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Maryland Climate Bulletin
November 2024

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DEPARTMENT OF ATMOSPHERIC & OCEANIC SCIENCE
Sumant Nigam, Chair

Maryland State Climatologist Office

Summary

Statewide averages indicate that November 2024 was warmer and drier than normal (i.e., 1991-2020 averages). Monthly mean temperatures were in the 43−53°F range; maximum temperatures were between 52 and 65°F, and minimum temperatures were in the 33−43°F range. Monthly total precipitation was between 1.5 and 4.8 inches.

Maryland Regional Features (Figures 1-6, C1, and D1)

- The mean temperature was warmer than normal over all the state, especially over Prince George's, western Charles, southern Anne Arundel, northern Calvert, and western Talbot counties (4.8°F), and in general over the counties to the west of the Bay and central Eastern Shore and Garrett County (above 3.9°F).

- The maximum temperature was also warmer than normal over the whole state, notably over southern Calvert, southern Charles, northern Saint Mary's, western Talbot, and eastern Caroline counties (5.7°F), and in general over the counties to the west and north of the Bay, central and northern Eastern Shore, and Garrett County (above 4.5°F).

- The minimum temperature was warmer than normal over the entire state, too, particularly over Prince George's, western Montgomery, Charles, southern Anne Arundel counties (3.9 –4.2°F), and in general over the counties to the west of the Bay, central Piedmont, and central Eastern Shore (3.3−3.9°F).

- Precipitation was below normal in much of the state, especially over Frederick, Washington, eastern Allegany, eastern Caroline, Dorchester, Wicomico, and northern Worcester counties (1.4 to 1.6 inches deficit). These counties received between 45 and 55% of their climatological rainfall for the month, while the rest of the counties around the Bay didn't get more than 60−70% of their climatological rainfall. Above-normal precipitation was observed over Garrett County only (1.2 inches maximum), accounting for 10−40% more than its climatological precipitation.

- Drought conditions covered the whole state at the end of November. While extreme drought conditions over Garrett County at the end of October changed to severe, extreme drought conditions appeared over southern Cecil, eastern Kent, Queen Anne's, the northern tip of Caroline, Wicomico, eastern Somerset, and western Worcester counties. Moderate to severe drought conditions covered around 91% of the state. Streams and rivers had below-normal streamflow in the severe to extreme drought areas along both sides of the Bay; above-normal streamflow was observed only over Garrett County streams.

Maryland Climate Divisions (Figures 7-8, B1, and B2)

- All climate divisions were warmer than normal, but only the Allegheny Plateau, Climate Division 8, was wetter than normal, while the rest was drier. The Lower and Upper Southern Climate Divisions 3 and 4 had the warmest anomalies (4.7°F above normal),

while the Southeastern Shore and Central Easter Shore Climate Divisions 1 and 2 had the driest anomalies (~1.3 inches below normal).

- Statewide temperature was warmer than normal (3.9°F) for the twelfth month since December 2023; anomalies in November 2024 were much larger than in October and September. Statewide precipitation was below normal (1.09 inches deficit) for the seventh time since April.

Extreme daily minimum temperatures and precipitation and growing degree days (Figures 9-11)

- Statewide minimum daily temperatures indicated that the number of freezing days with temperatures below 32, 28, and 24°F (the 28th, 19th, and 12th percentiles in 1951−2000) and their number of freezing spells (consecutive days with freezing days) were fewer than normal by the end of November for the calendar year. There were 23 fewer days with minimum temperatures colder than 32°F (47 vs. 70) and 3 fewer spells (8 vs. 11) than normal; 17 fewer days with minimum temperatures colder than 28°F (29 vs. 46) and 2 fewer spells (7 vs. 9) than normal; and 16 fewer days with minimum temperatures colder than 24°F (12 vs. 28) and 4 fewer spells (2 vs. 6) than normal.

- Statewide daily total precipitation showed that the number of days with extreme precipitation (at least 0.64 inches; the 95th percentile in 1951−2000) was fewer than normal by 1 day (16 vs. 17) by the end of November. The number of dry spells (consecutive days with daily precipitation of no more than 0.04 inches) was less than normal by 10 dry spells (34 vs. 44) by the end of the month. However, the mean duration of the dry spells was larger than normal by 1 day (6 vs. 5), and the longest duration of the spells was larger than normal by 17 days (34 vs. 17); the longest dry spell started October 8.

- The cumulative calendar year (until November 30) growing degree days have been greater than normal since the start of March. Modified growing degree days (base 86/50°F) reached 3995°FDD, and growing degree days (base 50°F) reached 3741°FDD by the end of November. The modified growing days were 345°FDD above normal, while the growing degree days were 369°FDD above normal.

Historical Context (Figure 12, Tables A1 and A2)

- Statewide mean, maximum, and minimum temperatures in November 2024 (50.2, 60.8, 39.5°F) were above their long-term (1895-2023) mean but far from their historical records of 51.7, 63.1, and 43.6°F set in 1985, 2001 and 1985, respectively. However, all the temperatures were within 10% of the highest recorded values. Statewide precipitation (2.08 inches) in November was below the long-term mean but still far from the record of 0.60 inches in 1917.

- Mean temperatures showed that November 2024 was the eighth hottest month statewide and among the ten hottest for 14 counties. It was the fifth hottest for Charles County, the fourth for Talbot County, the third for Anne Arundel, Calvert, and Saint Mary's counties, and the second hottest for Prince George's County.

- Maximum temperatures indicated that November 2024 was also the eighth hottest month statewide and among the ten hottest for 17 counties. It was the fifth hottest for Caroline, Dorchester, and Talbot counties, the third for Anne Arundel, Cecil, Kent, and Queen Anne's counties, and the second hottest for Calvert, Charles, Prince George's, and Saint Mary's counties.

- Minimum temperatures showed that November 2024 was the thirteenth hottest month statewide and among the ten hottest for 11 counties. It was the fourth hottest for Prince George's County.

- Precipitation indicated that November 2024 was the forty-fourth driest statewide.

Century-Plus Trends, 1895-2024 (Figures 13, 14)

- Statewide mean temperature, heating degree−days, and precipitation in November showed a significant warming trend (2.5°F/century), a significant decreasing heating trend (–79.0°FDD/century), and a significant wetting trend (0.59 in/century).

- Regionally, November temperatures showed significant warming trends everywhere in the state. The largest trend is over southwestern Baltimore County (3.2°F/century). Large trends (above 2.6°F/century) are also evident in the Piedmont and western Upper Coastal Plain (west of the Bay) counties.

- Regionally, November precipitation displayed significant wetting trends over a few regions. The largest trends are over central Baltimore County (northwest of Baltimore City) and central Saint Mary's County (0.9 in/century). Slightly smaller significant trends are found in Charles, Calvert, Dorchester, Somerset, Worcester, and Allegany counties (0.6−0.8 in/century).

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. It documents the surface climate conditions observed across the state in a calendar month and is issued in the second week of the following month.

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

The bulletin seeks to document and characterize monthly surface climate conditions in the state, placing them in the context of regional and continental climate variability and change to help Marylanders interpret and understand recent climate conditions.

The monthly surface climate conditions for November 2024 are presented via maps of key variables, such as average surface air temperature, maximum surface air temperature, minimum surface air temperature, total precipitation, and their anomalies (i.e., departures from normal); they are complemented by drought conditions for the state, as given by the U.S. Drought Monitor, and streamflow anomalies as given by the U.S. Geological Survey Water Watch in Section 3. Statewide and climate division averages for the month are compared against each other via scatter plots in Section 4. Extreme daily minimum temperatures and precipitation, as well as growing degree days, are presented from the analysis of daily statewide averaged temperatures and precipitation in Section 5. Monthly statewide averages are placed in the context of the historical record via box and whisker plots in Section 6. Century-plus trends in statewide air temperature, heating degree days, precipitation, and state maps of air temperature and precipitation are presented in Section 7. 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-D, including the percent of normal precipitation and normalized anomalies for the month.

2. Data & Methods

Surface air temperatures, total precipitation, and 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). It is available in a preliminary status at https://www.ncei.noaa.gov/data/nclimgrid-monthly/access/
  Data was downloaded on 12/12/2024.

- NOAA Monthly U.S. Climate *Divisional* Dataset (NClimDiv – Vose et al. 2014). It is available in a preliminary status (v1.0.0-20241205) at:
  https://www.ncei.noaa.gov/pub/data/cirs/climdiv/
  Data was downloaded on 12/9/2024.

- NOAA area averages of daily temperatures and precipitation dataset (nClimGrid−Daily −Durre et al. 2022). It is available in a preliminary status, v1.0.0, at:
  https://www.ncei.noaa.gov/products/land-based-station/nclimgrid-daily
  Data was downloaded on 12/9/2024.

Drought conditions are from the U.S. Drought Monitor website:
https://droughtmonitor.unl.edu/Maps/MapArchive.aspx

Streamflow conditions are from the U.S. Geological Survey Water Watch website:
https://waterwatch.usgs.gov/index.php

Some definitions:

About climate and climatology. Weather and climate are closely related, but they are not the same. Weather represents the state of the atmosphere (temperature, precipitation, 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). The current climate normal, or just the climatology, is defined for 1991–2020.

