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Maryland Climate Bulletin
Summer 2023

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https://www.atmos.umd.edu/~climate/Bulletin/

DEPARTMENT OF
ATMOSPHERIC &
OCEANIC SCIENCE
Sumant Nigam, Chair

Maryland
State
Climatologist
Office

Summary

Summer 2023 was colder and drier than normal (i.e., 1991-2020 averages) after a season of changes that started with a colder and drier June, followed by a warmer and wetter July, and it ended with a warmer and drier than normal August. Seasonal mean temperatures were between 65 to 78°F; maximum temperatures were in the 75 to 87°F range; minimum temperatures were between 56 to 68°F. Seasonal accumulated total precipitation was in the 9 to 16.8 inches range.

Maryland Regional Features (Figures 1-5, C1, and D1)

- Mean temperature was colder than normal almost everywhere, notably in Allegany and Washington counties (above 1.0°F); it was slightly warmer than normal over Baltimore City (0.2°F) and Wicomico, Somerset, and Worcester counties (above 0.2°F).

- Maximum temperature was also colder than normal almost everywhere, especially over Allegany, Cecil, Charles, and Saint Mary's counties (above 1.0°F); however, it was warmer than normal in Baltimore City, parts of Baltimore and Carroll counties (above 0.4°F), and portions of Saint Mary's, Dorchester, Wicomico, Somerset, and Worcester counties (above 0.2 °F).

- Minimum temperature was colder than normal almost over the whole state, particularly over Allegany and Washington counties (above 1.6°F) and Frederick and Carroll counties (above 1.2°F); it was slightly warmer than normal over Garrett and Queen Anne's counties (around 0.2°F) and over Wicomico, Somerset, and Worcester counties (around 0.4°F).

- Precipitation was below normal almost everywhere, notably over southern Saint Mary's and Calvert counties (above 4 in), parts of Frederick, Montgomery, Howard, and Carroll counties (above 3 in), portions of Charles and Dorchester counties (around 3 in), and over Baltimore, and Wicomico counties (above 2 in); it was wetter than normal, especially over Cecil and Kent counties (above 2.5 in).

- The partial water year (October 2022-August 2023) was below normal everywhere, especially over the Piedmont counties of Montgomery, Frederick, Howard, and Carroll, and over western Charles County (above 200 in). These regions have around 80% or less of the climatological amounts. This region over the Piedmont counties coincides with the region under drought conditions identified by the Drought Monitor at the end of August.

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

- Except for the Southeastern Shore climate division 1, which was warmer and drier than normal, the other seven climate divisions were colder and drier than normal; the Appalachian Mountains climate division 7 had the largest mean temperature departure from normal (1°F), while the Lower Shore climate division 3 had the largest precipitation departure from normal (2.78 in).

- Statewide temperature anomalies were the warmest in winter (4.4°F) and decreased in spring (0.9°F) before becoming colder than normal in summer (−0.3°F). Statewide dry anomalies have persisted since last winter, but the drying in spring was the largest (−3.89 in).

Historical Context (Figure 8, Tables A1 and A2)

- Summer 2023's mean, maximum, and minimum statewide temperatures (74.2, 84.5, and 63.8°F) were above the long-term (1895-2022) average but stayed far from the records established in 2010 (77.2, 87.9, and 66.6°F). Statewide accumulated total precipitation (11.36 in) was below the long-term average, far from the driest summer of 1966 (5.29 in).

Century-Plus Summer Trends (Figures 9, 10)

- Statewide mean temperature in summer showed a significant 1.9°F/century warming trend, and the cooling degree-days had a significant 180.92°F degree-days increasing trend. On the other hand, statewide accumulated total precipitation in summer showed a non-significant decreasing trend (−0.17 in/century), and the partial water year also had a non-significant increasing trend (2.03 in/century).
- Regionally, summer 2023 mean temperatures showed significant warming trends from Washinton County to the state's east. It varies from ~0.6°F/century over Washington County to above 1.5°F on the counties of the eastern and western shores of the Chesapeake Bay and to above 2.4°F/century over the Piedmont between Montgomery and Prince George's counties and Baltimore County, with a maximum over Baltimore City (3.0°F/century).
- Regionally, summer 2023 accumulated total precipitation showed significant decreasing trends. Decreasing trends larger than 1.4 in/century were found between western Frederick and Washington counties and over western Charles County.

Contents

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 summer 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, cooling 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 9/11/2023.

- NOAA Monthly U.S. Climate *Divisional* Dataset (NClimDiv – Vose et al. 2014), which is available in a preliminary status (v1.0.0-20230907) at: https://www.ncei.noaa.gov/pub/data/cirs/climdiv/
  Data was downloaded on 9/14/2023.

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., summer 2023) are the departures of the seasonal value from the corresponding season's 30-year average (i.e., from the average of 30 summers) 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. Summer 2023 Maps

A. Mean Temperatures

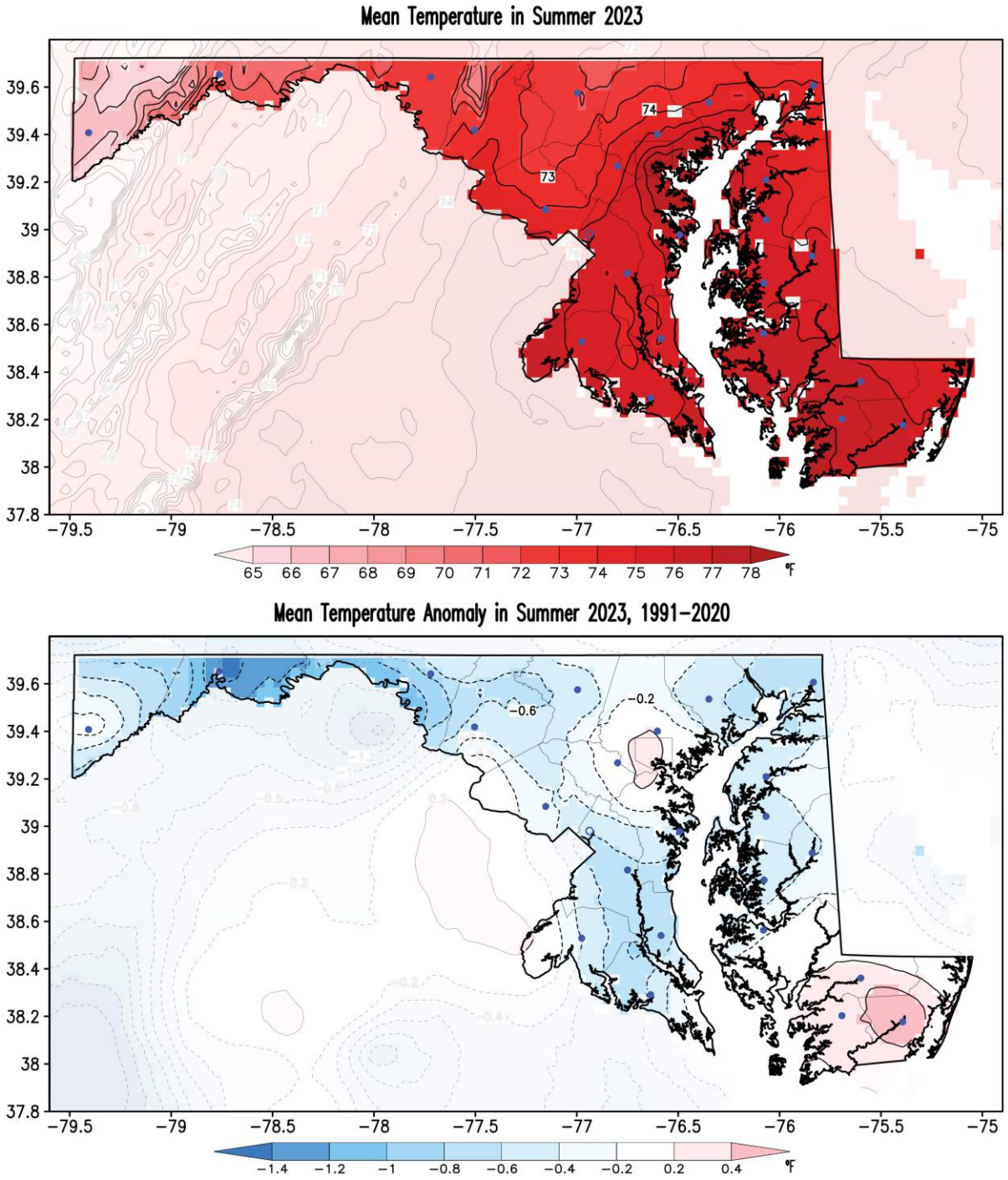

Figure 1. Seasonal mean surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for summer 2023. Temperatures are in °F following the color bar. Blue/red shading in the anomaly map marks colder/warmer than normal conditions. Note shading outside the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

