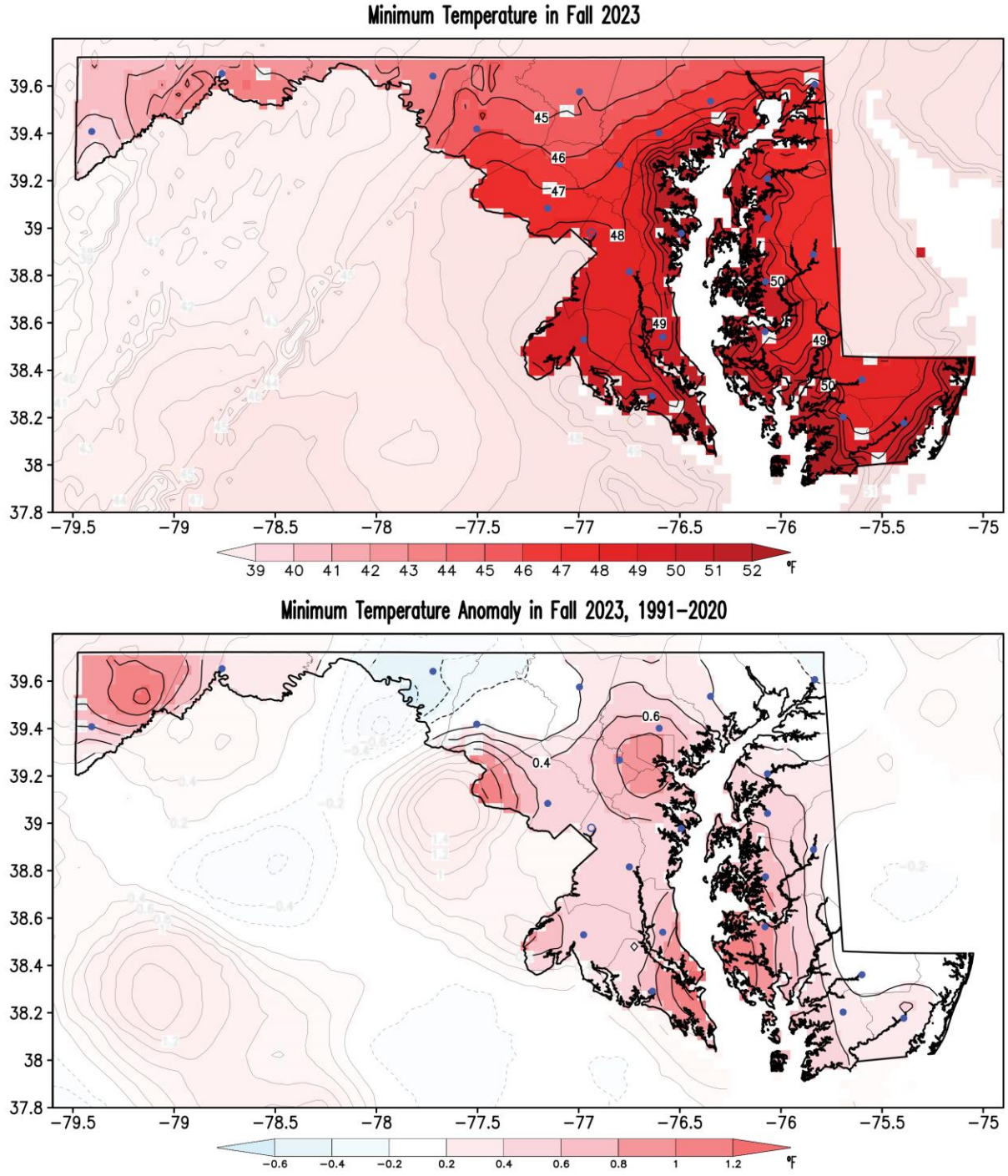

Figure 3. Seasonal minimum surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for fall 2023. Temperatures are in °F following the color bar. Blue/red shading in the anomaly map marks colder/warmer than normal conditions. Note shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

D. Precipitation

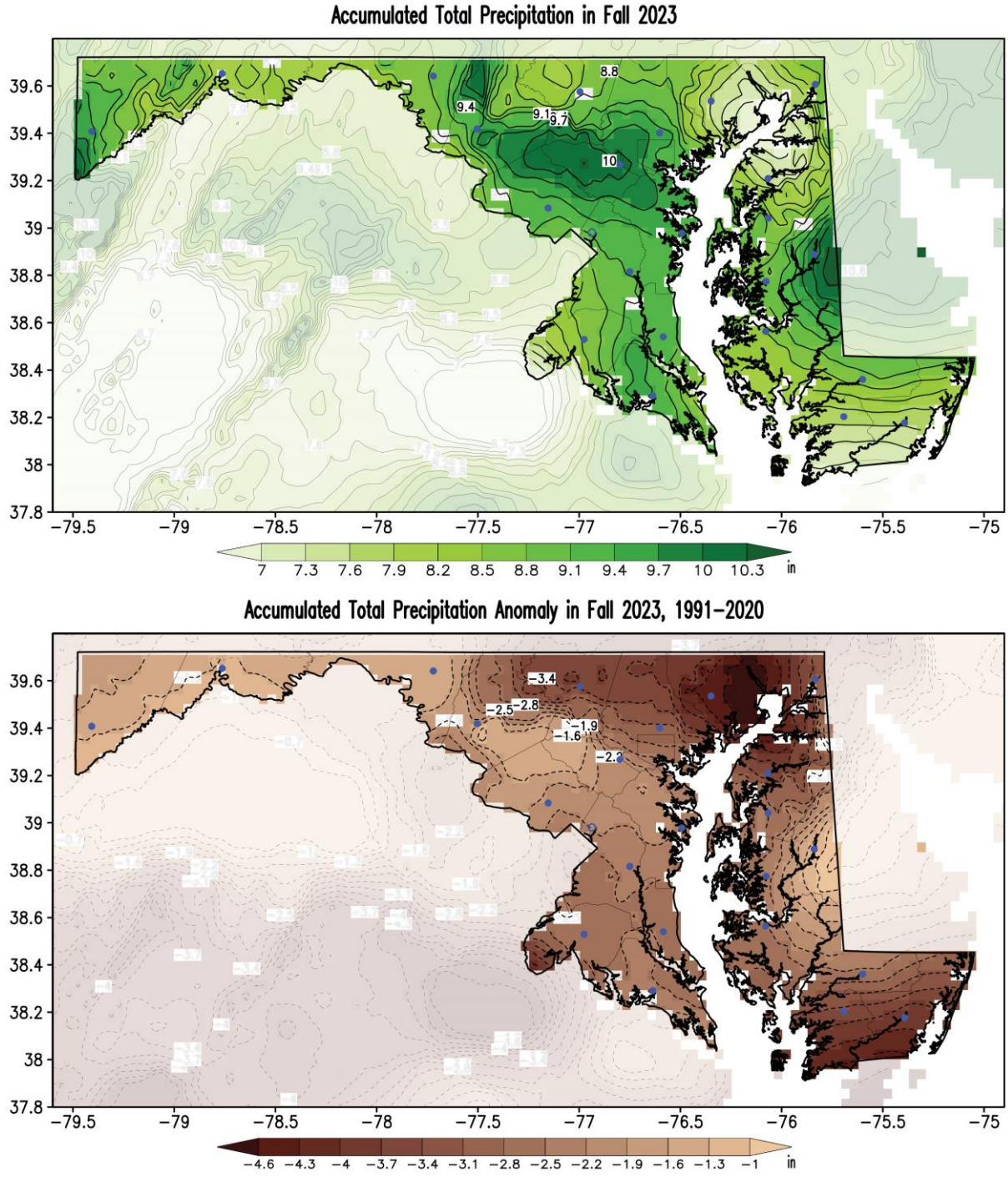

Figure 4. Seasonal accumulated total precipitation (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for fall 2023. Precipitation is in inches following the color bar. Brown shading in the anomaly map marks drier than normal conditions. Note shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