About the anomalies: Anomalies for a given month (e.g., November 2024) are the departures of the monthly value from the corresponding month's 30-year average (i.e., from the average of 30 Novembers) during 1991-2020. When the observed monthly 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 drier than normal) or negative anomaly.

About variability. The monthly standard deviation of a climate variable measures its dispersion relative to its monthly mean and assesses its 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.

About freezing days. Freezing temperatures affect people's health, comfort, and livelihood by impacting crops, livestock, infrastructure, water and energy resources, etc. Here, freezing temperatures are tracked by the count of days when daily minimum temperatures are below 32°F, 28°F, and 24°F (originally used to categorize agricultural impacts USDA, 2024) and their consecutive occurrence. When these conditions persist for two or more days, they define freezing day spells. These threshold values correspond to the 28th, 19th, and 12th percentiles of statewide daily minimum temperature for the period 1951−2000.

About degree days. Degree days are the difference between the daily mean temperature (high temperature plus low temperature divided by two) and a predefined base temperature; because energy demand is cumulative, degree-day totals are usually calculated on a daily, monthly, seasonal, and annual basis.

- *Heating and cooling degree days.* These are used to get a general idea of how much energy is required to warm or cool buildings. The base temperature used for this purpose is 65°F, considered tolerable for human comfort (CPC, 2023).

- *Growing degree days*. These estimate the growth and development of plants and insects through the calendar year or during the growing season under the idea that development will only occur if the temperature exceeds some minimum development threshold temperature or, in other words, if enough warmth is accumulated. Because the actual development will differ for different plants and insects, and the presence of weeds and precipitation can influence the development, a base temperature of 50°F is generally considered acceptable for all plants and insects (OSU 2024). However, this base temperature is best suited for the development of specific crops like corn, sweet corn, soybeans, tomatoes, and a few others.

    - *Modified growing degree days*. The modified growing degree days are obtained if base temperatures are established for the daily maximum and minimum temperatures before calculating the daily mean temperature. When the base temperature for the daily maximum temperature is set to 86°F, and the base temperature for the daily minimum temperature is set to 50°F, the growing degree days are specific to corn development as no appreciable growth is detected with temperatures lower than 50°F or greater than 86°F.

About extreme precipitation. This is defined as the yearly number of days with statewide averaged daily total precipitation equal to or greater than 0.64 inches. This threshold value represents the 95th percentile of statewide averaged daily total precipitation for 1951-2000.

About the dry day spells. A dry day is defined as a day with precipitation below 0.04 inches. These conditions are named dry spells if they persist for two or more days. The number of dry spells and their duration are particularly important during the vegetation period (Tschurr et al., 2020).

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. November 2024 Maps

A. Mean Temperatures

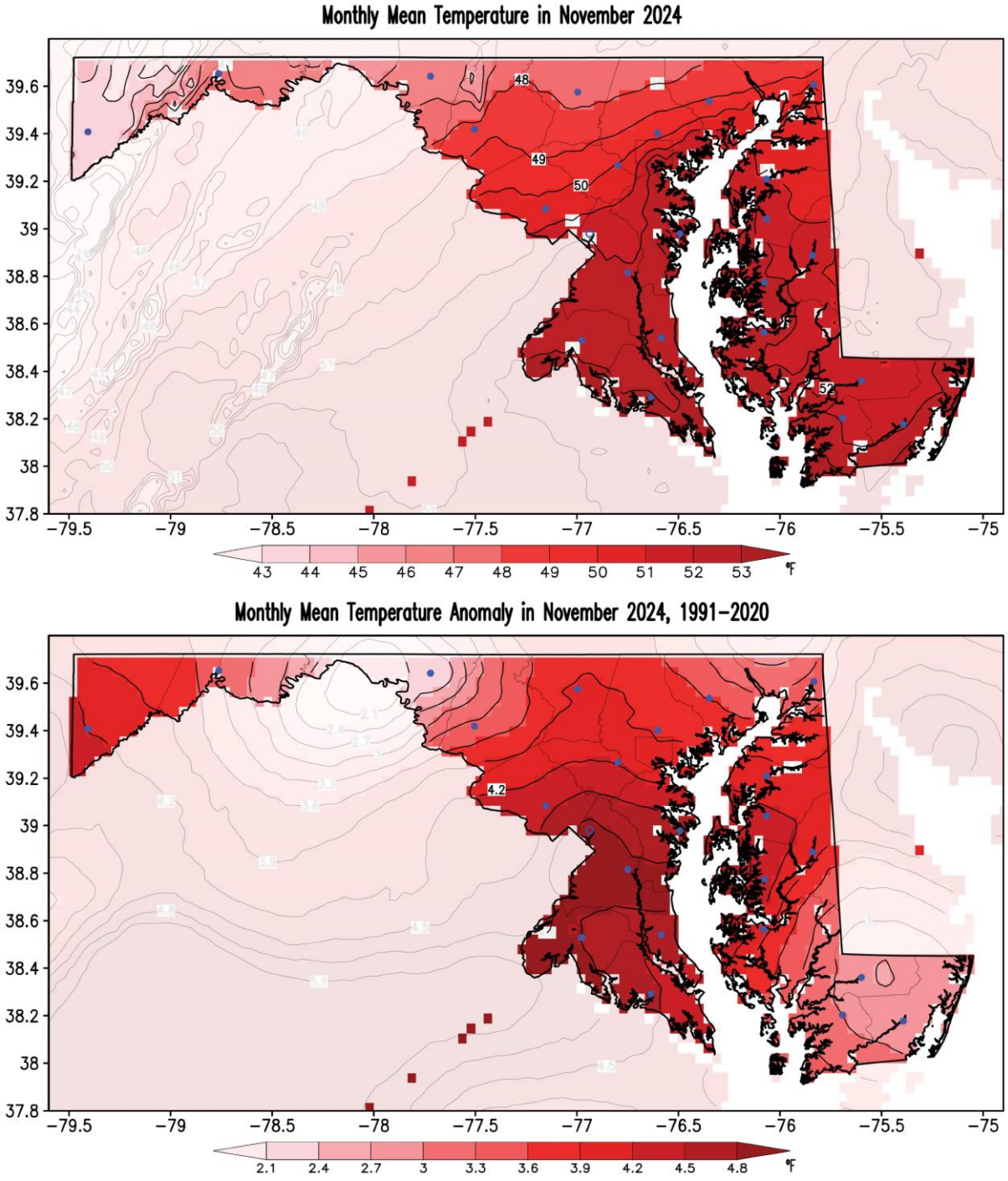

Figure 1. Monthly mean surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for November 2024. Temperatures are in °F following the color bar. Red shading in the anomaly map marks warmer than normal conditions. Note shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