B. Maximum Temperatures

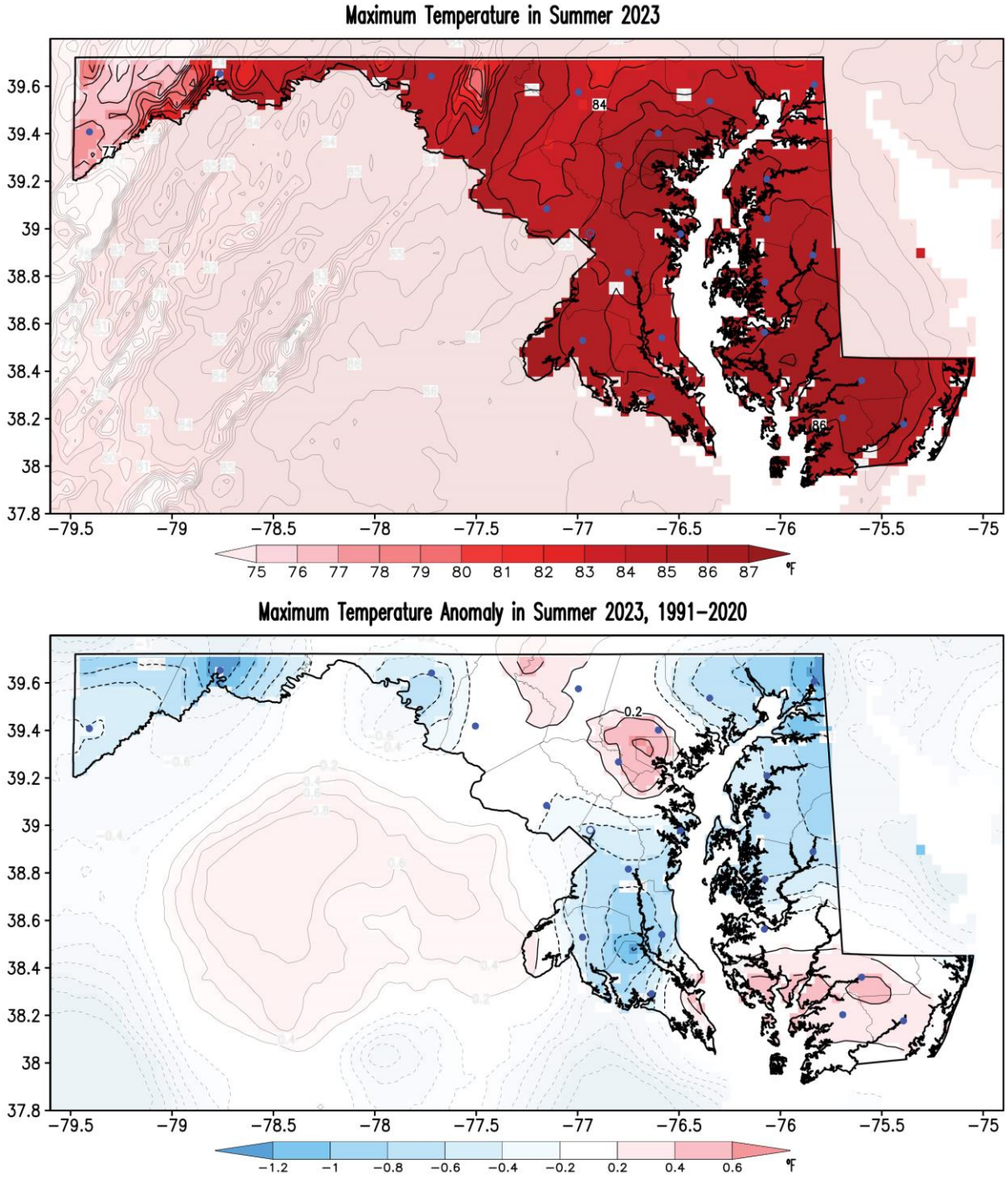

Figure 2. Seasonal maximum surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for summer 2023. Temperatures are in °F following the color bar. Blue/red shading in the anomaly map marks colder/warmer than normal conditions. Note shading outside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

C. Minimum Temperatures

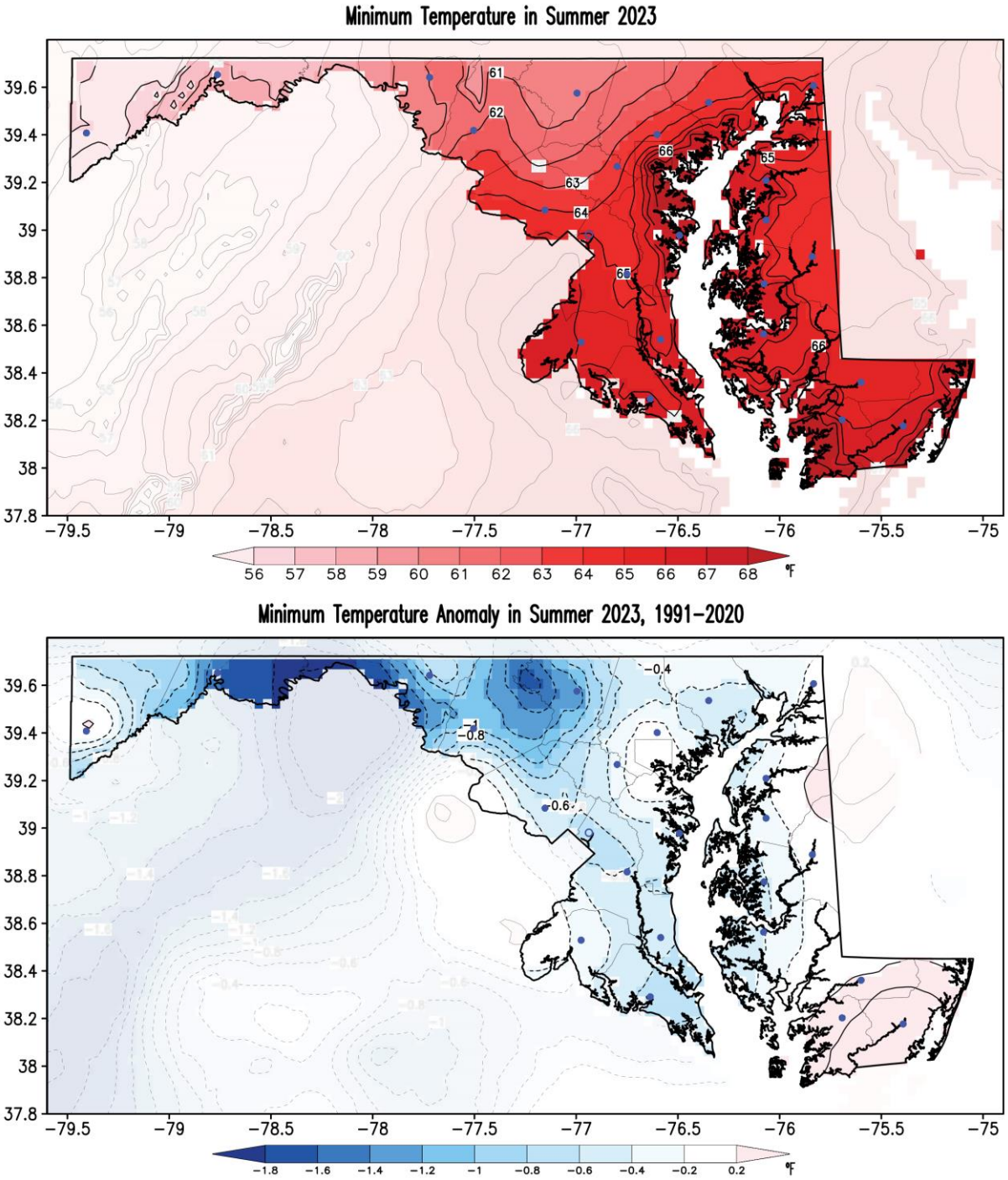

Figure 3. Seasonal minimum surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for summer 2023. Temperatures are in °F following the color bar. Blue/red shading in the anomaly map marks colder/warmer than normal conditions. Note shading outside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