E. Partial Water Year (October 2023 – November 2023)

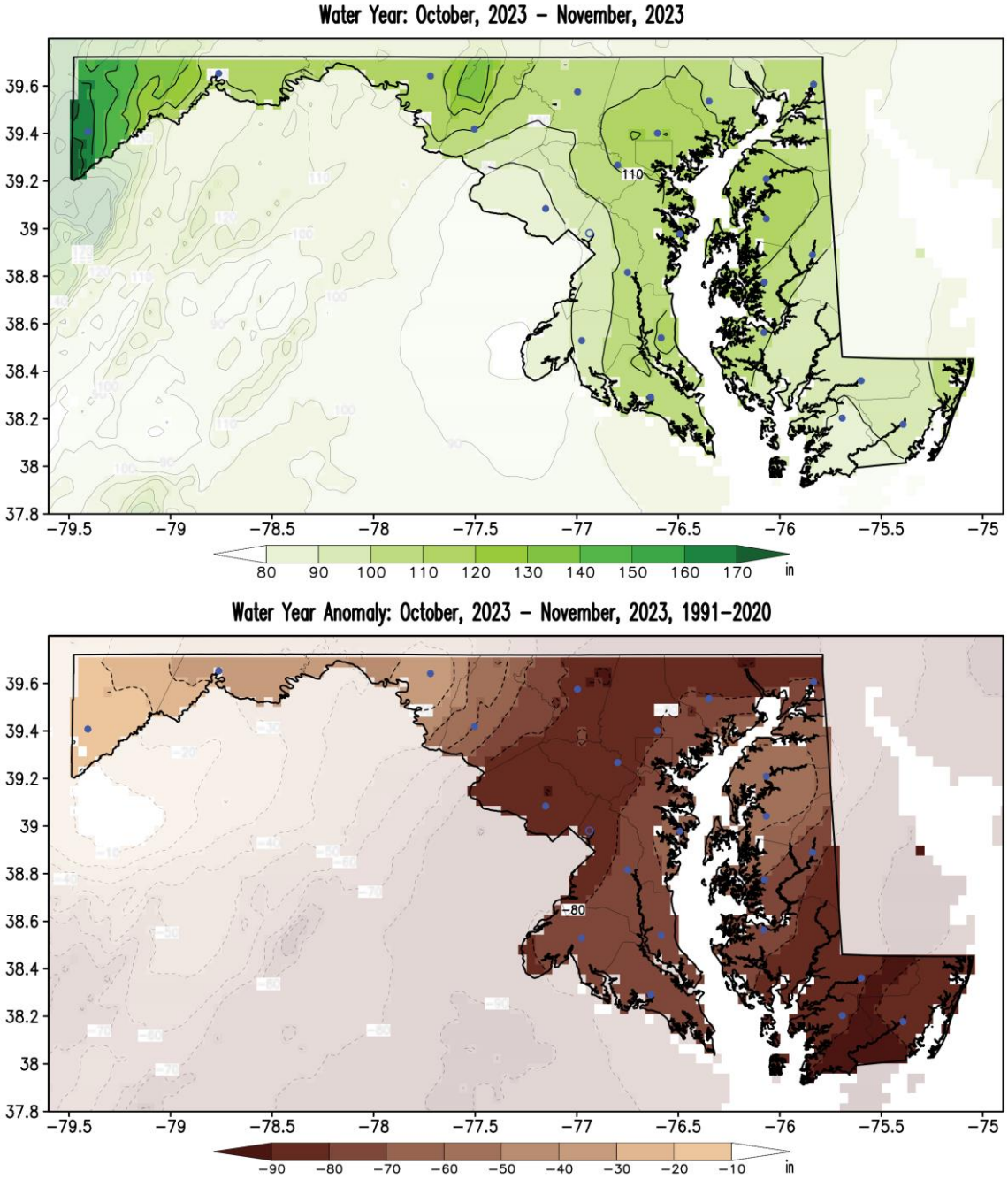

Figure 5. Partial water year until November 2023 (top panel), and its anomaly with respect to the 1991-2020 climatology (bottom panel). Water year is in inches following the color bar. Brown shading in the anomaly map marks drier than normal conditions. The current maps display the partial conditions from October 2023 to November 2023. The water year is the sum of total precipitation from the 1st of October to the 30th of September of the next year and is labeled by the year in which the measurements end; so, this is partial water year 2024. Total precipitation in the complete water year reflects winter snow accumulation and summer rainfall. Precipitation that falls during a water year reflects how much water will contribute to actual stream flow and groundwater inputs for that year. Note shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