B. Maximum Temperatures

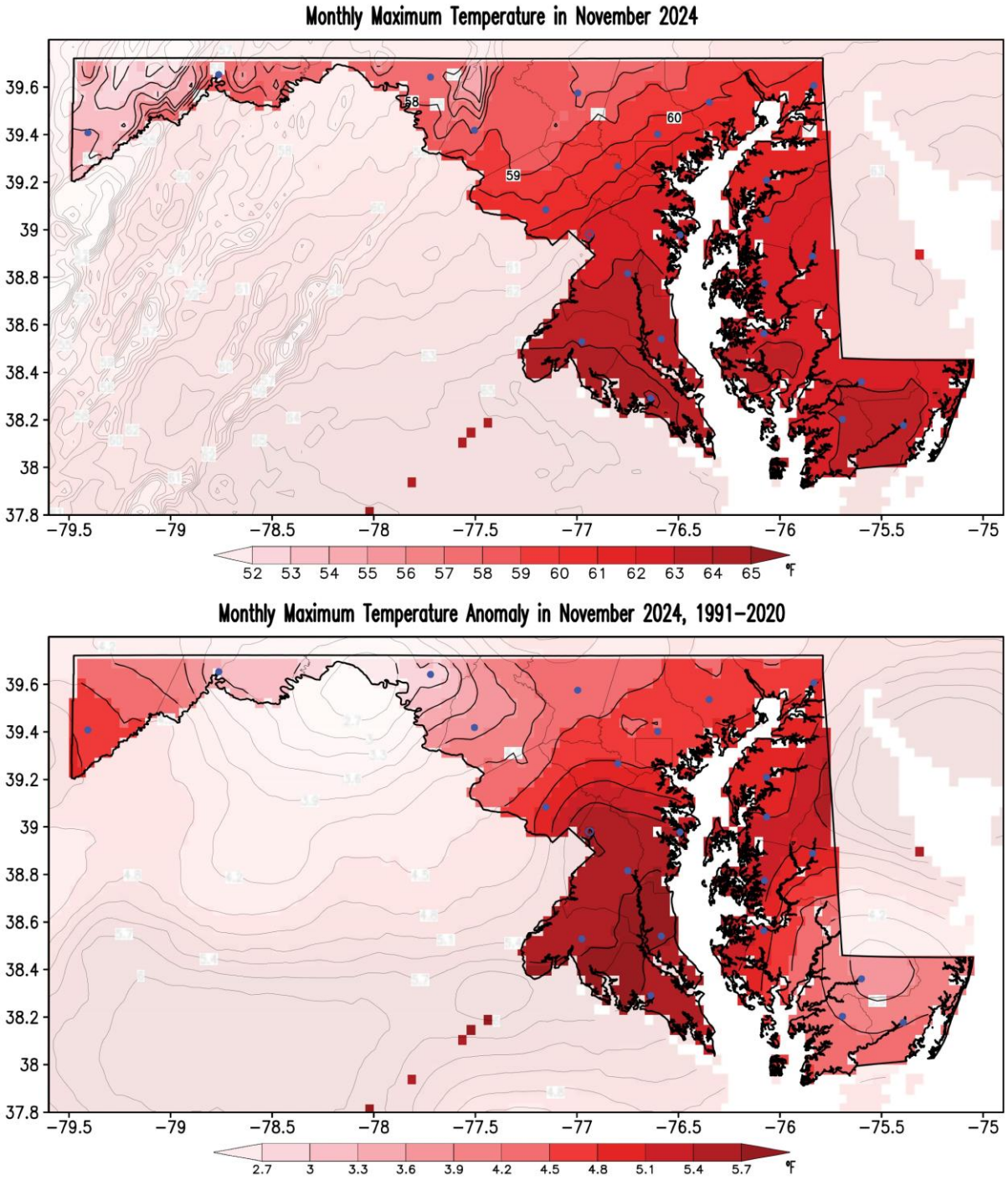

Figure 2. Monthly maximum surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for November 2024. Temperatures are in °F following the color bar. Red shading in the anomaly map marks warmer than normal conditions. Note shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

C. Minimum Temperatures

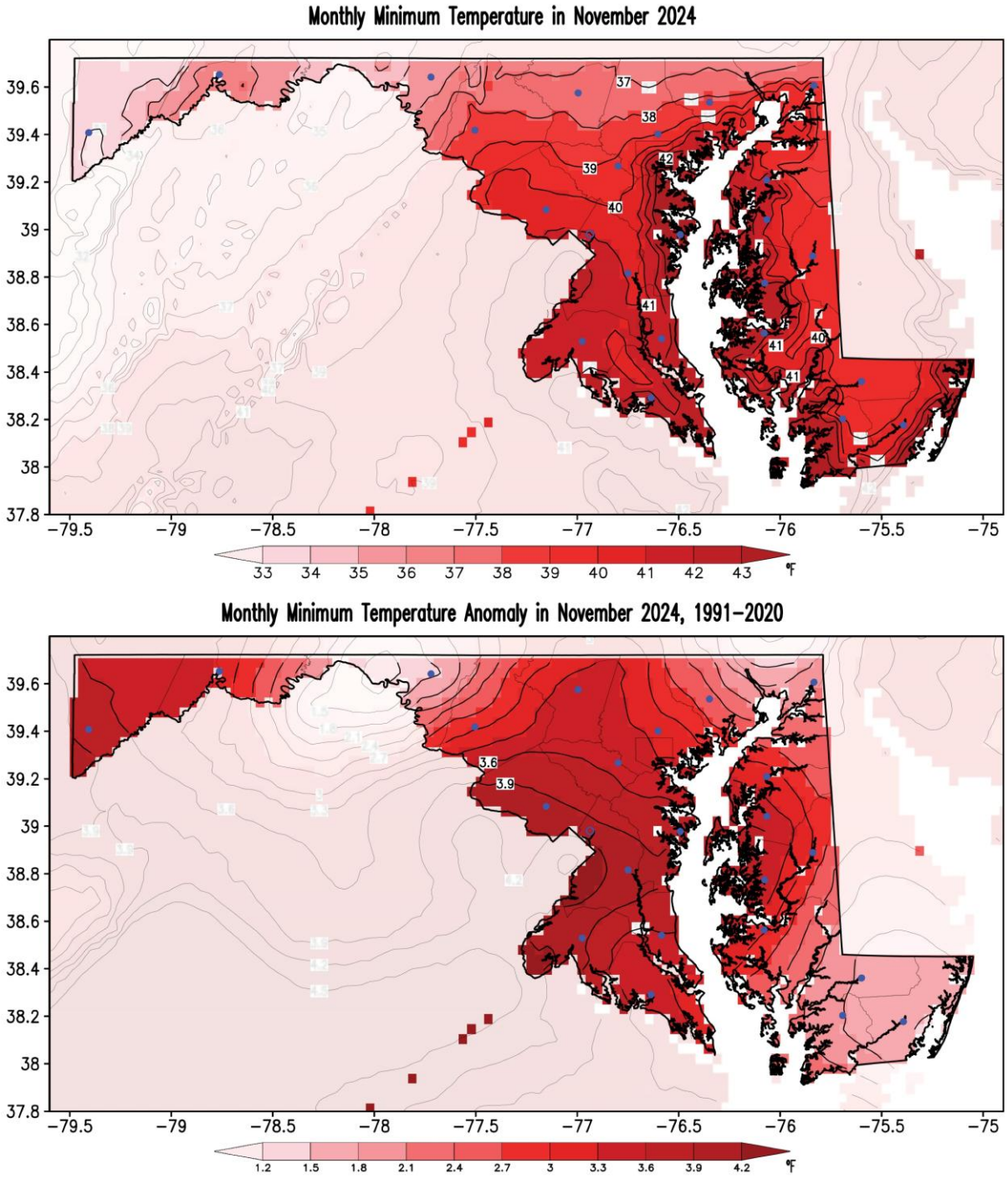

Figure 3. Monthly minimum surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for November 2024. Temperatures are in °F following the color bar. Red shading in the anomaly map marks warmer than normal conditions. Note shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

D. Precipitation

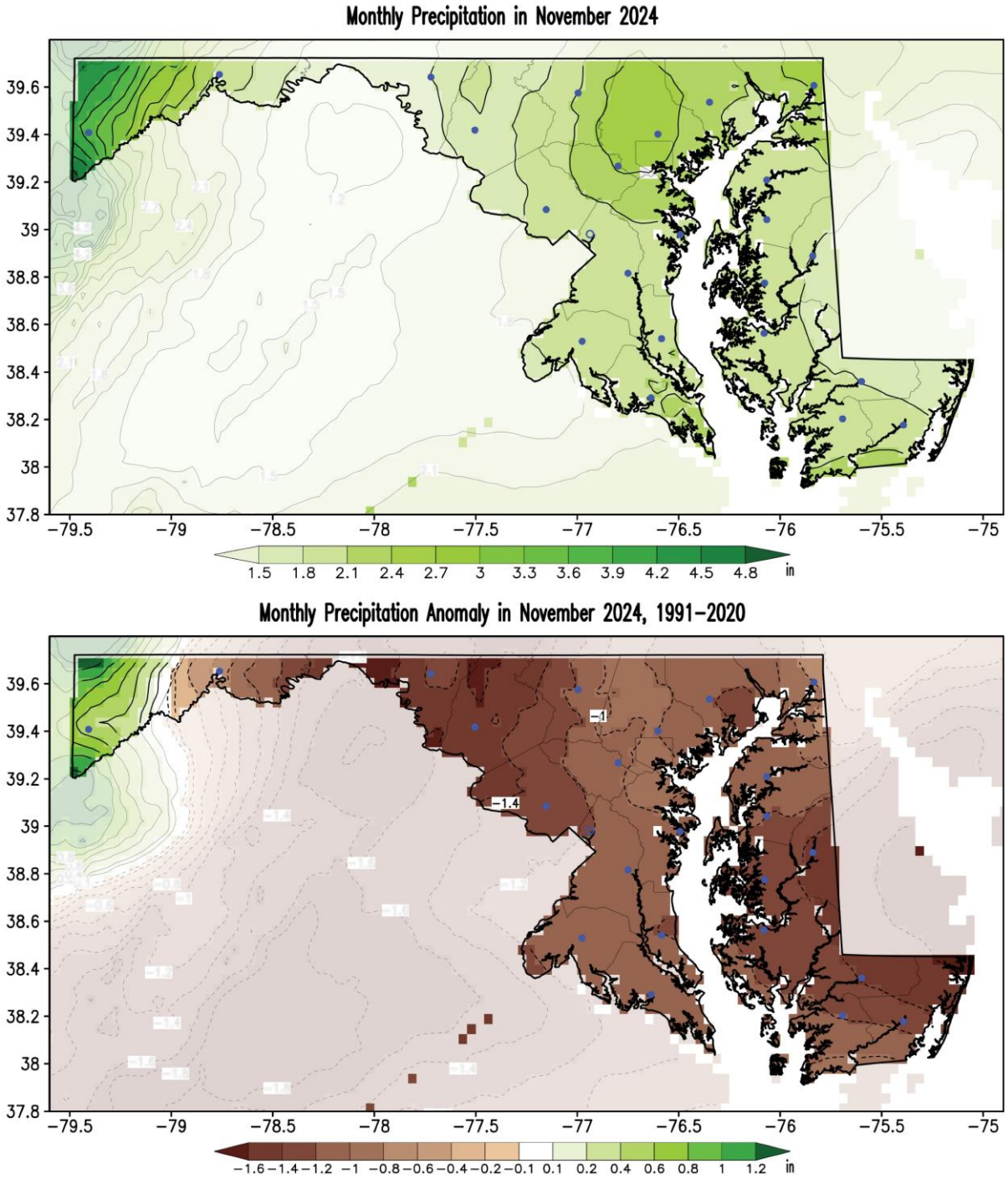

Figure 4. Monthly total precipitation (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for November 2024. Precipitation is in inches following the color bar. Brown/green shading in the anomaly map marks drier/wetter than normal conditions. Note shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