D. Precipitation

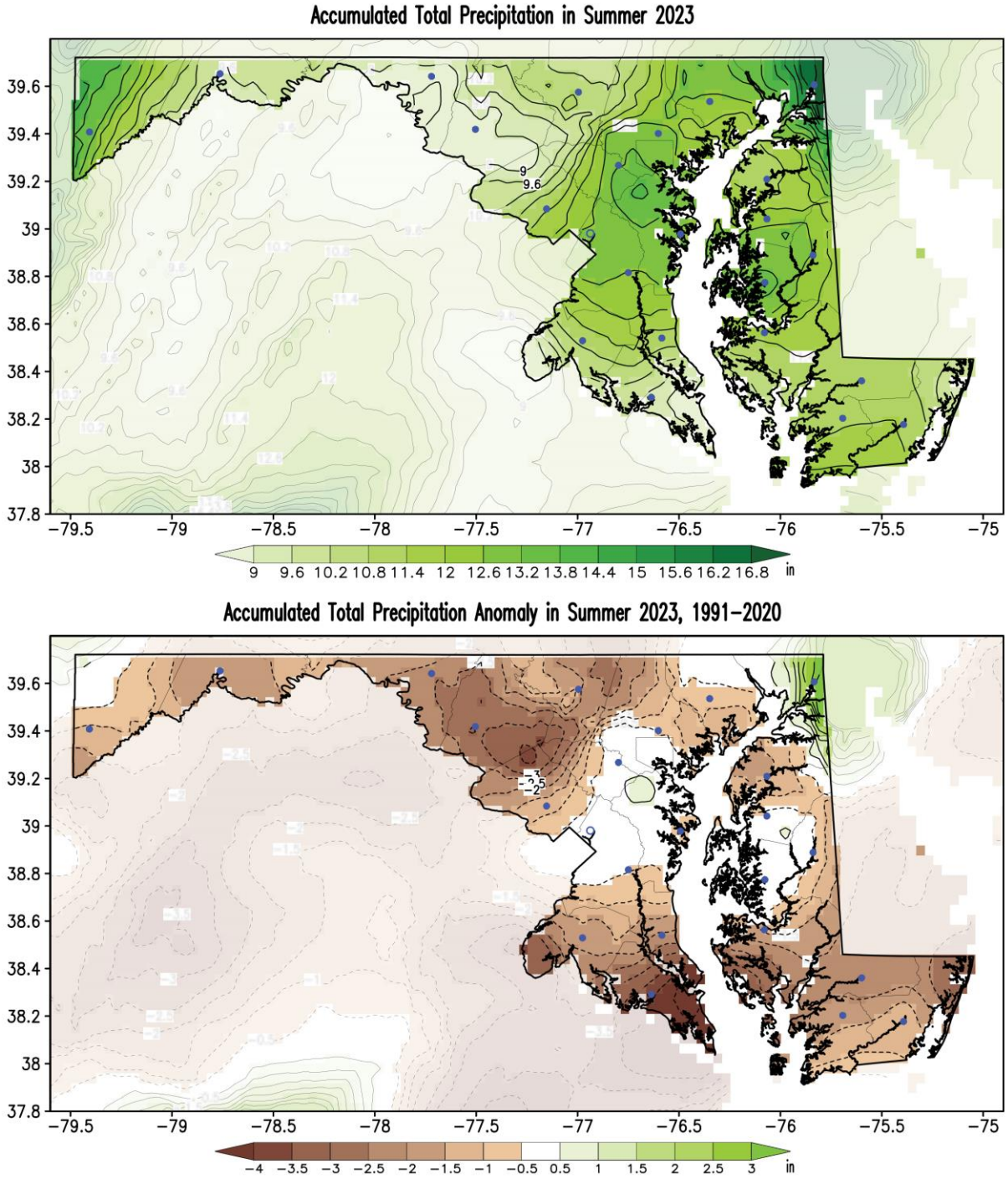

Figure 4. Seasonal accumulated total precipitation (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for summer 2023. Precipitation is in inches following the color bar. Brown/green shading in the anomaly map marks drier/wetter than normal conditions. Note shading outside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

E. Partial Water Year (October 2022 – August 2023)

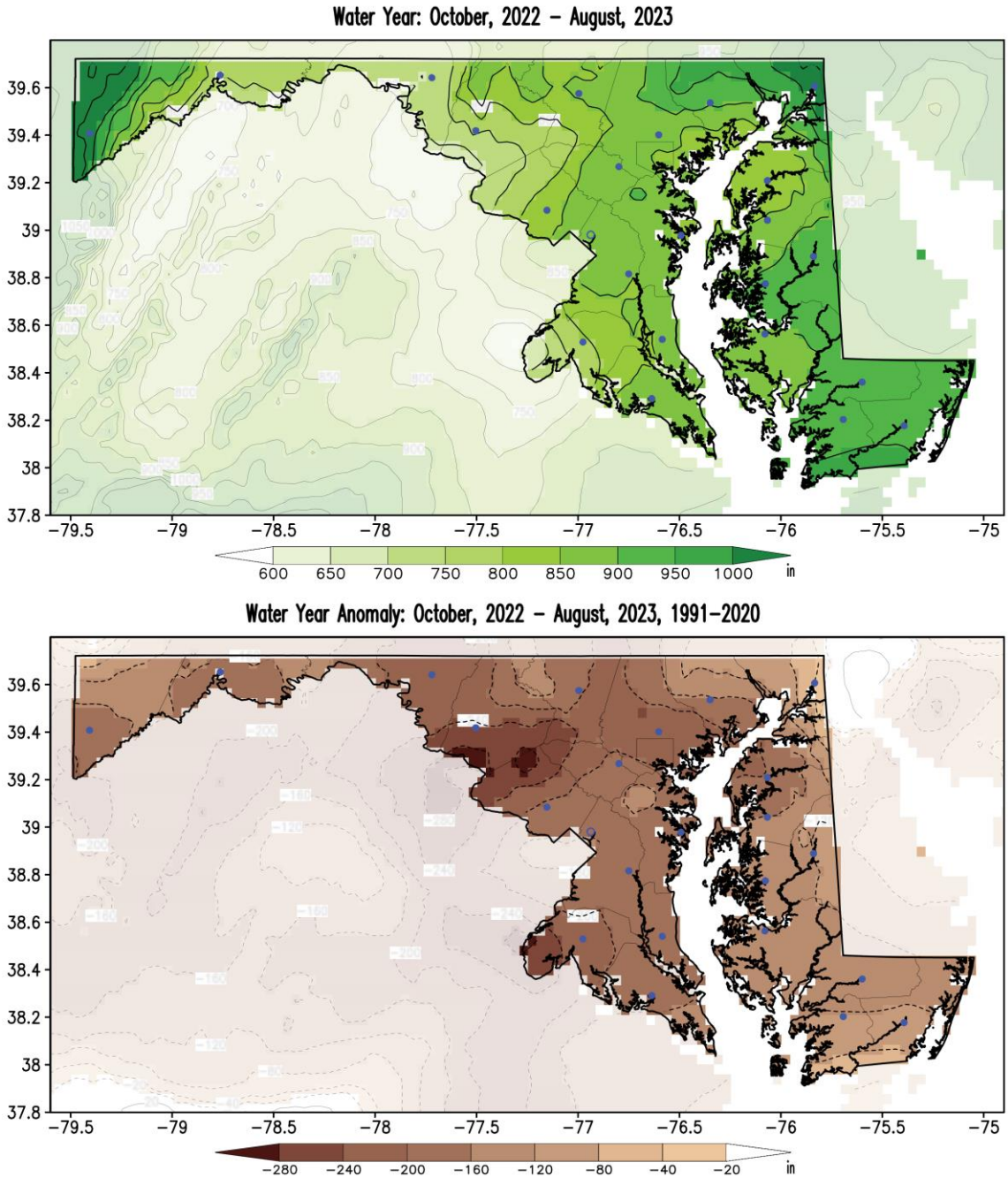

Figure 5. Partial water year until the end of summer 2023 (top panel), and its anomaly with respect to the 1991-2020 climatology (bottom panel). Water year is in inches following the color bar. Brown shading in the anomaly map marks drier than normal conditions. The current maps display the partial conditions from October 2022 to August 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; 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. Summer and Winter–Summer 2023 Climate Divisions Averages