4. Fall and Spring–Fall 2023 Climate Divisions Averages

A. Fall 2023 Scatter Plots

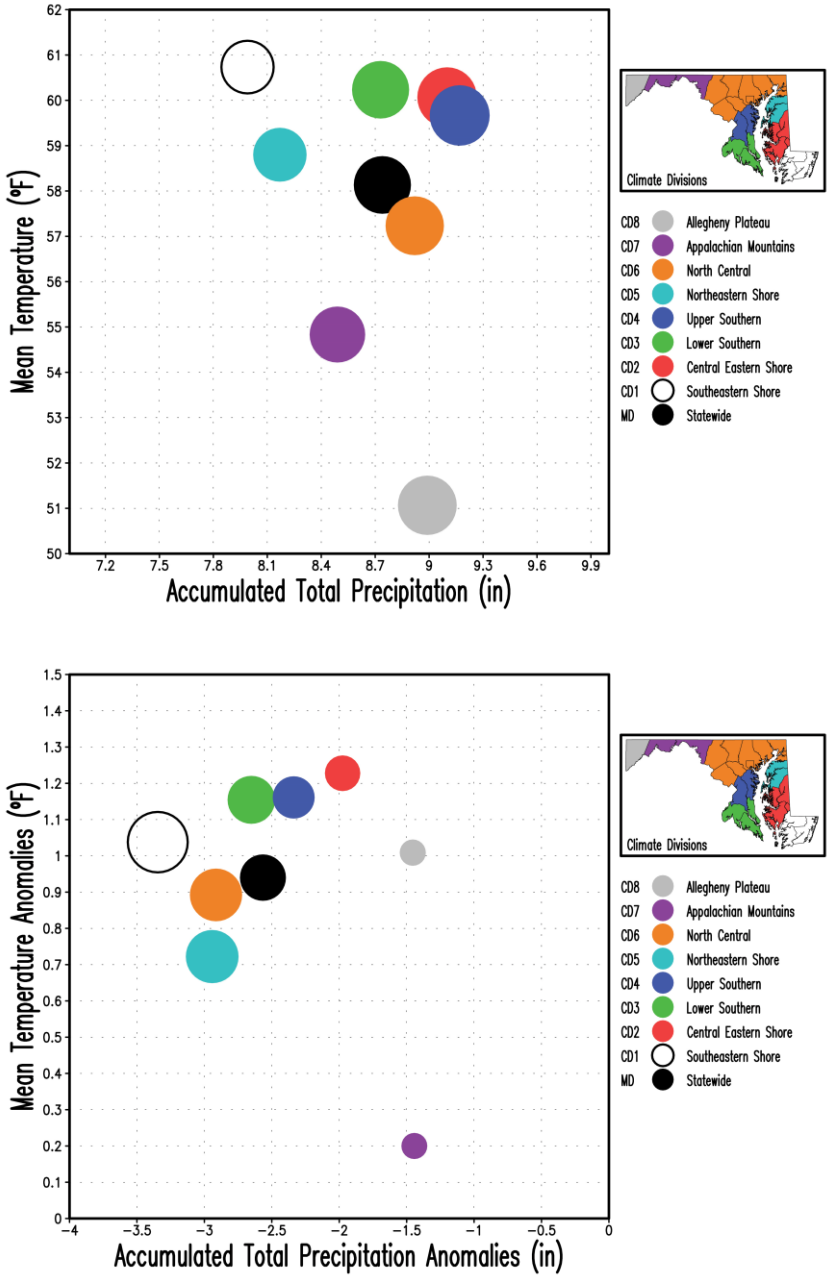

Figure 6. Scatter plots of Maryland (statewide) and Climate Divisions (CD#) seasonal mean surface air temperature vs. accumulated total precipitation for fall 2023. The upper panel shows the mean temperature and total precipitation, and the bottom panel displays their anomalies with respect to the 1991-2020 climatology. Temperatures are in °F and precipitation is in inches. The size of the circles is proportional to the total precipitation scaled down by the maximum precipitation (9.17 inches in CD4, top panel) and by the maximum precipitation anomaly (|-3.35| inches in CD1, bottom panel) among the nine regions. Note that the color of the filled circles corresponds to the color in the Climate Divisions according to the inset map.

B. Spring – Fall 2023 Scatter Plots

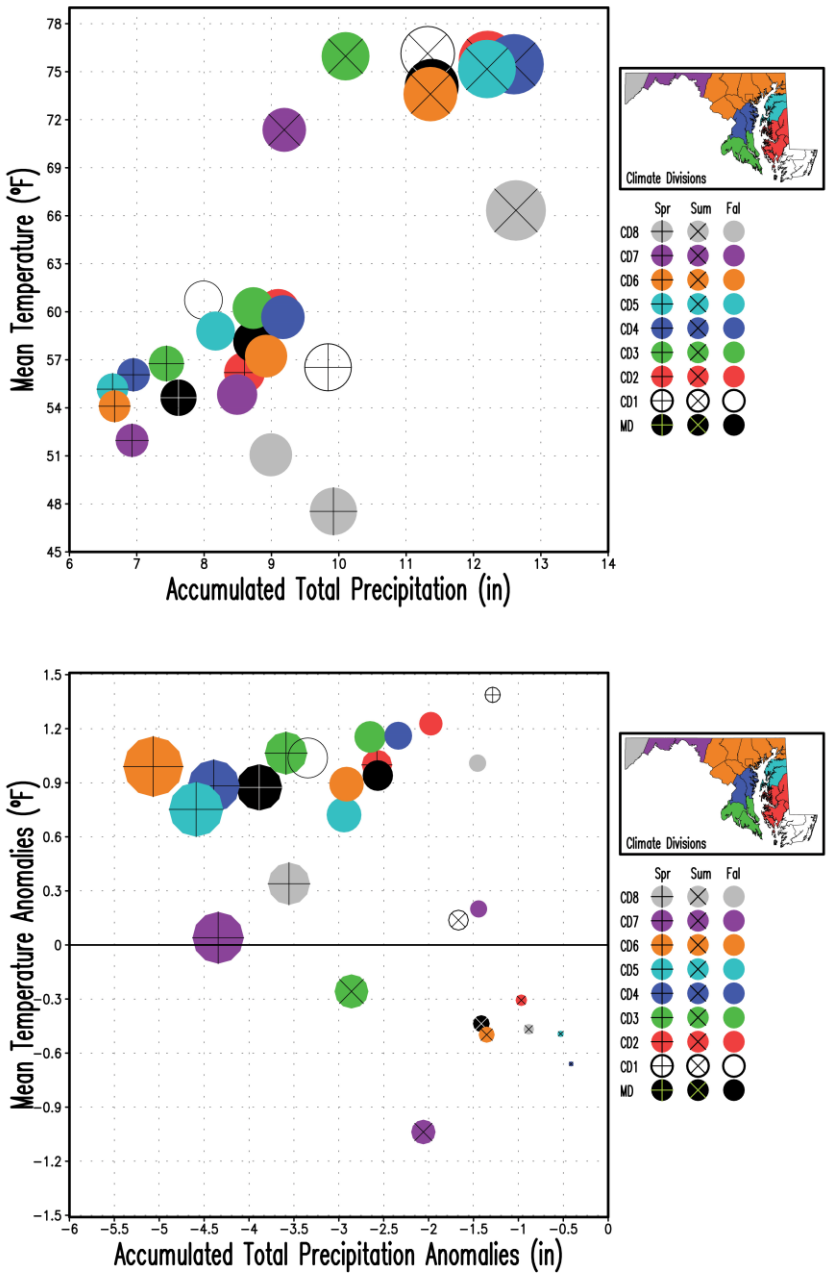

Figure 7. Scatter plots of Maryland (statewide) and Climate Divisions (CD#) seasonal mean surface air temperature vs. accumulated total precipitation for spring, summer, and fall 2023. The upper panel shows the mean temperature and total precipitation, and the bottom panel displays their anomalies with respect to the 1991-2020 climatology. Temperatures are in °F, and precipitation is in inches. The size of the circles is proportional to the total precipitation scaled down by the maximum precipitation (12.63 inches in CD8 in summer, top panel) and by the maximum precipitation anomaly (|-5.07| inches in CD6 in spring, bottom panel) among the nine regions and three months. Fall is displayed with filled circles only, while summer and spring are displayed with superposed multiplication and addition signs, respectively.