E. Drought

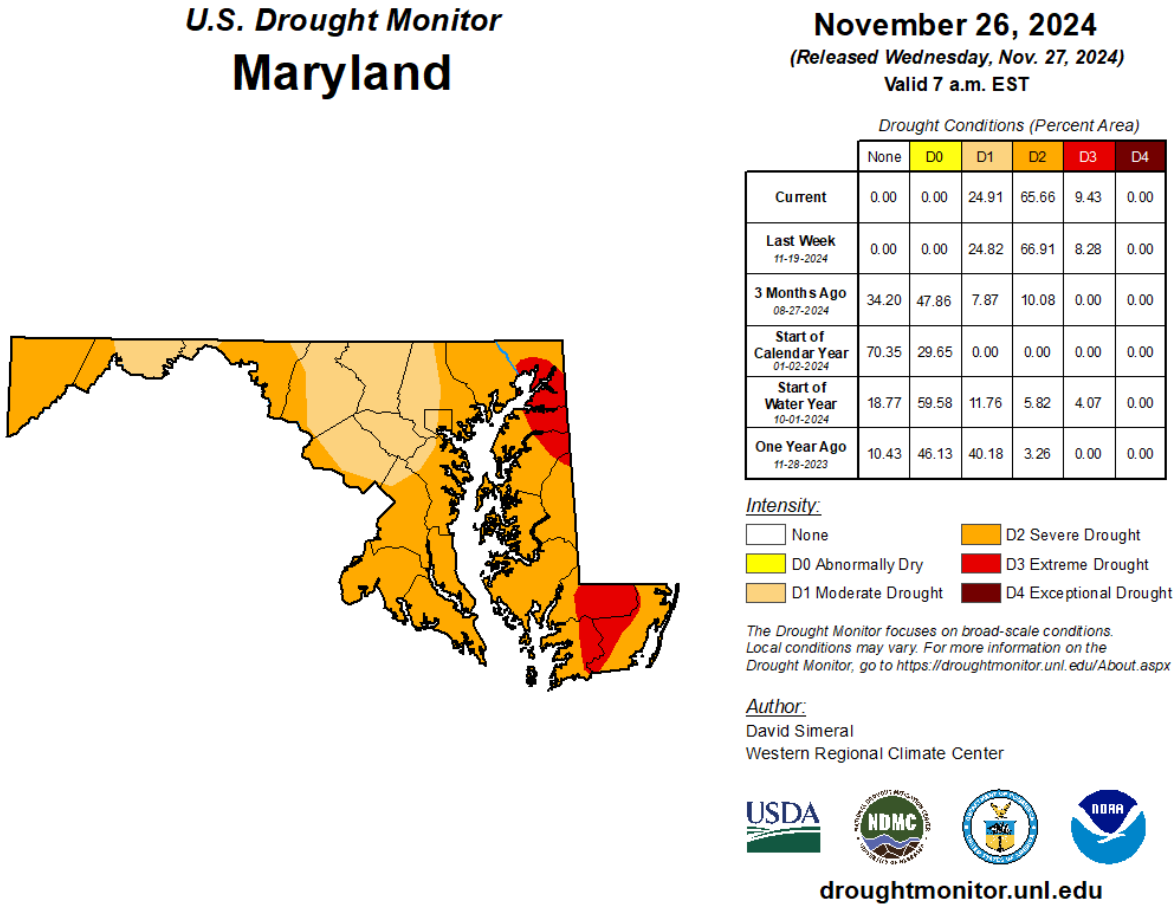

Figure 5. Drought conditions as reported by the U.S. Drought Monitor on November 26, 2024. At this time, the entire state is under some drought category, 13% more than at the end of October. Extreme drought conditions are no longer present in Garrett County but appear to the north and south on the Eastern Shore. The areas that were under none drought, abnormally dry and moderate drought conditions at the end of October are now under moderate to severe drought conditions (~91% of the state). Light orange shading shows regions under a moderate drought, darker orange marks regions under severe drought, and red shading indicates extreme drought according to the drought intensity key. Numbers in the table indicate the percentage of the state covered under the particular drought conditions at the time (in the left column). Light orange areas (Moderate Drought) highlight land that may experience low water supply and damage to crops and pastures. Orange areas (Severe Drought) show land with water shortages and an increased likelihood of crop and pasture losses. Red areas (Extreme Drought) highlight land that may experience widespread water shortages and major losses of crops and pastures, with forests susceptible to fire. Current conditions can be monitored from the U. S. Drought Monitor website.

F. Streamflow

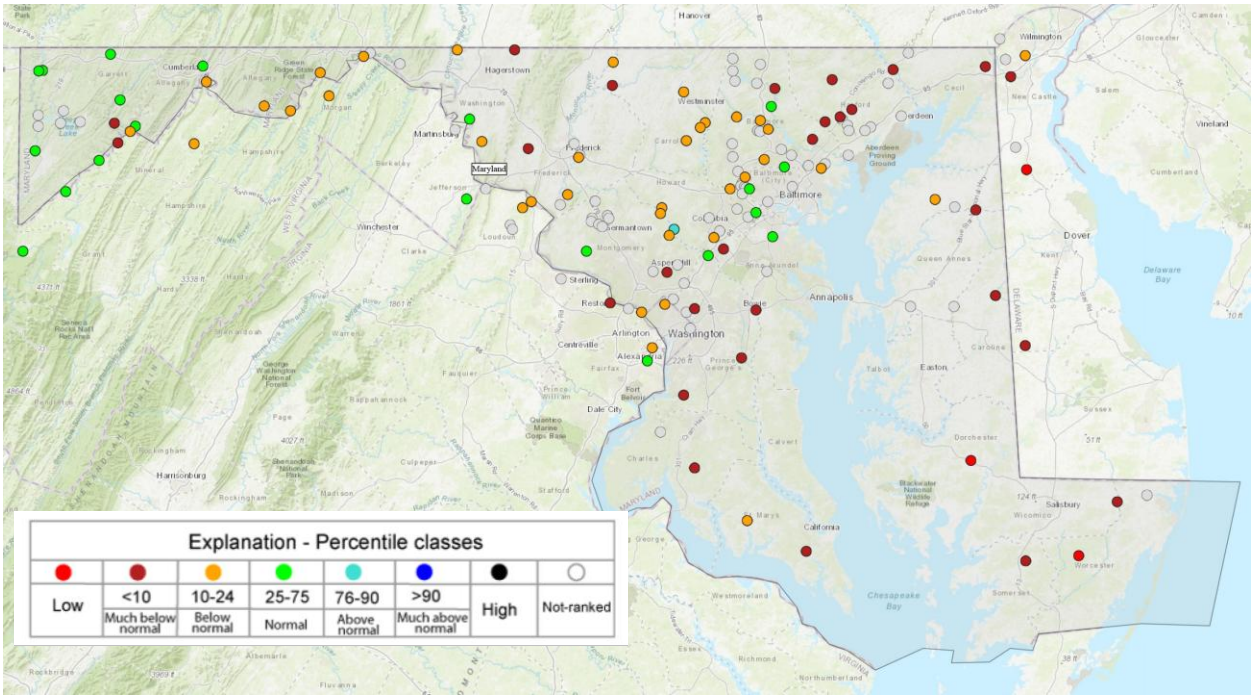

Figure 6. Monthly averaged streamflow class anomalies as reported by the U.S. Geological Survey (USGS) Water Watch for November 2024. Orange to red-filled circles denote below-normal streamflow conditions, cyan to black-filled circles denote above-normal streamflow conditions, and green-filled circles represent normal streamflow conditions. Streams and rivers had below-normal streamflow in the severe to extreme drought areas along both sides of the Bay. Current conditions can be monitored from the U. S. Geological Survey website.