A. Summer 2023 Scatter Plots

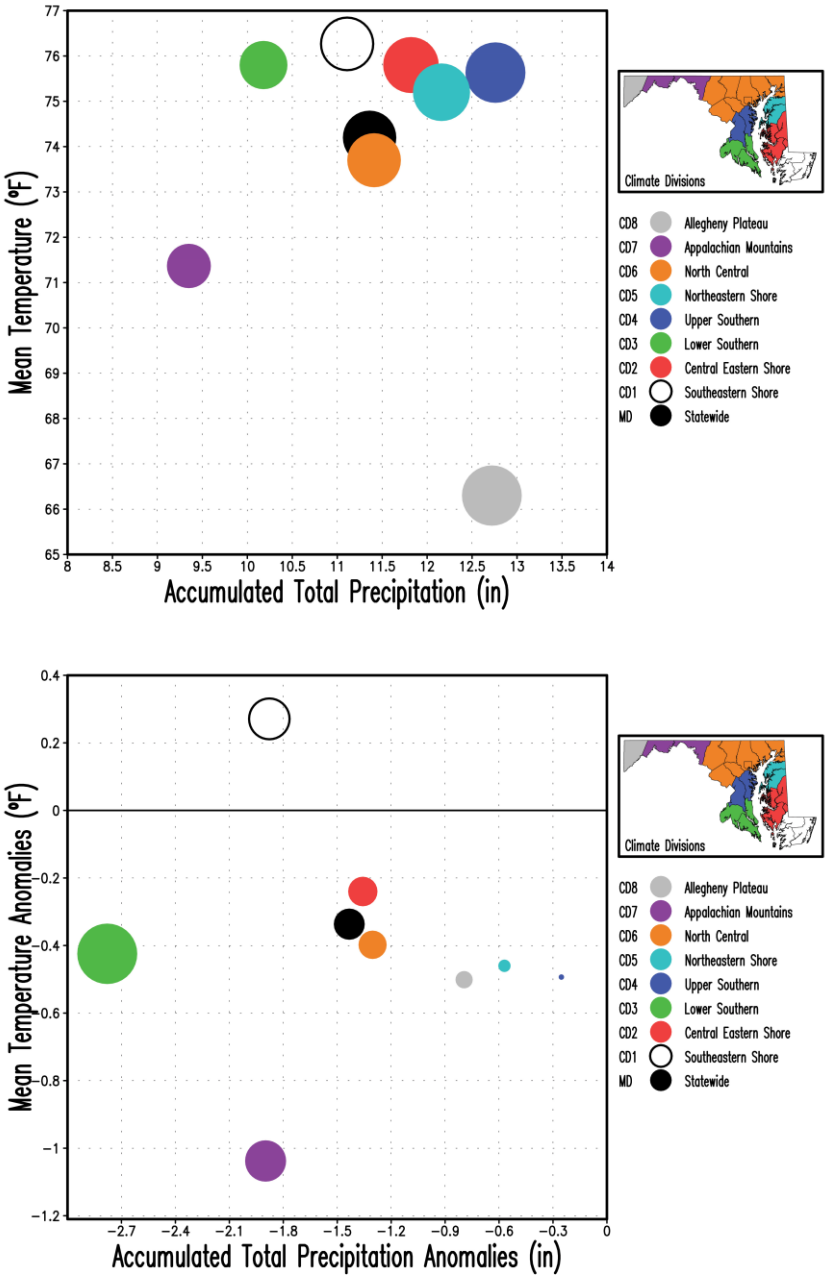

Figure 6. Scatter plots of Maryland (statewide) and Climate Divisions (CD#) seasonal mean surface air temperature vs. accumulated total precipitation for summer 2023. The upper panel shows the mean temperature and total precipitation, and the bottom panel displays their anomalies with respect to the 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 (12.76 inches in CD4, top panel) and by the maximum precipitation anomaly (|−2.78| inches in CD3, 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. Winter–Summer 2023 Scatter Plots

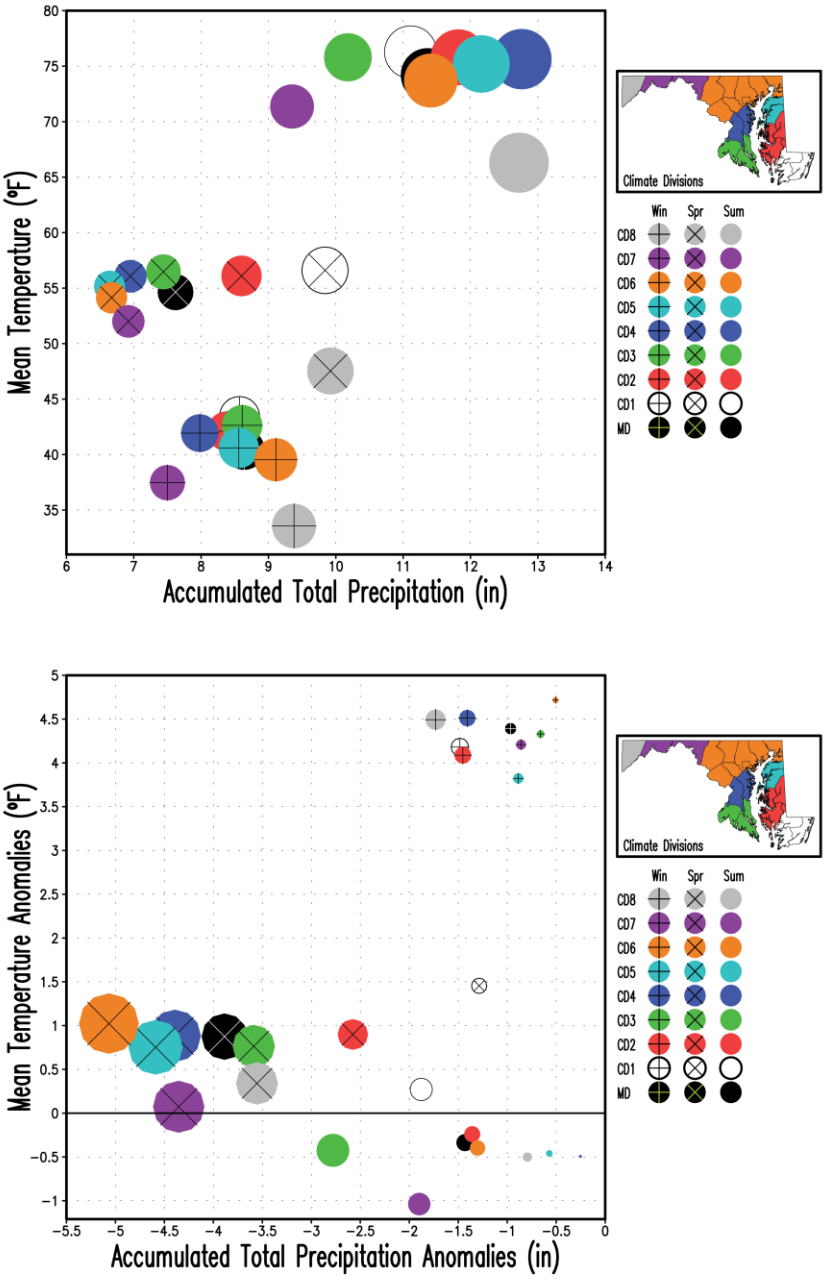

Figure 7. Scatter plots of Maryland (statewide) and Climate Divisions (CD#) seasonal mean surface air temperature vs. accumulated total precipitation for winter, spring, and summer 2023. The upper panel shows the mean temperature and total precipitation, and the bottom panel displays their anomalies 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 (12.76 inches in CD4 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. Summer is displayed with filled circles only, while spring and winter are displayed with superposed multiplication and addition signs, respectively.