5. Fall 2023 Statewide Averages in the Historical Record

A. Box and Whisker Plots

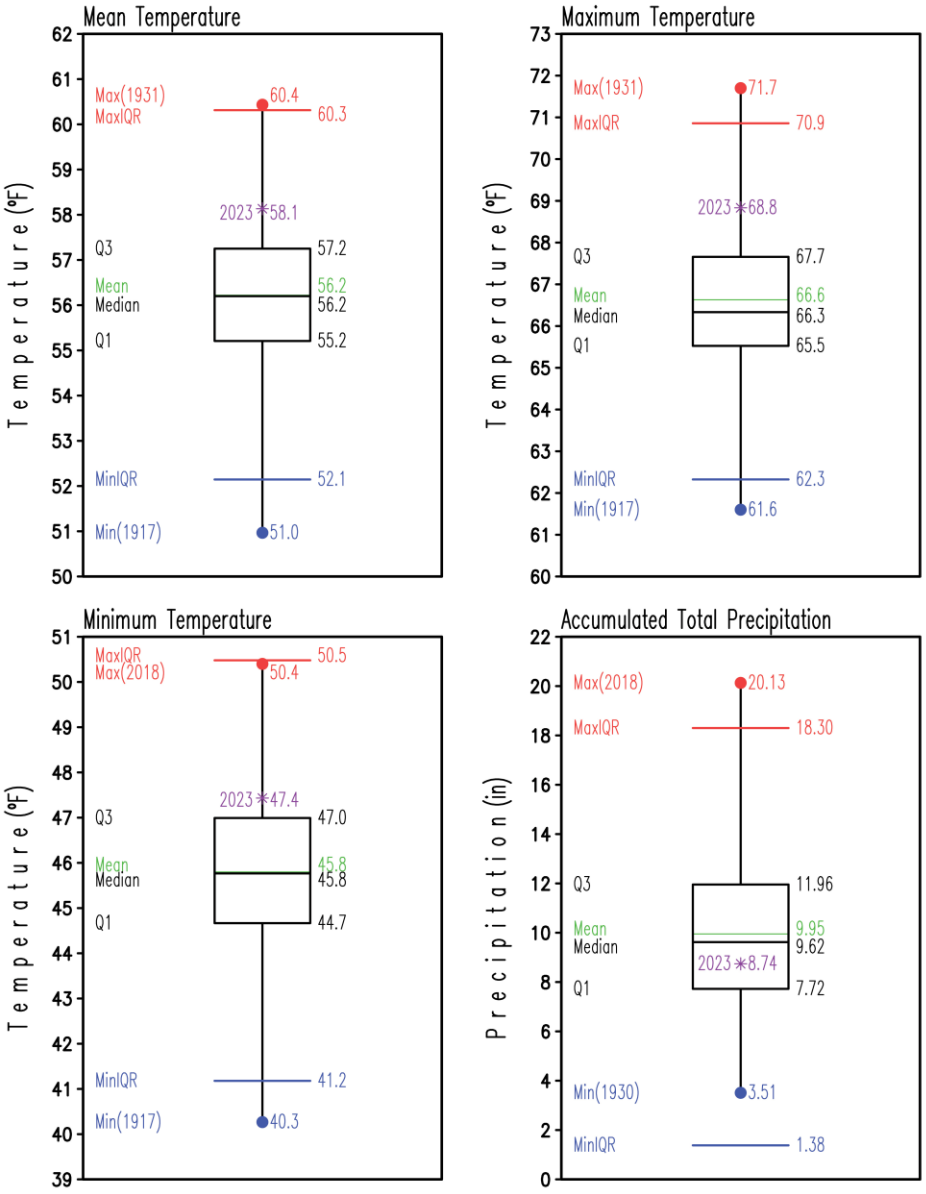

Figure 8. Box and Whisker plots of Maryland (statewide) seasonal mean (upper left), maximum (upper right), minimum (lower left) surface air temperatures, and accumulated total precipitation (lower right) for fall for the period 1895-2022. The label and asterisk in purple represent conditions for fall 2023. Statistics for the period 1895-2022 are labeled at the left side of each box and whisker plot and their values at their right. Temperatures are in °F and precipitation is in inches. The mean is the green line within the box, while the median is the black line within the box. The lower (Q1) and upper (Q3) quartiles, indicating the values of the variable that separate 25% of the smaller and larger values are the lower and upper horizontal black lines of the box, respectively. The blue and red dots mark the minimum and maximum values in the period at the end of the whiskers; the year of occurrence is shown in parenthesis. The blue and red horizontal lines represent extreme values defined by Q1-1.5×(Q3-Q1) and Q3+1.5×(Q3-Q1), respectively.

6. 1895-2023 Trends

A. Statewide Mean Temperature, Heating Degree-Days, Accumulated Total Precipitation, and Partial (October-November) Water Year

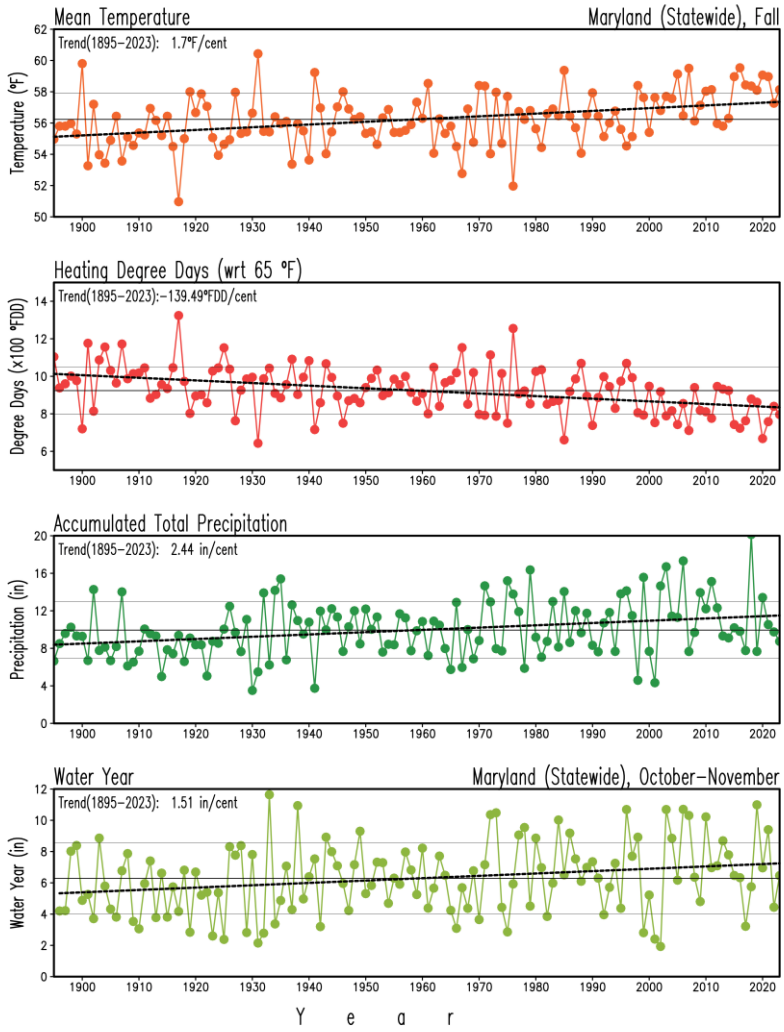

Figure 9. Maryland (statewide) mean surface air temperature, heating degree-days, accumulated total precipitation in fall, and partial (October-November) water year for the period 1895-2023. Temperature is in °F, heating degree-days is in °F degree-days (°FDD), and precipitation is in inches. The thin, continuous black lines in each panel display the long-term means (56.2°F, 923.65°FDD, 9.94 in, and 6.29 in, 1895-2023), and the double thin, continuous gray lines indicate the standard deviation (1.7°F, 124.20°FDD, 3.02 in, and 2.27 in) above/below the long-term mean. The thick dashed black lines show the long-term linear trend. Degree-days are the difference between the daily mean temperature (high temperature plus low temperature divided by two) and 65°F. It gives a general idea of how much energy is required to heat buildings; because energy demand is cumulative, degree-day totals for a season are the sum of each individual day's degree-day total (CPC, 2023). The warming temperature trend (1.7°F/century), the decreasing heating degree-days trend (−139.49°FDD/century), the increasing precipitation trend (2.44 in/century), and the increasing water year trend (1.51 in/century) are statistically significant at the 95% level (*Student's t-test* −Santer et al. 2000).