4. November and SON 2024 Climate Divisions Averages

A. November 2024 Scatter Plots

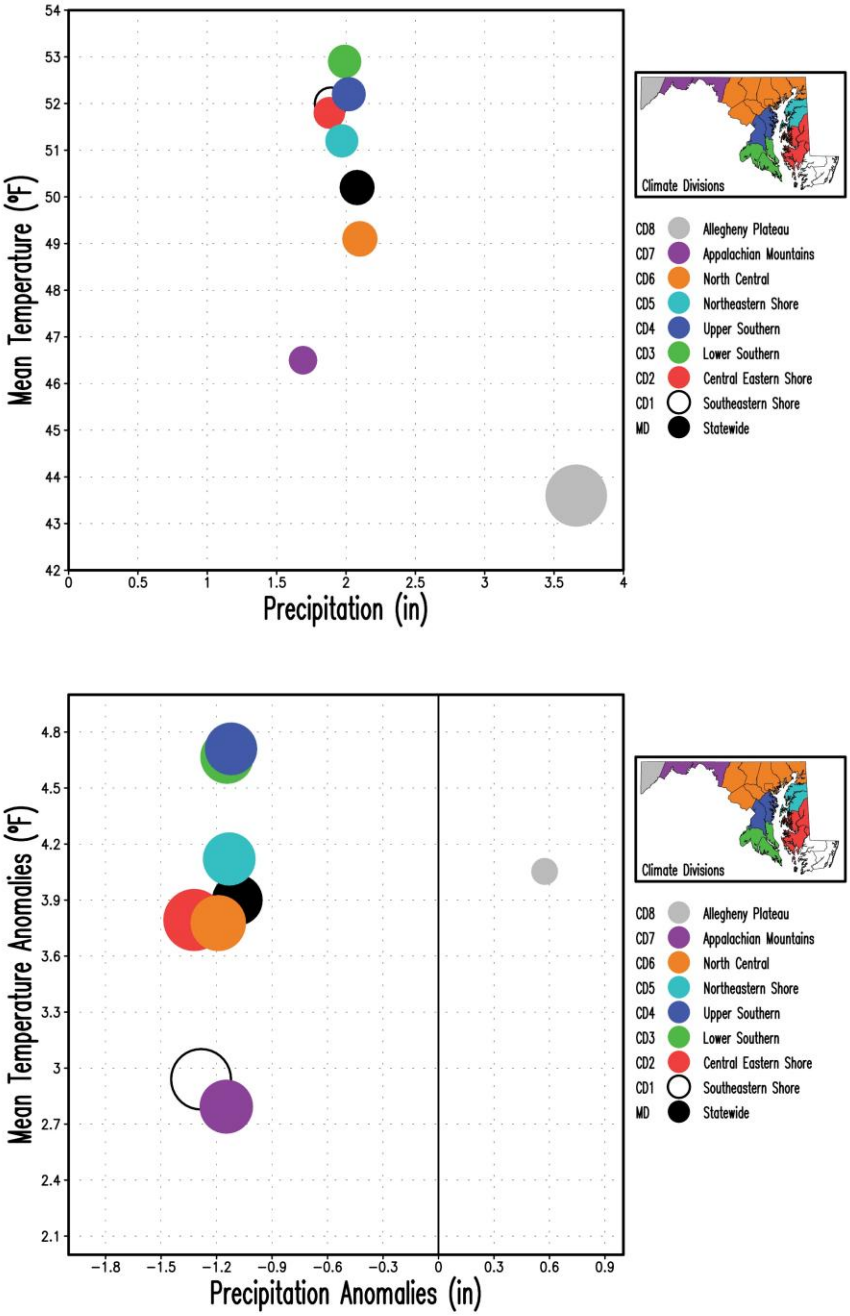

Figure 7. Scatter plots of Maryland (statewide) and Climate Divisions (CD#) monthly mean surface air temperature vs. total precipitation for November 2024. The upper panel shows the mean temperature and total precipitation, and the bottom panel displays their anomalies with respect to the 1991-2020 climatology. 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 (3.66 inches in CD8, top panel) and by the maximum precipitation anomaly (|−1.32| inches in CD2, 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. September – November 2024 Scatter Plots

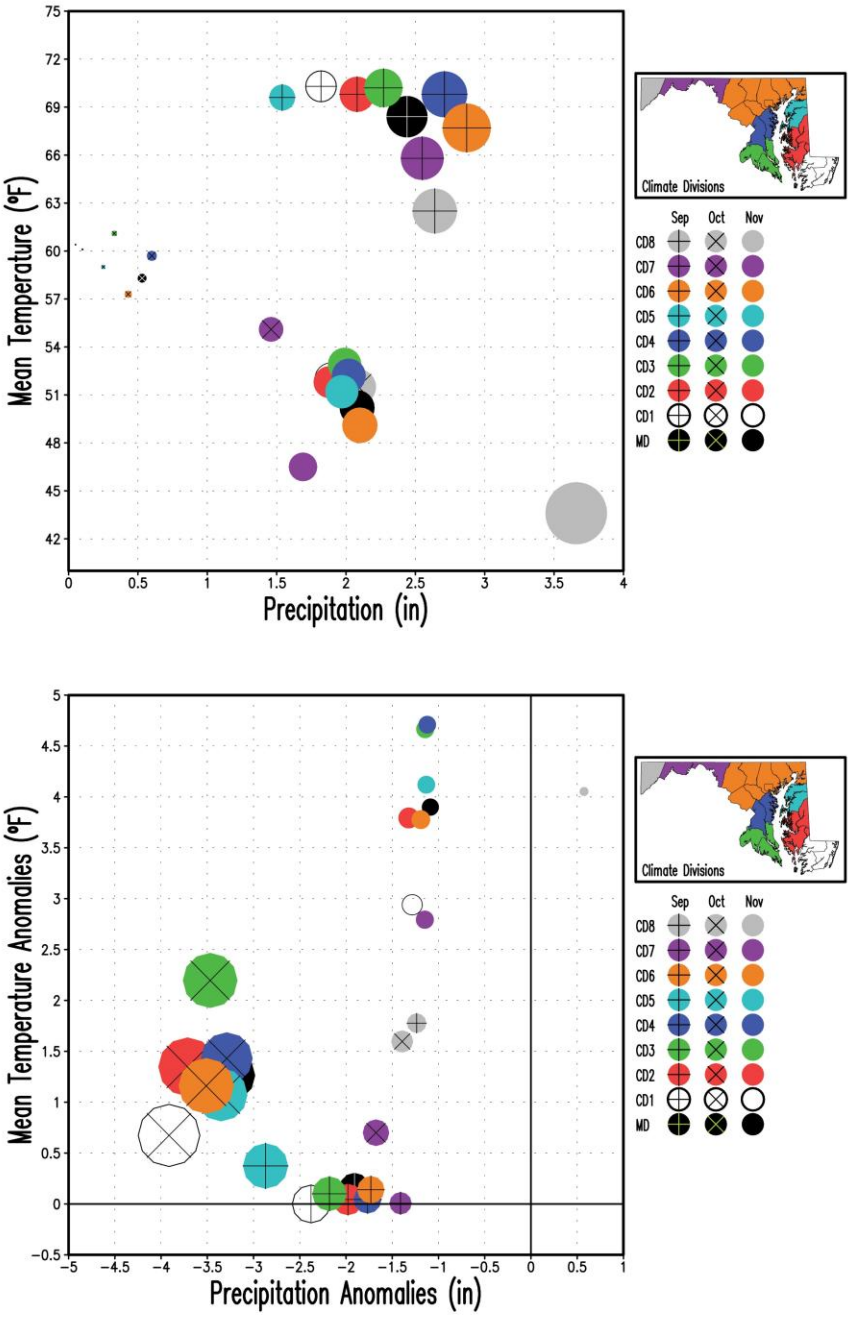

Figure 8. Scatter plots of Maryland (statewide) and Climate Divisions (CD#) monthly mean surface air temperature vs. total precipitation for September, October, and November 2024. The upper panel shows the mean temperature and total precipitation, and the bottom panel displays their anomalies with respect 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 (3.66 inches in CD8 in November, top panel) and by the maximum precipitation anomaly (|−3.91| inches in CD1 in October, bottom panel) among the nine regions and three months. November is displayed with filled circles only, while October and September are displayed with superposed multiplication and addition signs, respectively.