5. Summer 2023 Statewide Averages in the Historical Record

A. Box and Whisker Plots

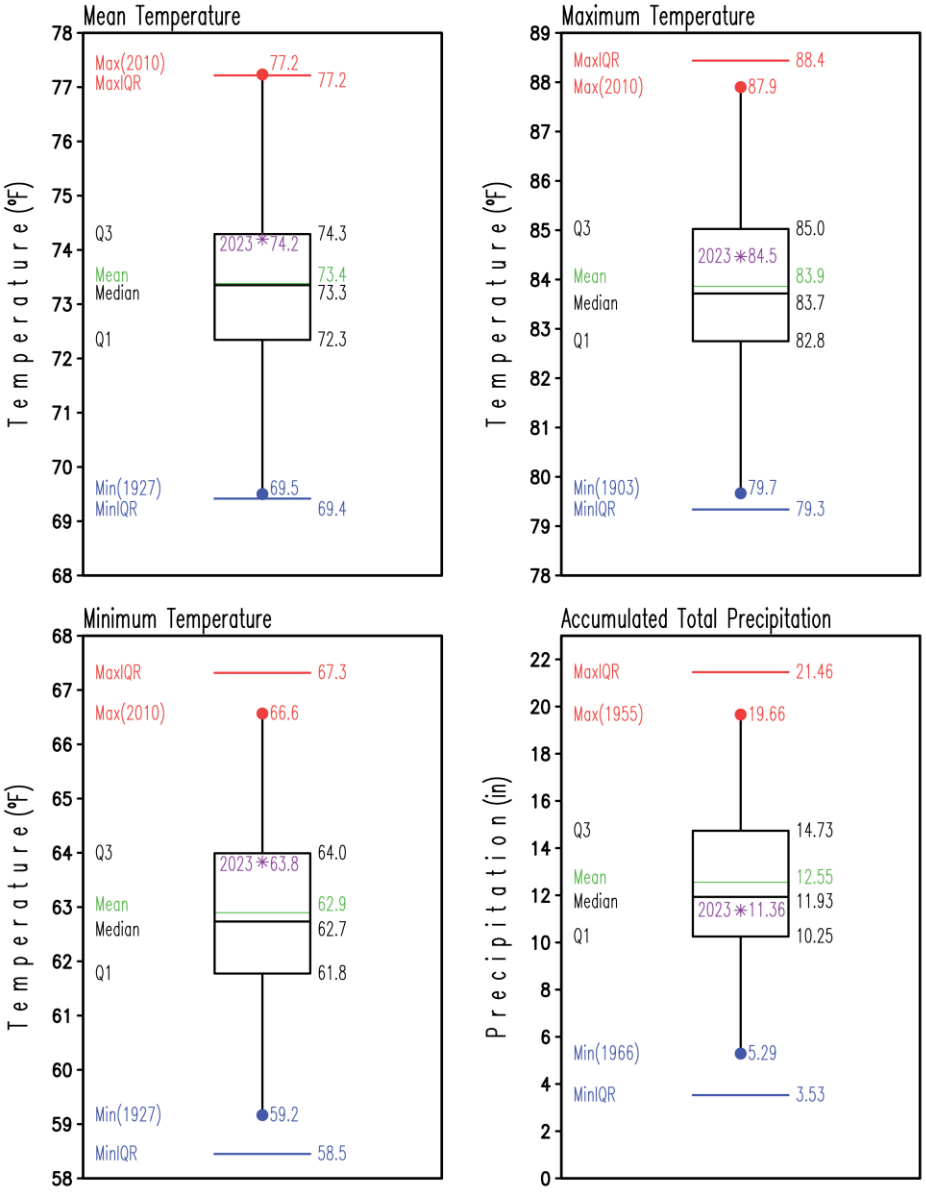

Figure 8. Box and Whisker plots of Maryland (statewide) seasonal mean (upper left), maximum (upper right), minimum (lower left) surface air temperatures, and accumulated total precipitation (lower right) for summer for the period 1895-2022. The label and asterisk in purple represent conditions for summer 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 Summer Trends

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

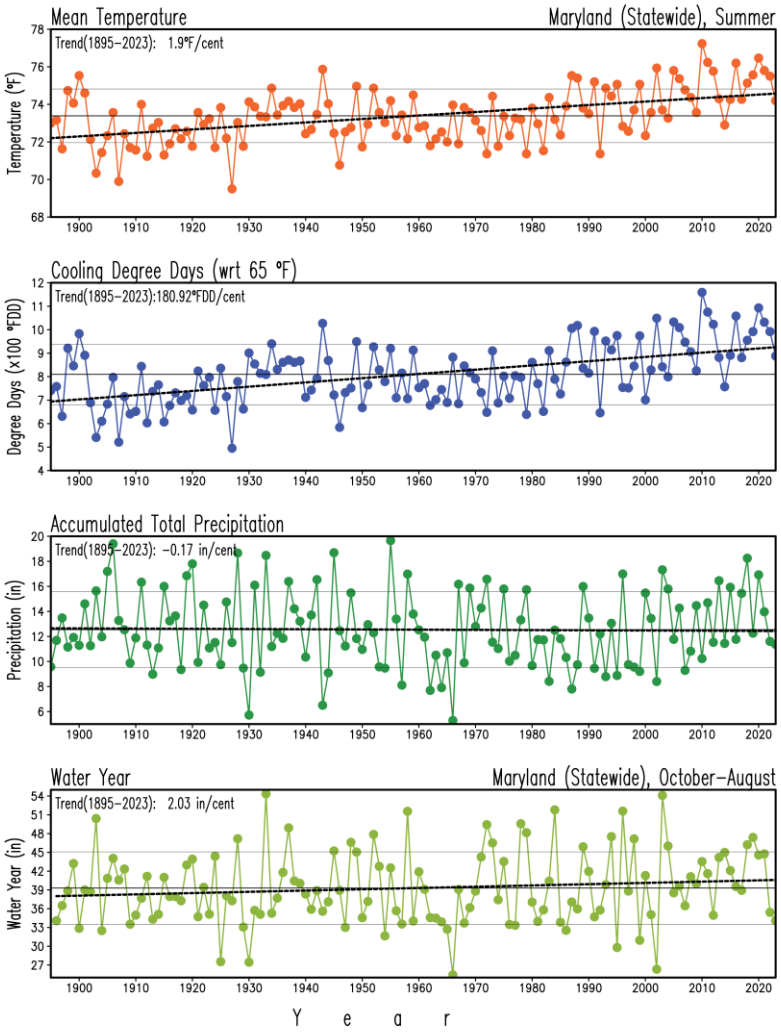

Figure 9. Maryland (statewide) mean surface air temperature, cooling degree-days, accumulated total precipitation in summer, and partial (October-August) water year for the period 1895-2023. Temperature is in °F, cooling degree-days is in °F degree-days (°FDD), and precipitation is in inches. The thin, continuous black lines in each panel display the long-term means (73.4°F, 809.81°FDD, 12.54 in, and 39.30 in, 1895-2023), and the double thin, continuous gray lines indicate the standard deviation (1.4°F, 129.31°FDD, 3.02 in, and 5.79 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 cool 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 (1.9°F/century), and the increasing cooling degree-days (180.92°FDD/century) trend are statistically significant at the 95% level (*Student's t-test* −Santer et al. 2000), but not the decreasing precipitation (–0.17 in/century) trend or the increasing water year (2.03 in/century) trend.