B. Temperature and Precipitation Maps

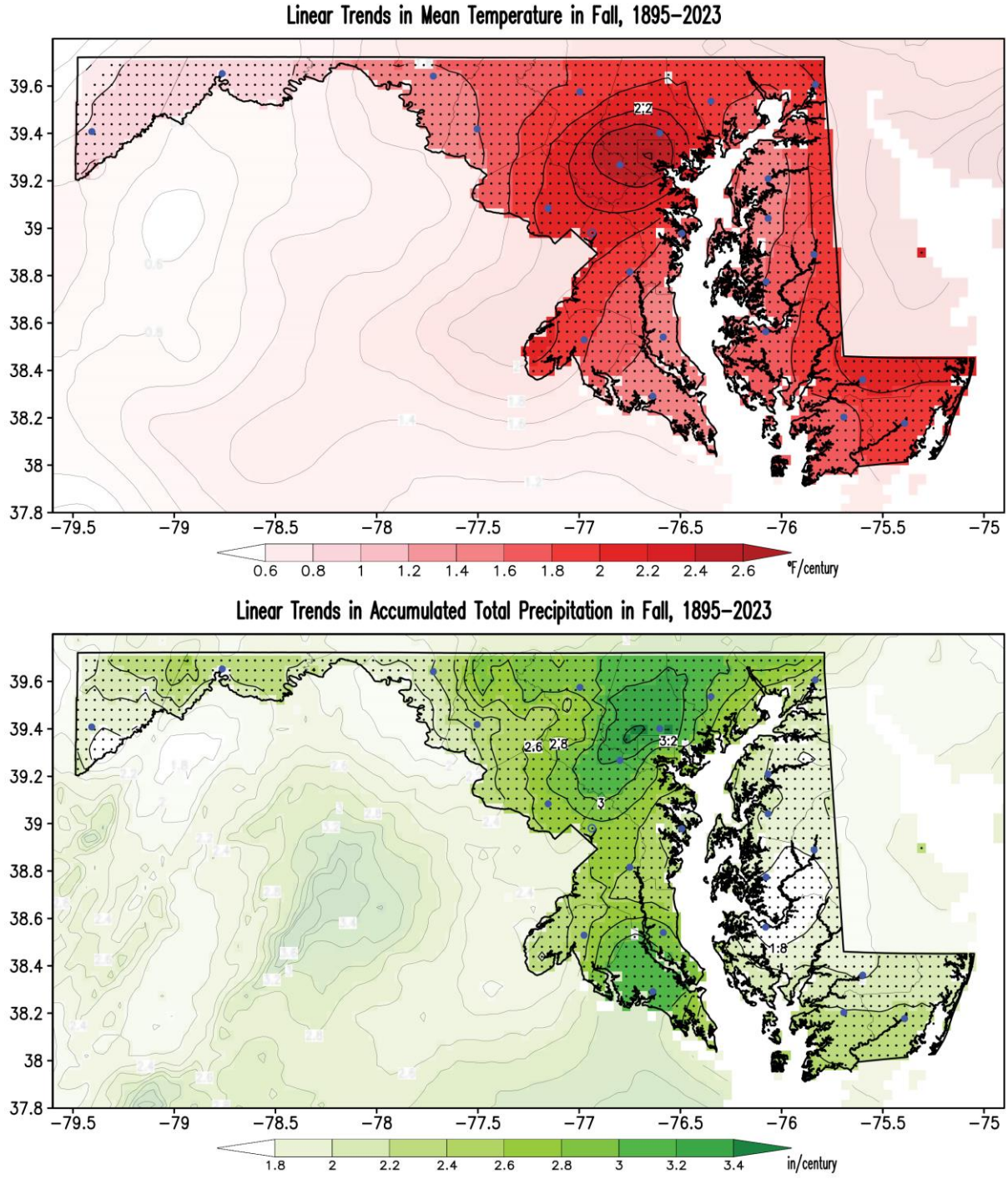

Figure 10. Linear trends in fall surface air mean temperature and accumulated total precipitation for the period 1895-2023. Temperatures are in °F/century, and precipitation is in inches/century following the color bars. Red shading in the temperature map marks warming trends. Green shading in the precipitation map shows wetting trends. Stippling in the maps shows regions where trends are statistically significant at the 95% level (*Student's t-test* −Santer et al. 2000). Note that shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

Appendix A. Fall 2023 Tables: Statewide, Climate Divisions, and Counties

A. Mean Temperature and Precipitation

Region	Mean Air Temperature (°F)	Rank (#)
Statewide	58.1	112
Climate Division 1	60.7	115
Climate Division 2	60.1	115
Climate Division 3	60.2	112
Climate Division 4	59.7	115
Climate Division 5	58.8	107
Climate Division 6	57.2	111
Climate Division 7	54.8	96
Climate Division 8	51.1	103
Allegany	54.5	96
Anne Arundel	60.0	114
Baltimore	57.7	113
Baltimore City	60.0	119
Calvert	60.3	115
Caroline	58.9	111
Carroll	56.0	112
Cecil	57.4	100
Charles	60.0	112
Dorchester	60.8	119
Fredrick	56.3	102
Garrett	51.1	103
Harford	57.5	108
Howard	57.8	117
Kent	58.8	107
Montgomery	57.9	115
Prince George's	59.3	113
Queen Anne's	58.9	108
Saint Mary's	60.6	114
Somerset	61.3	117
Talbot	60.1	114
Washington	55.2	95
Wicomico	60.3	117
Worcester	60.6	110

Region	Acc. Total Precipitation (in)	Rank (#)
Statewide	8.74	51
Climate Division 1	7.99	40
Climate Division 2	9.10	55
Climate Division 3	8.73	57
Climate Division 4	9.17	63
Climate Division 5	8.17	41
Climate Division 6	8.92	51
Climate Division 7	8.49	64
Climate Division 8	8.99	59
Allegany	8.22	66
Anne Arundel	9.46	63
Baltimore	9.13	49
Baltimore City	9.51	63
Calvert	9.09	59
Caroline	9.80	73
Carroll	8.86	49
Cecil	7.88	32
Charles	8.32	50
Dorchester	8.61	50
Fredrick	9.25	63
Garrett	8.99	59
Harford	7.71	34
Howard	10.05	72
Kent	7.76	36
Montgomery	9.39	65
Prince George's	9.07	61
Queen Anne's	8.42	43
Saint Mary's	9.17	63
Somerset	7.47	36
Talbot	8.88	51
Washington	8.76	65
Wicomico	8.62	49
Worcester	7.92	39

Table A1. Seasonal mean surface air temperature (left) and accumulated total precipitation (right) at Maryland (statewide), climate division, and county levels for fall 2023. Temperatures are in °F, and precipitation is in inches. The rank is the order that the variable for fall 2023 occupies among the 129 falls after the 129 values have been arranged from the lowest to the highest in the *standard competition ranking method*. The closer to 129 the rank, the larger (i.e., warmer/wetter) the value of the surface variable is in the record; similarly, the closer to 1 the rank is, the smaller (i.e., the colder/drier) the value of the surface variable is in the record.

B. Maximum and Minimum Temperatures

Region	Maximum Air Temperature (°F)	Rank (#)
Statewide	68.8	112
Climate Division 1	71.4	122
Climate Division 2	71.0	121
Climate Division 3	70.8	115
Climate Division 4	70.1	115
Climate Division 5	69.2	108
Climate Division 6	68.0	112
Climate Division 7	66.3	92
Climate Division 8	61.6	94
Allegany	66.0	87
Anne Arundel	70.2	115
Baltimore	68.6	118
Baltimore City	70.4	120
Calvert	70.5	118
Caroline	70.2	113
Carroll	67.3	114
Cecil	67.5	107
Charles	70.7	109
Dorchester	71.7	125
Fredrick	67.1	106
Garrett	61.6	94
Harford	67.9	111
Howard	68.8	122
Kent	68.9	108
Montgomery	68.4	115
Prince George's	70.1	115
Queen Anne's	69.3	109
Saint Mary's	71.0	119
Somerset	71.6	124
Talbot	70.2	115
Washington	66.6	94
Wicomico	71.8	124
Worcester	70.9	120