5. Extremes and Growing Degree Days

A. Freezing Days

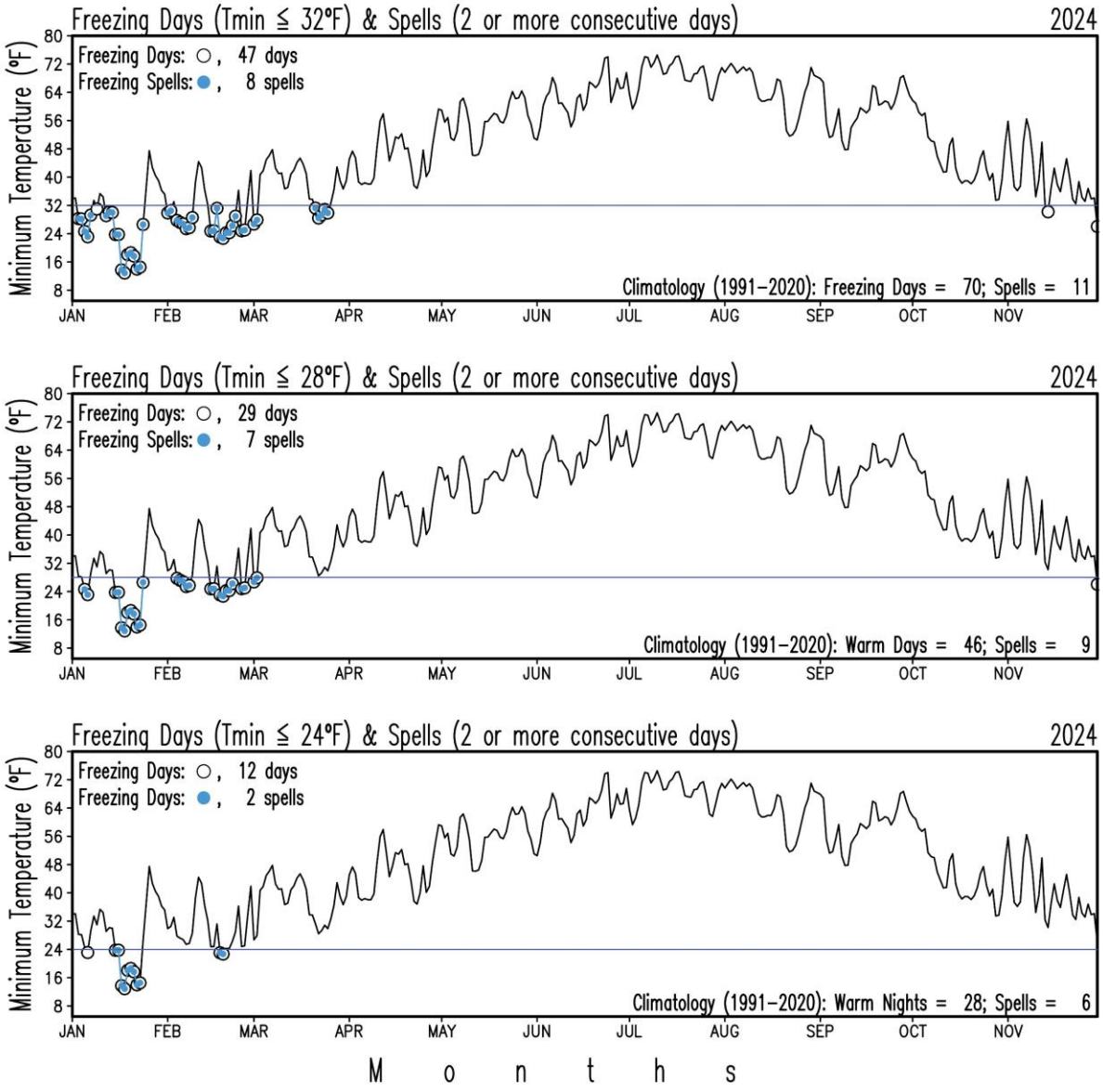

Figure 9. Maryland (statewide) number of freezing days, and their consecutive occurrence for the period January 1 - November 30, 2024. The panels show freezing days in open circles and spells of freezing days in blue-filled circles from statewide daily minimum temperatures. The upper panel displays freezing days and spells when statewide daily minimum temperatures are equal to or below 32°F. The middle panel shows freezing days and spells when statewide daily minimum temperatures are equal to or lower than 28°F. The lower panel shows freezing days and spells when statewide daily minimum temperatures are equal to or below 24°F. The blue line in each panel marks the threshold temperatures of 32°F, 28°F, and 24°F for each case. Figures at the county and climate division level and summary tables can be found on the MDSCO website.

B. Extreme Precipitation and Dry Spells

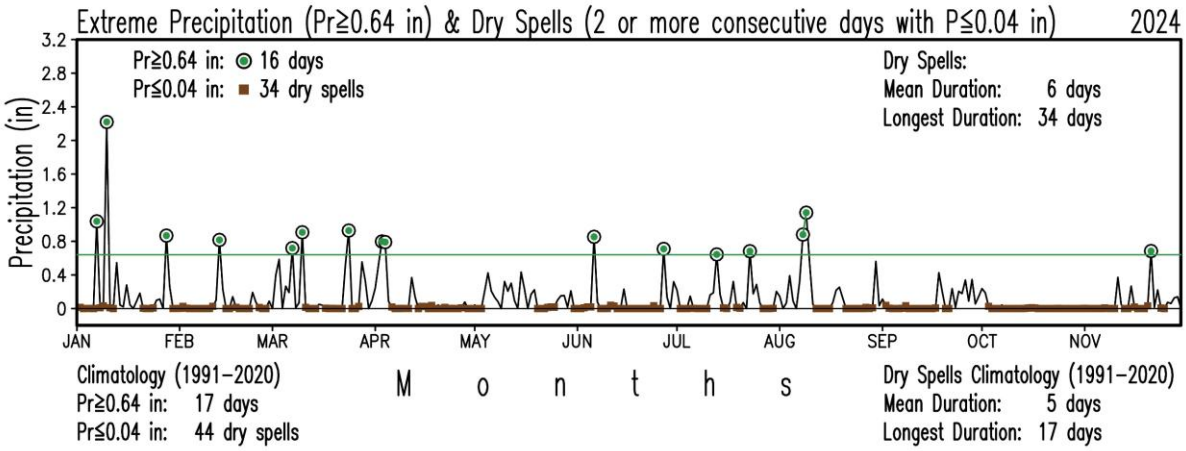

Figure 10. Maryland (statewide) number of days with extreme precipitation and dry day spells for the period January 1 - November 30, 2024. Extreme precipitation days (precipitation equal to or larger than 0.64 in) are identified by the green-filled circles. Dry spells (consecutive days with daily total precipitation less than or equal to 0.04 in) are shown by brown-filled squares. Both extremes are identified from the statewide area-averaged total daily precipitation. Figures at the county and climate division level and summary tables can be found on the MDSCO website.

C. Modified Growing Degree Days

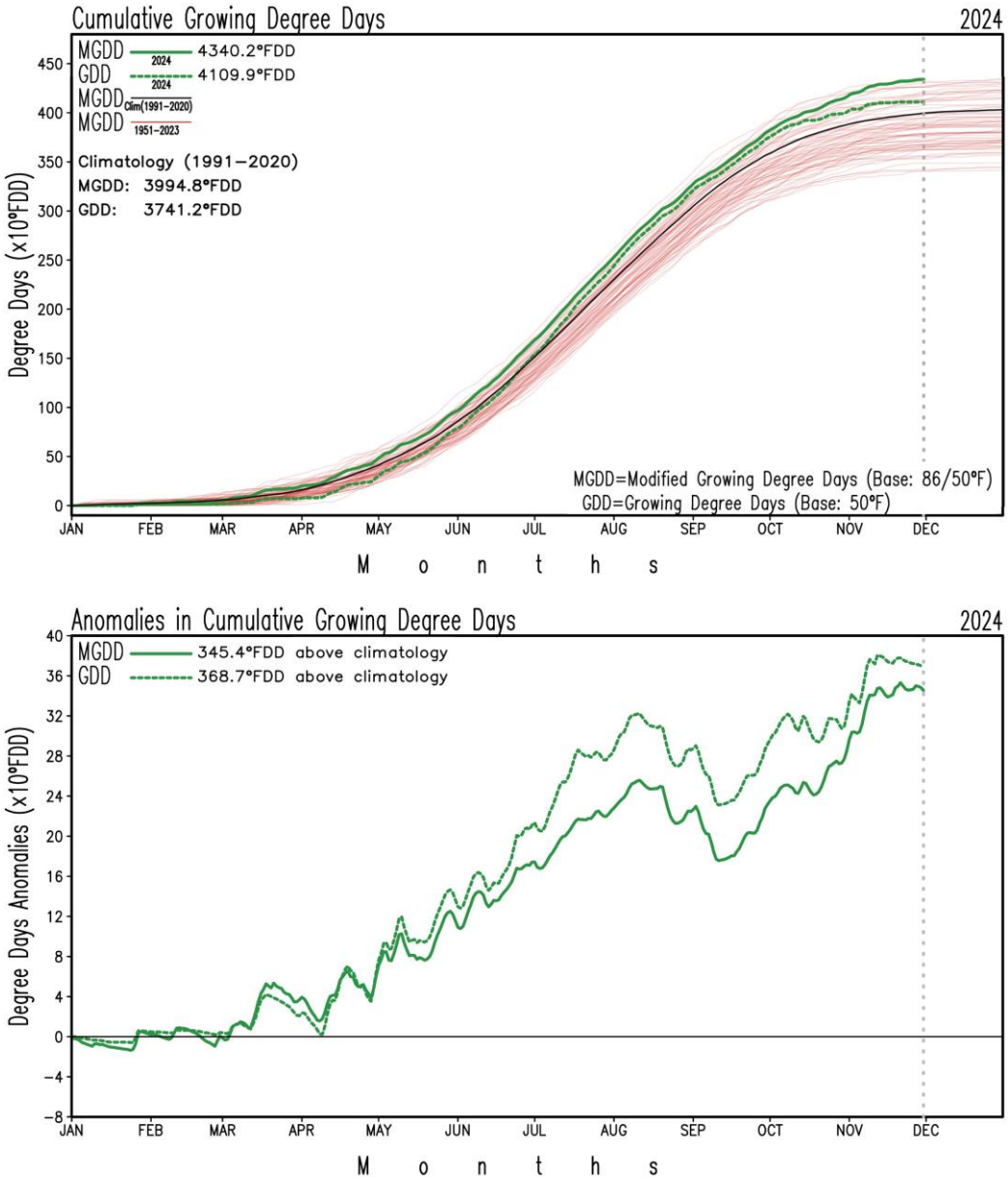

Figure 11. Maryland (statewide) cumulative growing degree days (upper panel) and its anomalies with respect to the 1991-2020 climatology (bottom panel) during the calendar year period January 1 to November 30, 2024. The cumulative modified growing degree days are displayed with the continuous green line, while the growing degree days are shown with the dashed green line; the black line in the upper panel shows the 1991- 2020 climatological cumulative modified growing degree days, and the thin red lines display the cumulative modified growing degree days every year from 1951 to 2023. Figures at the county and climate division level and summary tables can be found on the MDSCO website.