B. Temperature and Precipitation Maps

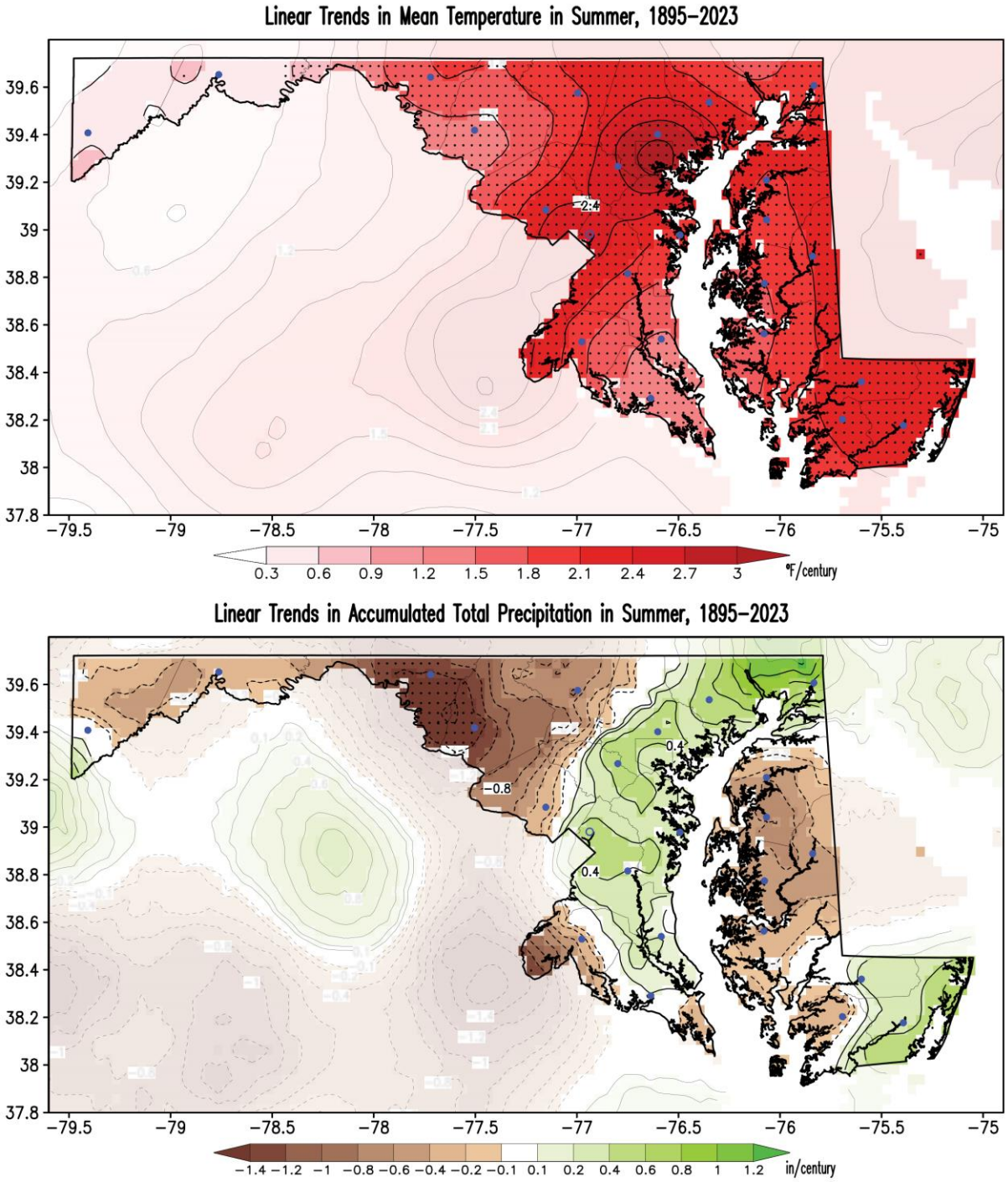

Figure 10. Linear trends in summer surface air mean temperature and accumulated total precipitation for the period 1895-2023. Temperatures are in °F/century, and precipitation is in inches/century following the color bars. Red shading in the temperature map marks warming trends. Brown/green shading in the precipitation map shows drying/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. Summer 2023 Tables: Statewide, Climate Divisions, and Counties

A. Mean Temperature and Precipitation

Region	Mean Air Temperature (°F)	Rank (#)
Statewide	74.2	94
Climate Division 1	76.3	110
Climate Division 2	75.8	99
Climate Division 3	75.8	89
Climate Division 4	75.6	94
Climate Division 5	75.2	93
Climate Division 6	73.7	92
Climate Division 7	71.4	57
Climate Division 8	66.3	71
Allegany	70.4	46
Anne Arundel	76.1	97
Baltimore	74.3	101
Baltimore City	76.7	109
Calvert	75.4	79
Caroline	75.2	97
Carroll	72.4	85
Cecil	74.1	90
Charles	76.0	91
Dorchester	76.2	102
Fredrick	72.9	79
Garrett	66.3	70
Harford	74.3	90
Howard	73.8	98
Kent	75.3	94
Montgomery	74.0	93
Prince George's	75.3	94
Queen Anne's	75.2	93
Saint Mary's	75.8	84
Somerset	76.8	113
Talbot	75.7	94
Washington	72.4	70
Wicomico	76.2	110
Worcester	76.0	110

Region	Acc. Total Precipitation (in)	Rank (#)
Statewide	11.36	49
Climate Division 1	11.11	50
Climate Division 2	11.82	57
Climate Division 3	10.18	35
Climate Division 4	12.76	75
Climate Division 5	12.16	68
Climate Division 6	11.41	60
Climate Division 7	9.35	30
Climate Division 8	12.72	55
Allegany	9.89	43
Anne Arundel	13.07	75
Baltimore	12.06	66
Baltimore City	12.94	79
Calvert	10.93	45
Caroline	12.24	61
Carroll	10.33	39
Cecil	14.76	94
Charles	10.38	37
Dorchester	11.19	44
Fredrick	9.33	30
Garrett	12.70	55
Harford	12.54	69
Howard	11.90	58
Kent	11.93	64
Montgomery	10.62	43
Prince George's	12.56	76
Queen Anne's	12.31	72
Saint Mary's	9.64	27
Somerset	11.46	54
Talbot	13.02	73
Washington	8.84	27
Wicomico	11.06	45
Worcester	10.89	54

Table A1. Seasonal mean surface air temperature (left) and accumulated total precipitation (right) at Maryland (statewide), climate division, and county levels for summer 2023. Temperatures are in °F, and precipitation is in inches. The rank is the order that the variable for summer 2023 occupies among the 129 summers 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	84.5	83
Climate Division 1	85.7	106
Climate Division 2	86.0	95
Climate Division 3	85.5	73
Climate Division 4	85.5	83
Climate Division 5	85.0	76
Climate Division 6	84.4	86
Climate Division 7	83.7	65
Climate Division 8	76.9	47
Allegany	83.0	52
Anne Arundel	85.8	88
Baltimore	85.0	91
Baltimore City	87.0	107
Calvert	84.9	70
Caroline	85.7	86
Carroll	83.8	82
Cecil	83.6	60
Charles	85.8	73
Dorchester	86.3	100
Fredrick	84.1	84
Garrett	76.9	48
Harford	84.4	76
Howard	84.7	96
Kent	84.9	76
Montgomery	84.4	90
Prince George's	85.3	77
Queen Anne's	85.1	75
Saint Mary's	85.3	74
Somerset	86.0	106
Talbot	85.5	82
Washington	84.3	77
Wicomico	86.4	108
Worcester	85.1	105

Region	Minimum Air Temperature (°F)	Rank (#)
Statewide	63.8	91
Climate Division 1	66.8	108
Climate Division 2	65.6	95
Climate Division 3	66.1	94
Climate Division 4	65.8	95
Climate Division 5	65.4	101
Climate Division 6	63.1	91
Climate Division 7	59.2	54
Climate Division 8	55.7	91
Allegany	57.8	47
Anne Arundel	66.5	97
Baltimore	63.5	103
Baltimore City	66.5	108
Calvert	65.9	88
Caroline	64.7	102
Carroll	61.0	82
Cecil	64.7	103
Charles	66.1	102
Dorchester	66.1	96
Fredrick	61.6	68
Garrett	55.7	90
Harford	64.1	93
Howard	62.9	94
Kent	65.8	103
Montgomery	63.7	89
Prince George's	65.1	92
Queen Anne's	65.5	101
Saint Mary's	66.2	89
Somerset	67.6	108
Talbot	66.0	87
Washington	60.4	59
Wicomico	65.9	107
Worcester	66.8	110

Table A2. Seasonal maximum (left) and minimum (right) surface air temperatures at Maryland (statewide), climate division, and county levels for summer 2023. Temperatures are in °F. The rank is the order that the variable for summer 2023 occupies among the 129 summers 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. Summer 2023 Bar Graphs: Statewide, Climate Divisions, and Counties