Region	Minimum Air Temperature (°F)	Rank (#)
Statewide	47.4	106
Climate Division 1	50.2	102
Climate Division 2	49.2	106
Climate Division 3	49.7	107
Climate Division 4	49.2	110
Climate Division 5	48.4	105
Climate Division 6	46.4	106
Climate Division 7	43.4	96
Climate Division 8	40.5	110
Allegany	43.0	103
Anne Arundel	49.9	110
Baltimore	46.8	110
Baltimore City	49.7	112
Calvert	50.0	110
Caroline	47.6	100
Carroll	44.8	104
Cecil	47.3	101
Charles	49.2	110
Dorchester	49.9	108
Fredrick	45.4	98
Garrett	40.5	110
Harford	47.0	103
Howard	46.7	109
Kent	48.7	106
Montgomery	47.4	110
Prince George's	48.5	107
Queen Anne's	48.5	105
Saint Mary's	50.3	106
Somerset	50.9	104
Talbot	49.9	107
Washington	43.7	87
Wicomico	48.8	100
Worcester	50.4	101

Table A2. Seasonal maximum (left) and minimum (right) surface air temperatures at Maryland (statewide), climate division, and county levels for fall 2023. Temperatures are in °F. The rank is the order that the variable for fall 2023 occupies among the 129 falls after the 129 values have been arranged from the lowest to the highest using the *standard competition ranking method*. The closer to 129 the rank, the larger (i.e., the warmer) the value of the surface variable is in the record; similarly, the closer to 1 the rank is, the smaller (i.e., the colder) the value of the surface variable is in the record.

Appendix B. Fall 2023 Bar Graphs: Statewide, Climate Divisions, and Counties

A. Temperatures and Precipitation

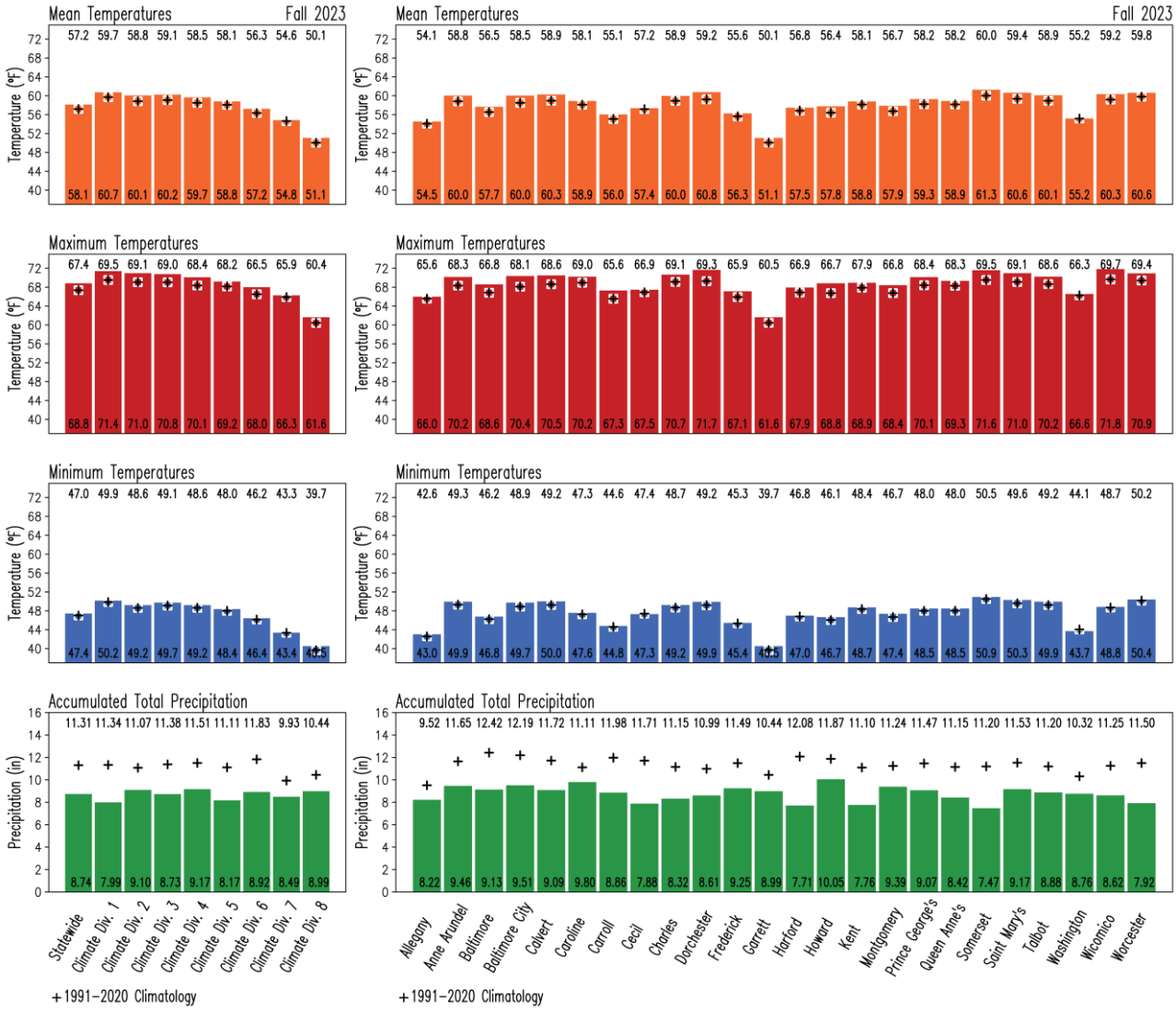

Figure B1. Seasonal surface variables in Maryland for fall 2023. Color bars represent the variables as follows: mean surface air temperature (orange), maximum surface air temperature (red), minimum surface air temperature (blue) and accumulated total precipitation (green) at statewide and climate division (left column), and at county (right column) levels. Temperatures are in °F, and precipitation is in inches. The numbers at the base of the bars indicate the magnitude of the variable for fall 2023. For comparison, the corresponding 1991-2020 climatological values for fall are displayed as black addition signs, and their magnitudes are shown at the top of the panels.