6. November 2024 Statewide Averages in the Historical Record

A. Box and Whisker Plots

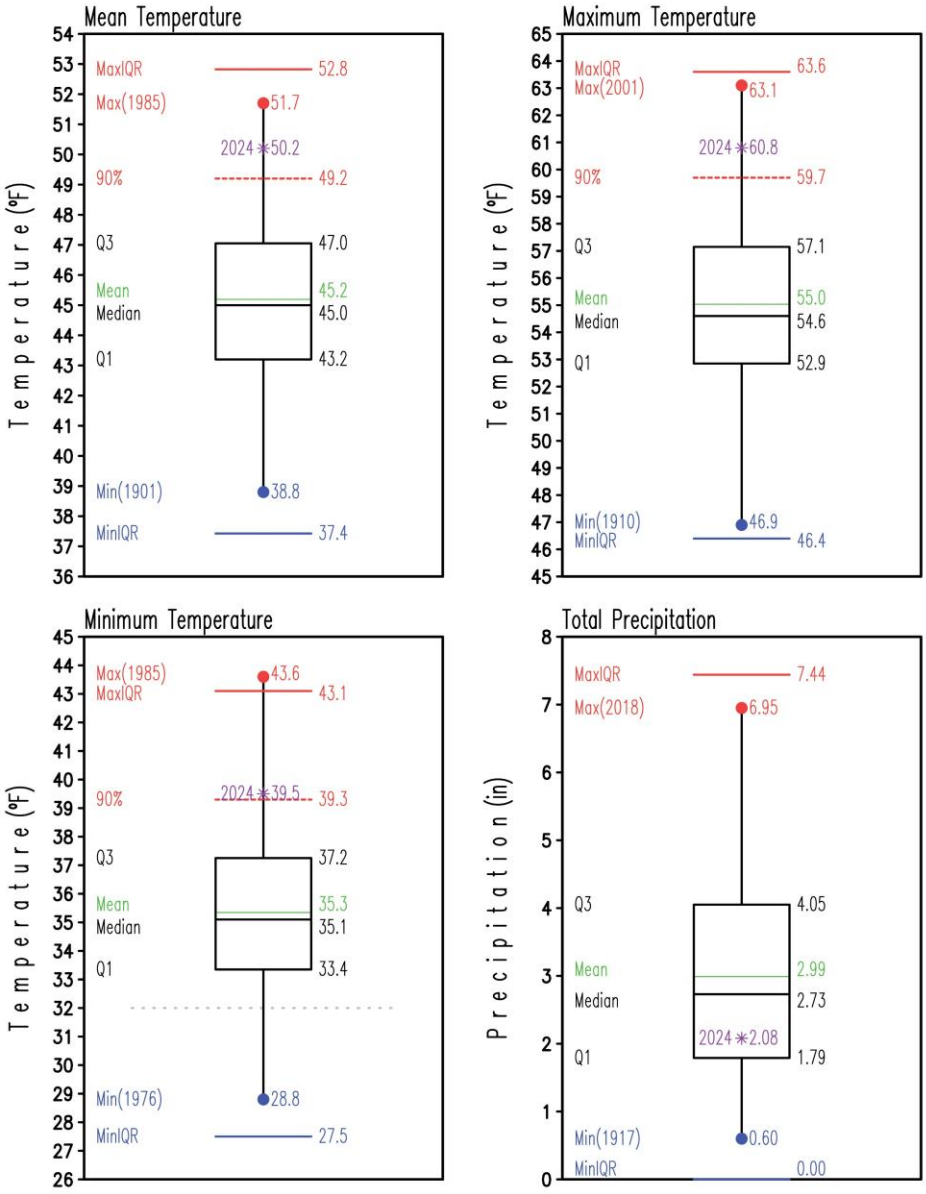

Figure 12. Box and Whisker plots of Maryland (statewide) monthly mean (upper left), maximum (upper right), minimum (lower left) surface air temperatures, and total precipitation (lower right) for November for the period 1895-2023. The label and asterisk in purple represent conditions for November 2024. Statistics for the period 1895-2023 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 smallest and largest values, are the lower and upper horizontal black lines of the box, respectively. The thresholds indicating the upper 10% values in the temperatures are marked by the dashed red lines. 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.

7. 1895-2024 November Trends

A. Statewide Mean Temperature, Heating Degree-Days, and Precipitation

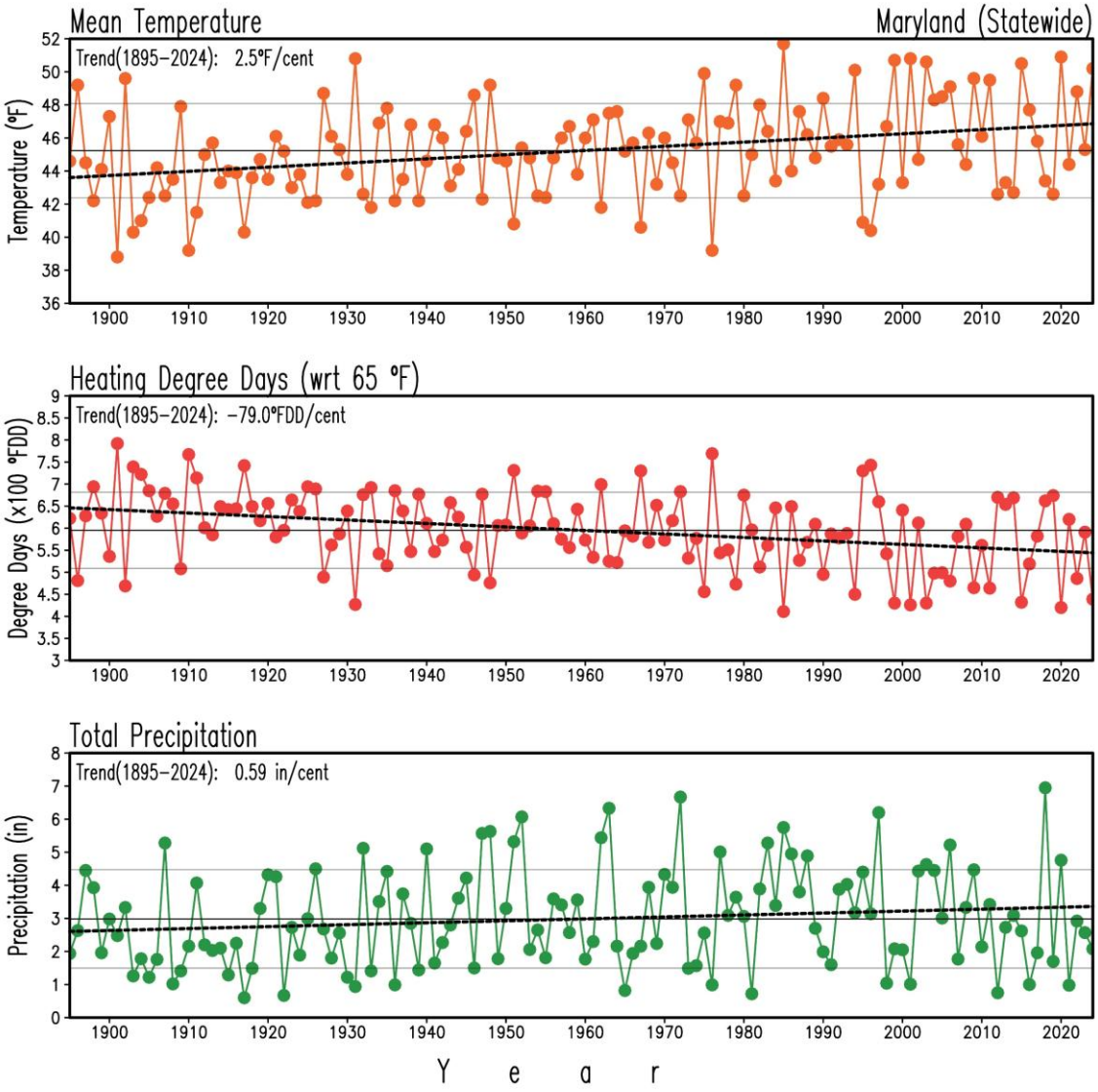

Figure 13. Maryland (statewide) mean surface air temperature, heating degree days, and precipitation in November for the period 1895-2024. Temperature is in °F, heating degree-days is in °F degree-days (°FDD), and precipitation is in inches. The thin, continuous black lines in each panel display the long-term means (45.2°F, 595.2°FDD and 2.98 in, 1895-2024), and the double thin, continuous gray lines indicate the standard deviation (2.9°F, 86.2°FDD and 1.49 in) above/below the long-term mean. The thick dashed black lines show the long-term linear trend. The warming temperature trend (2.5°F/century), the decreasing heating degree-days trend (−79.0°FDD/century), and the precipitation wetting trend (0.59 in/century) are statistically significant at the 95% level (*Student's t-test* −Santer et al. 2000).