A. Temperatures and Precipitation

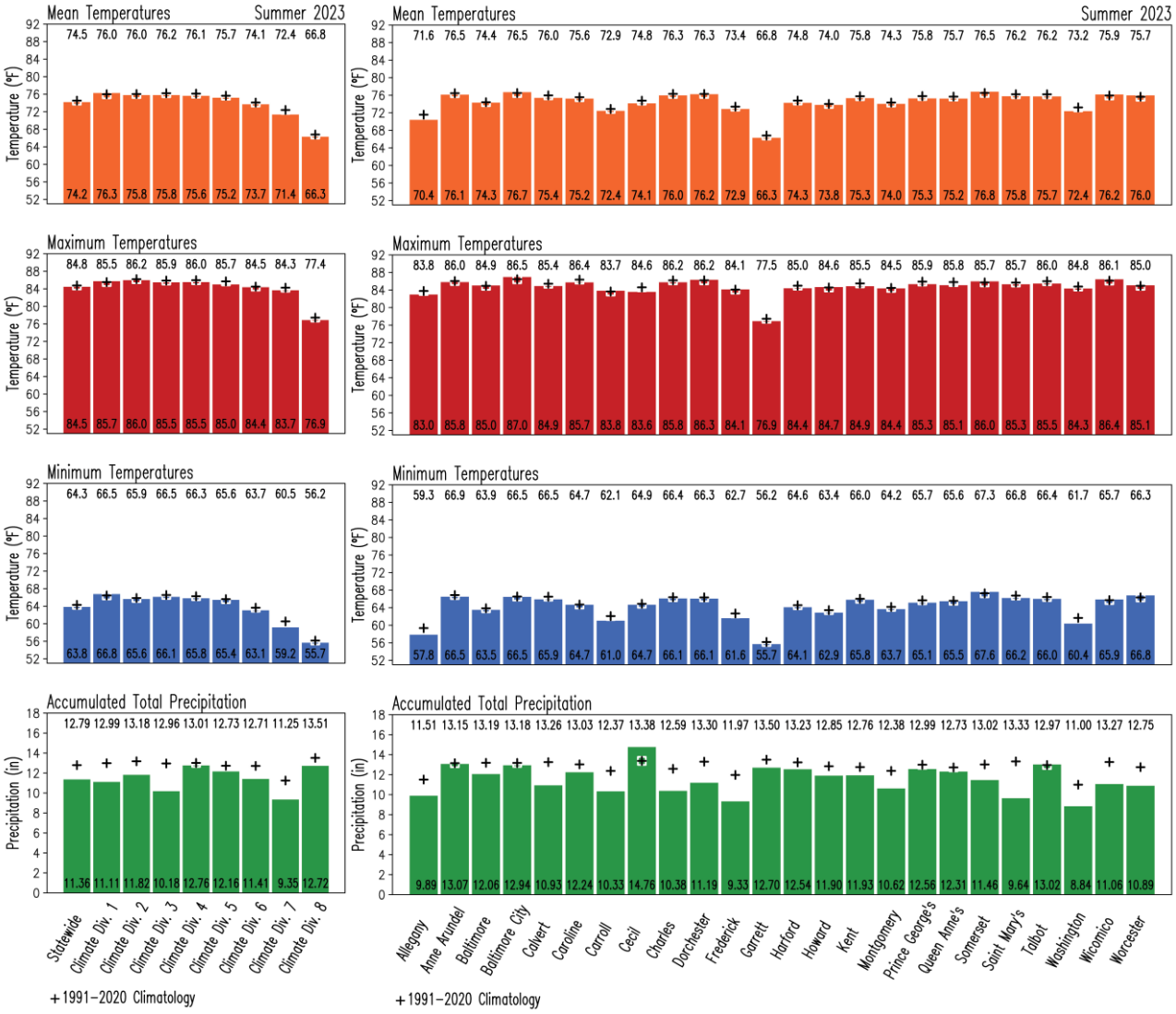

Figure B1. Seasonal surface variables in Maryland for summer 2023. Color bars represent the variables as follows: mean surface air temperature (orange), maximum surface air temperature (red), minimum surface air temperature (blue) and accumulated total precipitation (green) at statewide and climate division (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 summer 2023. For comparison, the corresponding 1991-2020 climatological values for summer are displayed as black addition signs, and their magnitudes are shown at the top of the panels.

B. Temperature and Precipitation Anomalies

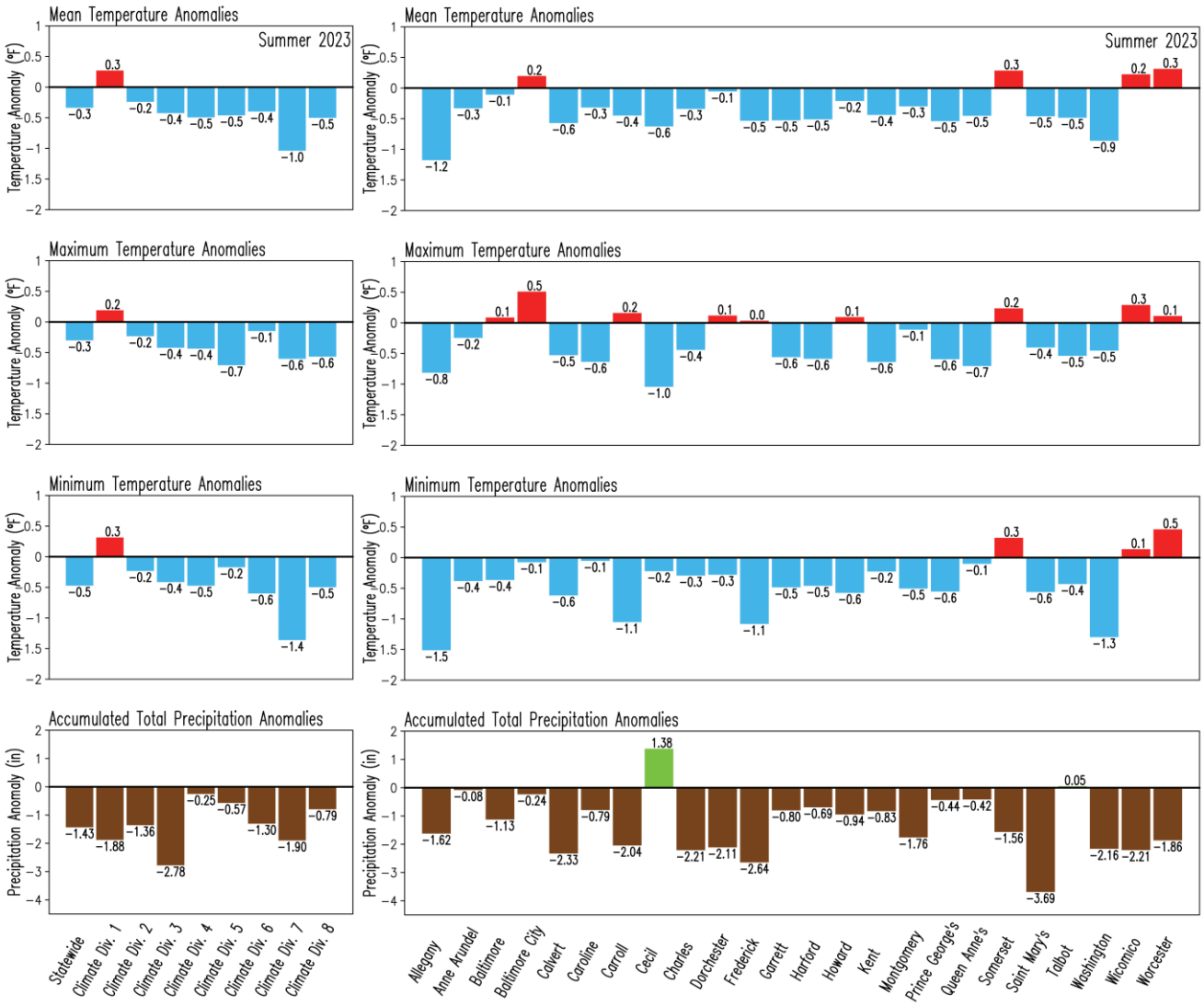

Figure B2. Anomalies of the seasonal surface variables in Maryland for summer 2023. Anomalies are with respect to the 1991-2020 climatology. Red/blue color represents positive/negative anomalies for mean surface air temperature (upper row), maximum surface air temperature (second row from top), and minimum surface air temperature (third row from top) while green/brown color indicates positive/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 summer 2023.

Appendix C. Summer 1991-2020 Climatology Maps

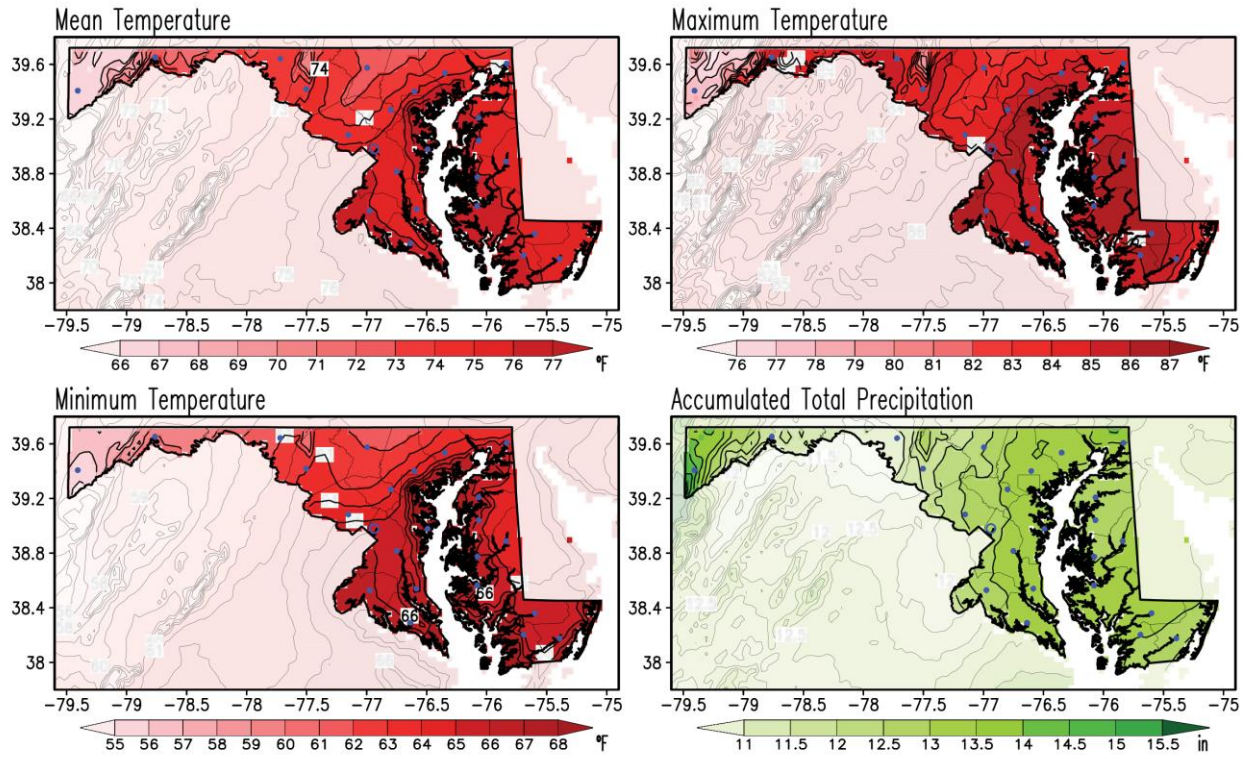

Figure C1. Summer climatology of the seasonal mean, maximum and minimum surface air temperatures, and accumulated total precipitation for the period 1991-2020. Temperatures are in °F, and precipitation is in inches according to the color bars. This is the current climate normal against which the summer 2023 conditions are compared to obtain the summer 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 averaging 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 Partial Water Year 1991-2020 Climatology, and October 2022 – August 2023 as Percentage of Climatology