B. Temperature and Precipitation Anomalies

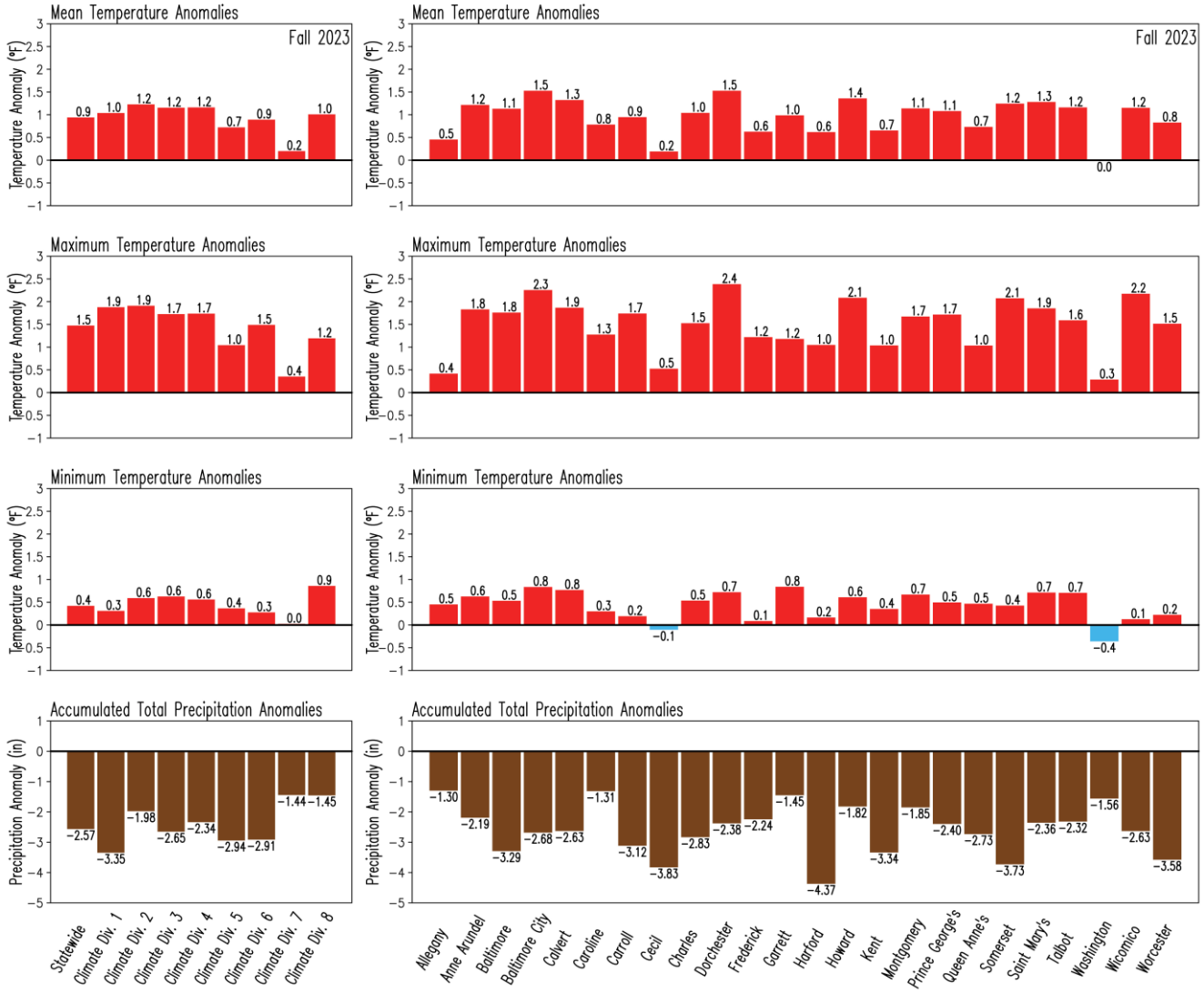

Figure B2. Anomalies of the seasonal surface variables in Maryland for fall 2023. Anomalies are with respect to the 1991-2020 climatology. Red/blue color represents positive/negative anomalies for mean surface air temperature (upper row), maximum surface air temperature (second row from top), and minimum surface air temperature (third row from top) while brown color indicates negative anomalies in accumulated total precipitation (bottom row) at statewide and climate division (left column), and at county (right column) levels. Temperatures are in °F and precipitation is in inches. The numbers outside of the bars indicate the magnitude of the anomaly for fall 2023.

Appendix C. Fall 1991-2020 Climatology Maps

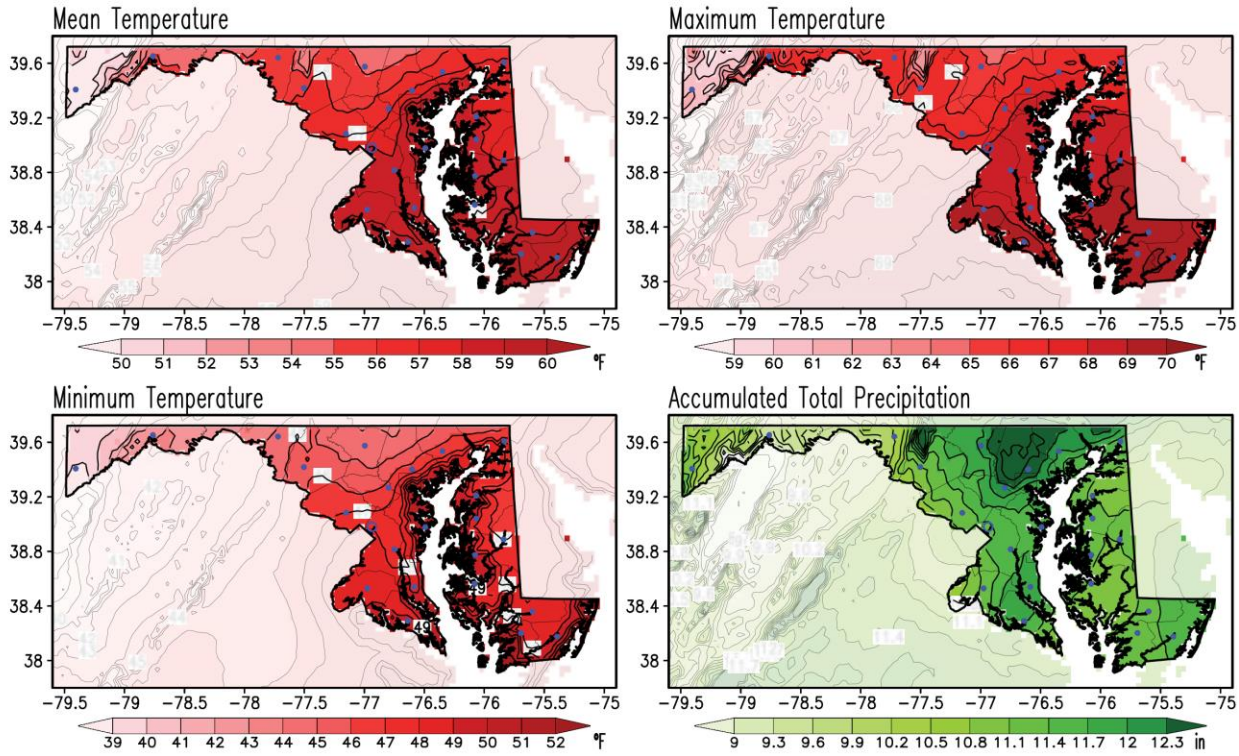

Figure C1. Fall climatology of the seasonal mean, maximum and minimum surface air temperatures, and accumulated total precipitation for the period 1991-2020. Temperatures are in °F, and precipitation is in inches according to the color bars. This is the current climate normal against which the fall 2023 conditions are compared to obtain the fall 2023 anomalies. Note that shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

Weather and climate are closely related, but they are not the same. Weather represents the state of the atmosphere (temperature, precipitation, humidity, wind, sunshine, cloudiness, etc.) at any given time. On the other hand, climate refers to the time average of the weather elements when the average is over long periods. If the average period is long enough, we can start to characterize the climate of a particular region.

It is customary to follow the World Meteorological Organization (WMO) recommendation and use 30 years for the average. The 30-year averaged weather data is traditionally known as Climate Normal (Kunkel and Court 1990), which is updated every ten years (WMO 2017). Establishing a climate normal or climatology is important as it allows one to compare a specific day, month, season, or even another normal period with the current normal. Such comparisons characterize anomalous weather and climate conditions, climate variability and change, and help define extreme weather and climate events (Arguez et al. 2012).

Appendix D: The Water Year 1991-2020 Climatology, and October 2023 – November 2023 as Percentage of Climatology

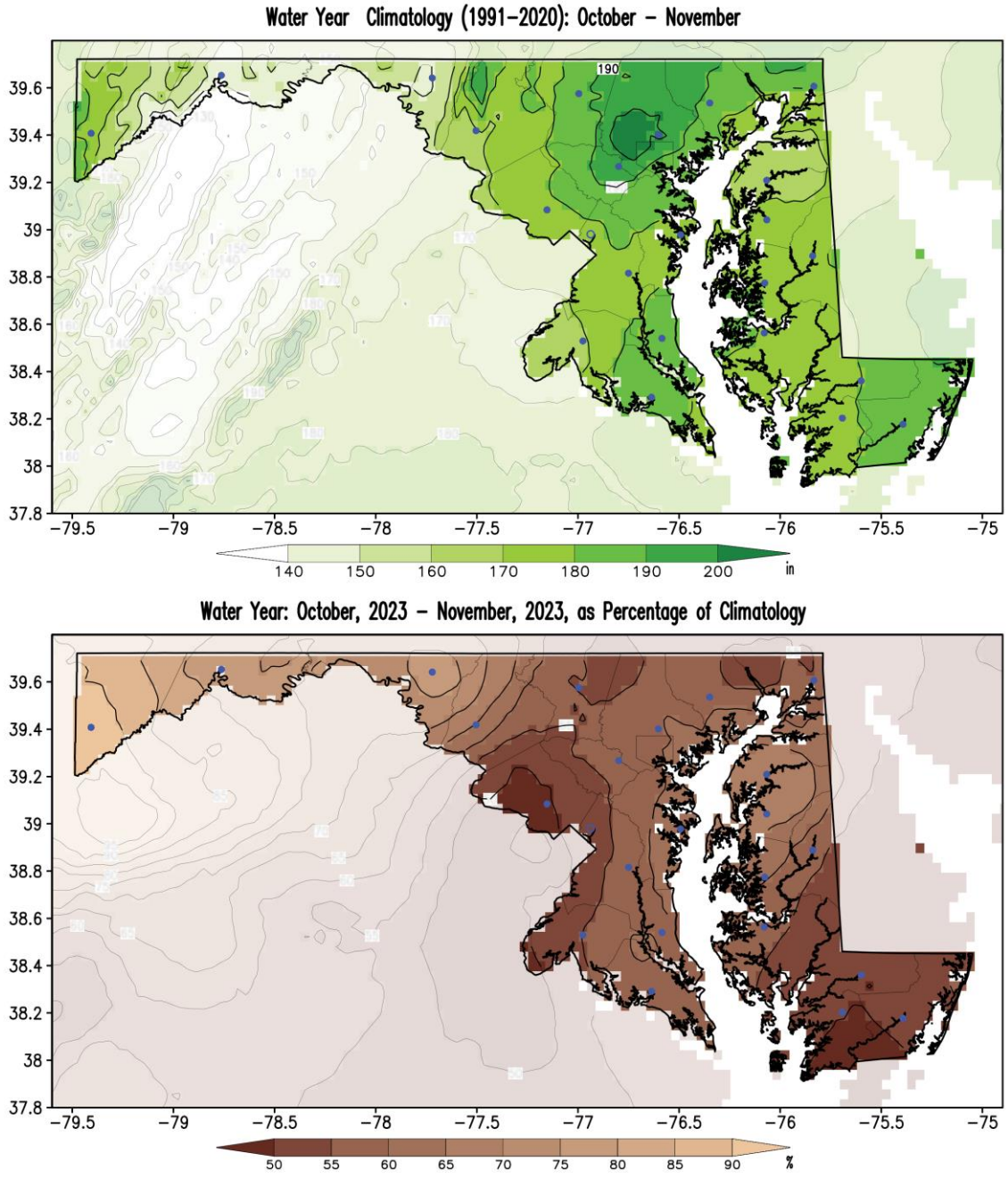

Figure D1. Climatology of the partial water year (October-November, top panel), and current partial water year (October 2023 – November 2023) as a percentage of the climatology (bottom panel). Climatology is for the period 1991-2020. The water year climatology is in inches following the color bar. The current water year as a percentage of climatology is obtained by dividing the current water year (Figure 5 upper panel) by the climatology (upper panel) and multiplying the ratio by 100; hence units are in percent (%). Brown shading in the percentage map highlights regions where the current water year is smaller than normal. Note that shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

Appendix E. Fall Standard Deviation and Fall 2023 Standardized Anomalies Maps

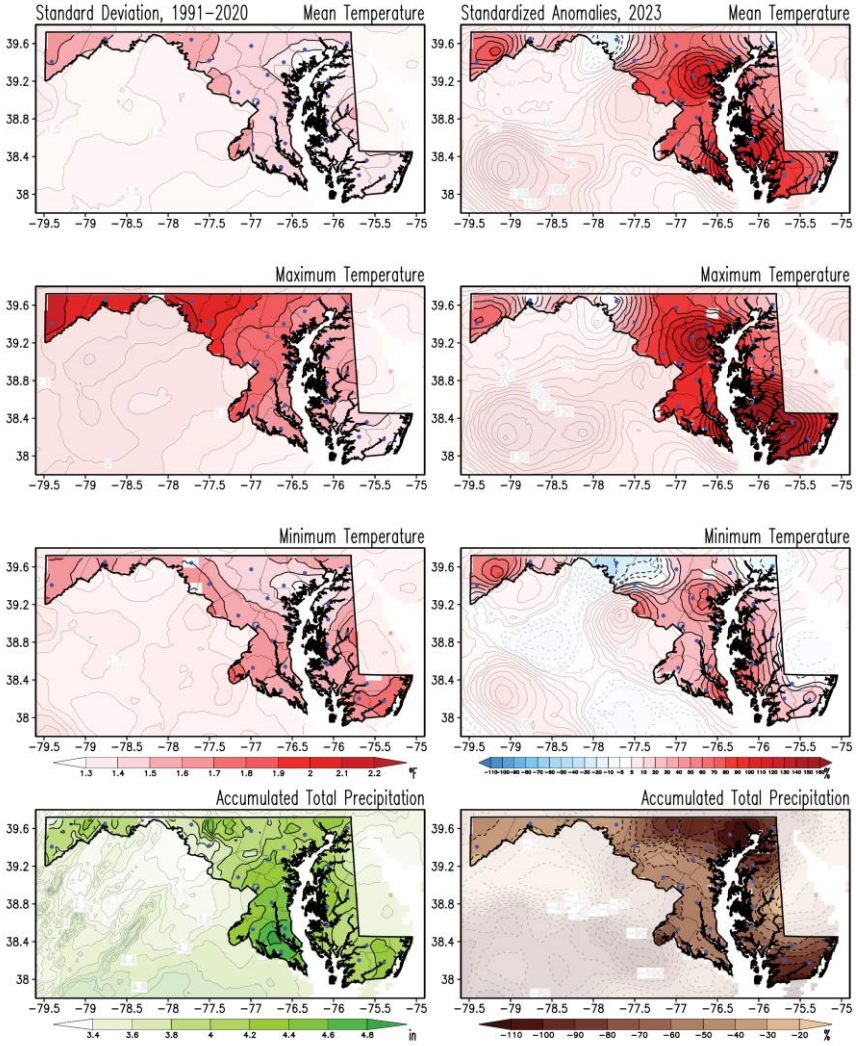

Figure E1. Standard deviation for fall and standardized anomalies of temperatures and precipitation for fall 2023. Standard deviations for seasonal mean, maximum, and minimum surface air temperatures and accumulated total precipitation were obtained for the 1991-2020 period (left column). Anomalies for fall 2023 (right column) are obtained as a percentage of the standard deviations. The standard deviations in temperatures are in °F, and those in precipitation are in inches according to the color bars. Blue/red shading in the anomaly temperature maps marks colder/warmer than normal conditions; brown shading in the anomaly precipitation map marks drier than normal conditions. The standardized anomalies are obtained by dividing the raw anomalies (from Figures 1 to 4) by the standard deviation (from left column panels) and multiplying that ratio by 100; hence units are in percent (%). Note that shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

The standard deviation measures a climate variable's year-to-year, or interannual, variability. Anomalies are sometimes compared against that variability to identify extremes in the climate record. When the anomalies are divided by the standard deviation, they are named *standardized anomalies*.

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