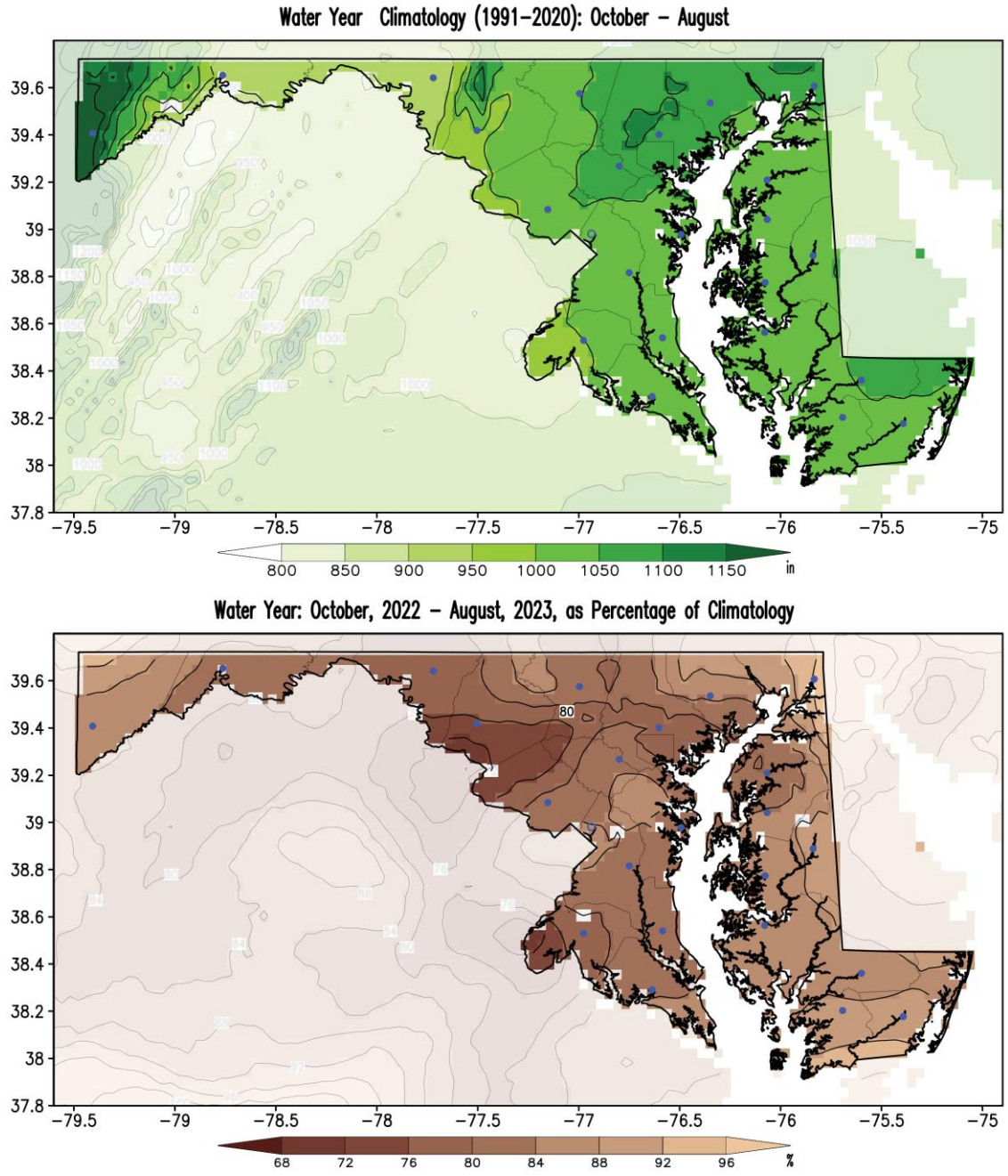

Figure D1. Climatology of the partial water year (October-August, top panel), and current partial water year (October 2022 – August 2023) as a percentage of the climatology (bottom panel). Climatology is for the period 1991-2020. The water year climatology is in inches following the color bar. The current 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 drier 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. Summer Standard Deviation and Summer 2023 Standardized Anomalies Maps

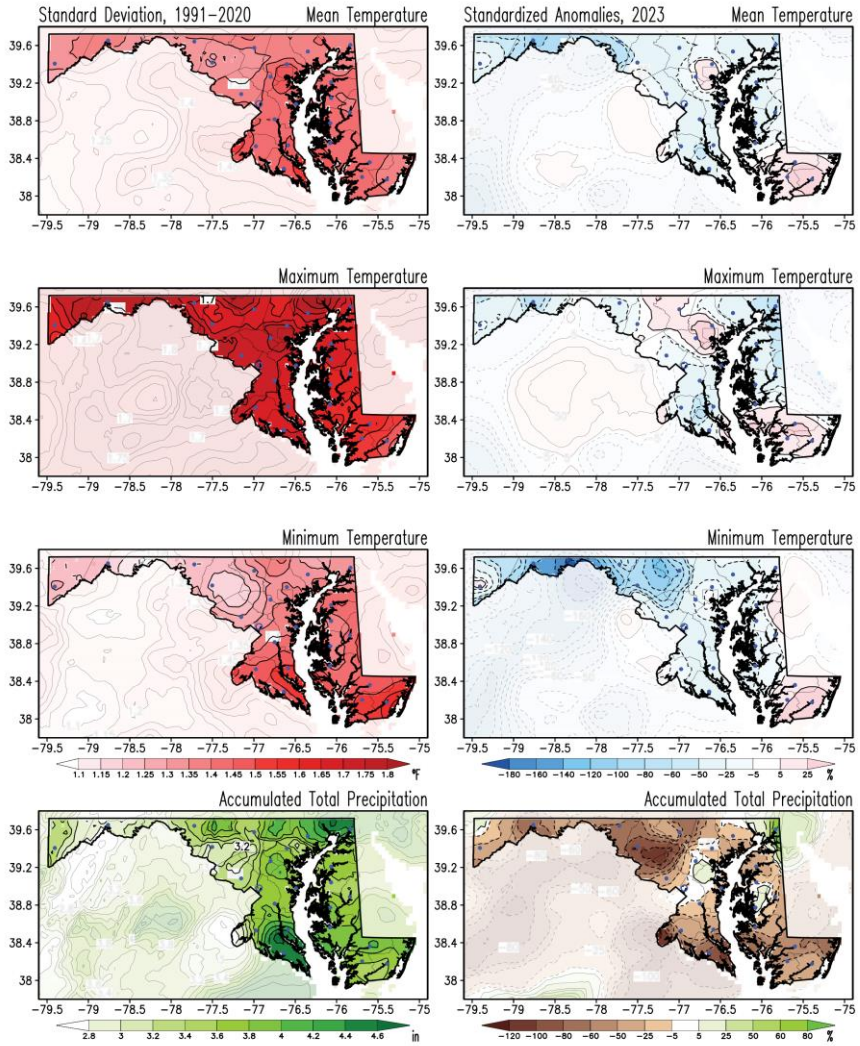

Figure E1. Standard deviation for summer and standardized anomalies of temperatures and precipitation for summer 2023. Standard deviations for seasonal mean, maximum, and minimum surface air temperatures and accumulated total precipitation were obtained for the 1991-2020 period (left column). Anomalies for summer 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/green shading in the anomaly precipitation map marks drier/wetter 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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