B. Temperature and Precipitation Maps

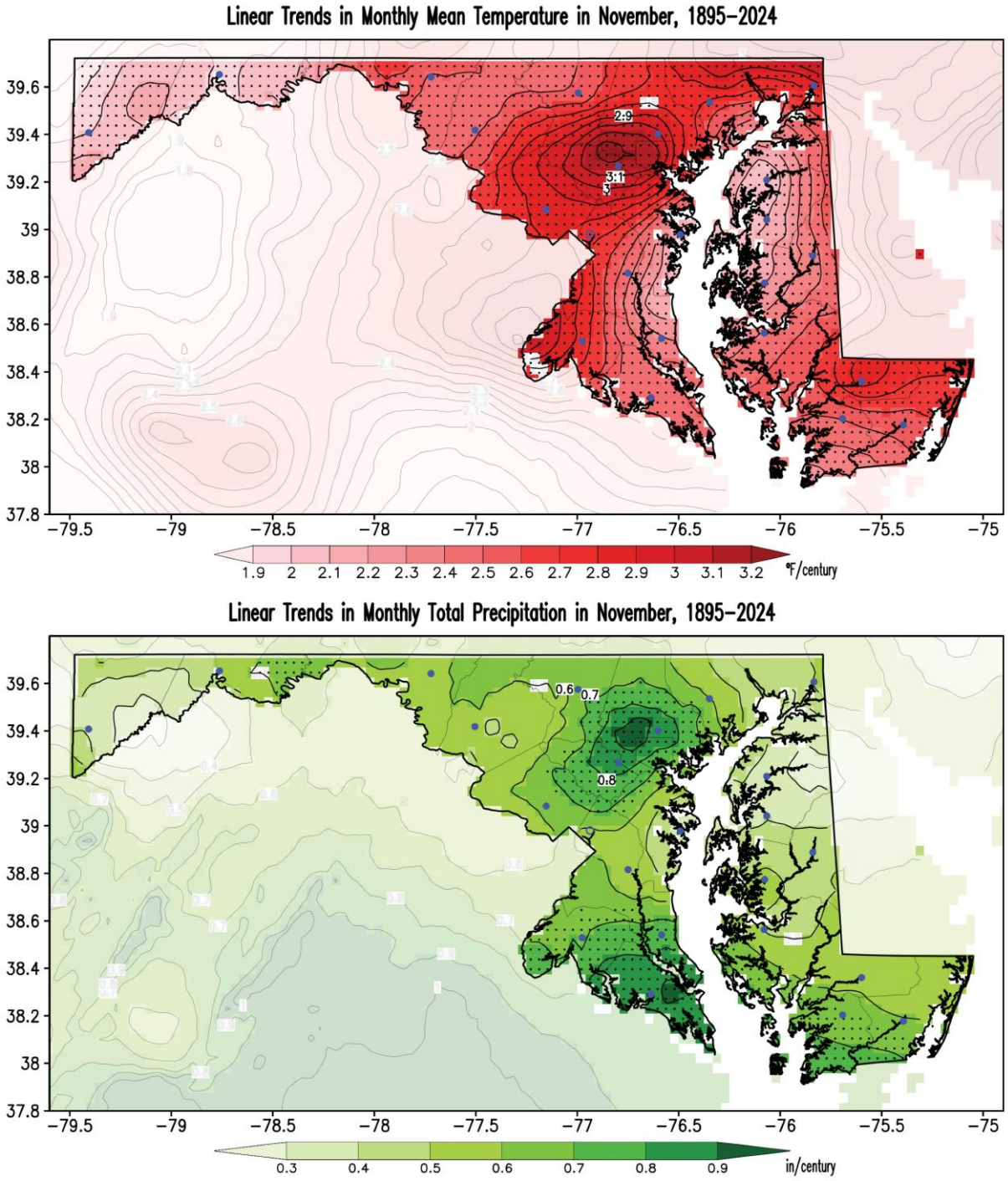

Figure 14. Linear trends in surface air mean temperature and precipitation in November for the period 1895-2024. Temperatures are in °F/century, and precipitation is in inches/century following the color bars. Red shading in the temperature map marks warming trends. Green shading in the precipitation 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. November 2024 Data Tables: Statewide, Climate Divisions, and Counties

A. Mean Temperature and Precipitation

Region	Mean Air Temperature (°F)	Rank (#)
Statewide	50.2	123
Climate Division 1	52.0	115
Climate Division 2	51.8	124
Climate Division 3	52.9	128
Climate Division 4	52.2	128
Climate Division 5	51.2	122
Climate Division 6	49.1	123
Climate Division 7	46.5	114
Climate Division 8	43.6	120
Allegany	46.4	115
Anne Arundel	52.3	128
Baltimore	49.3	123
Baltimore City	51.3	124
Calvert	52.7	128
Caroline	51.2	125
Carroll	48.0	122
Cecil	49.5	120
Charles	52.9	126
Dorchester	52.1	123
Fredrick	48.1	119
Garrett	43.6	120
Harford	49.2	120
Howard	49.7	123
Kent	51.1	122
Montgomery	50.2	123
Prince George's	52.1	129
Queen Anne's	51.4	125
Saint Mary's	53.0	128
Somerset	52.4	119
Talbot	52.4	127
Washington	46.6	110
Wicomico	51.4	115
Worcester	52.2	115

Region	Total Precipitation (in)	Rank (#)
Statewide	2.08	44
Climate Division 1	1.89	38
Climate Division 2	1.88	36
Climate Division 3	1.99	47
Climate Division 4	2.02	42
Climate Division 5	1.97	39
Climate Division 6	2.10	41
Climate Division 7	1.69	34
Climate Division 8	3.66	91
Allegany	1.94	52
Anne Arundel	2.11	44
Baltimore	2.47	53
Baltimore City	2.48	56
Calvert	2.07	49
Caroline	1.80	33
Carroll	2.08	40
Cecil	2.28	52
Charles	1.89	45
Dorchester	1.92	40
Fredrick	1.74	27
Garrett	3.65	91
Harford	2.18	40
Howard	2.22	48
Kent	2.02	40
Montgomery	1.83	36
Prince George's	1.98	41
Queen Anne's	1.94	39
Saint Mary's	2.07	49
Somerset	2.02	45
Talbot	1.92	37
Washington	1.45	24
Wicomico	1.80	33
Worcester	1.86	38

Table A1. Monthly mean surface air temperature (left) and total precipitation (right) at Maryland (statewide), climate division, and county levels for November 2024. Temperatures are in °F, and precipitation is in inches. The rank is the order that the variable for November 2024 occupies among the 130 Novembers after the 130 values have been arranged from the lowest to the highest in the *standard competition ranking method*. The closer to 130 the rank is, the larger (i.e., the 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	60.8	123
Climate Division 1	63.0	122
Climate Division 2	62.8	126
Climate Division 3	64.0	129
Climate Division 4	62.7	128
Climate Division 5	62.0	128
Climate Division 6	59.5	122
Climate Division 7	57.2	115
Climate Division 8	53.5	114
Allegany	57.0	113
Anne Arundel	62.6	128
Baltimore	59.8	122
Baltimore City	61.4	127
Calvert	63.5	129
Caroline	62.7	126
Carroll	58.4	121
Cecil	60.4	128
Charles	64.1	129
Dorchester	63.0	126
Fredrick	58.2	120
Garrett	53.5	114
Harford	60.0	123
Howard	60.2	124
Kent	61.6	128
Montgomery	60.2	122
Prince George's	62.9	129
Queen Anne's	62.2	128
Saint Mary's	64.1	129
Somerset	63.1	124
Talbot	62.6	126
Washington	57.4	112
Wicomico	62.8	120
Worcester	63.0	122

Region	Minimum Air Temperature (°F)	Rank (#)
Statewide	39.5	118
Climate Division 1	41.1	108
Climate Division 2	40.9	117
Climate Division 3	41.8	123
Climate Division 4	41.7	128
Climate Division 5	40.3	116
Climate Division 6	38.7	117
Climate Division 7	35.8	110
Climate Division 8	33.7	125
Allegany	35.8	117
Anne Arundel	42.1	124
Baltimore	38.8	121
Baltimore City	41.3	121
Calvert	41.9	123
Caroline	39.6	115
Carroll	37.6	121
Cecil	38.6	109
Charles	41.7	124
Dorchester	41.2	116
Fredrick	38.1	114
Garrett	33.7	125
Harford	38.4	116
Howard	39.2	123
Kent	40.5	115
Montgomery	40.2	124
Prince George's	41.2	127
Queen Anne's	40.6	117
Saint Mary's	42.0	121
Somerset	41.7	109
Talbot	42.0	121
Washington	35.8	106
Wicomico	40.0	110
Worcester	41.3	107

Table A2. Monthly maximum (left) and minimum (right) surface air temperatures at Maryland (statewide), climate division, and county levels for November 2024. Temperatures are in °F. The rank is the order that the variable for November 2024 occupies among the 130 Novembers after the 130 values have been arranged from the lowest to the highest using the *standard competition ranking method*. The closer to 130 the rank is, 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. November 2024 Bar Graphs: Statewide, Climate Divisions, and Counties

A. Temperatures and Precipitation

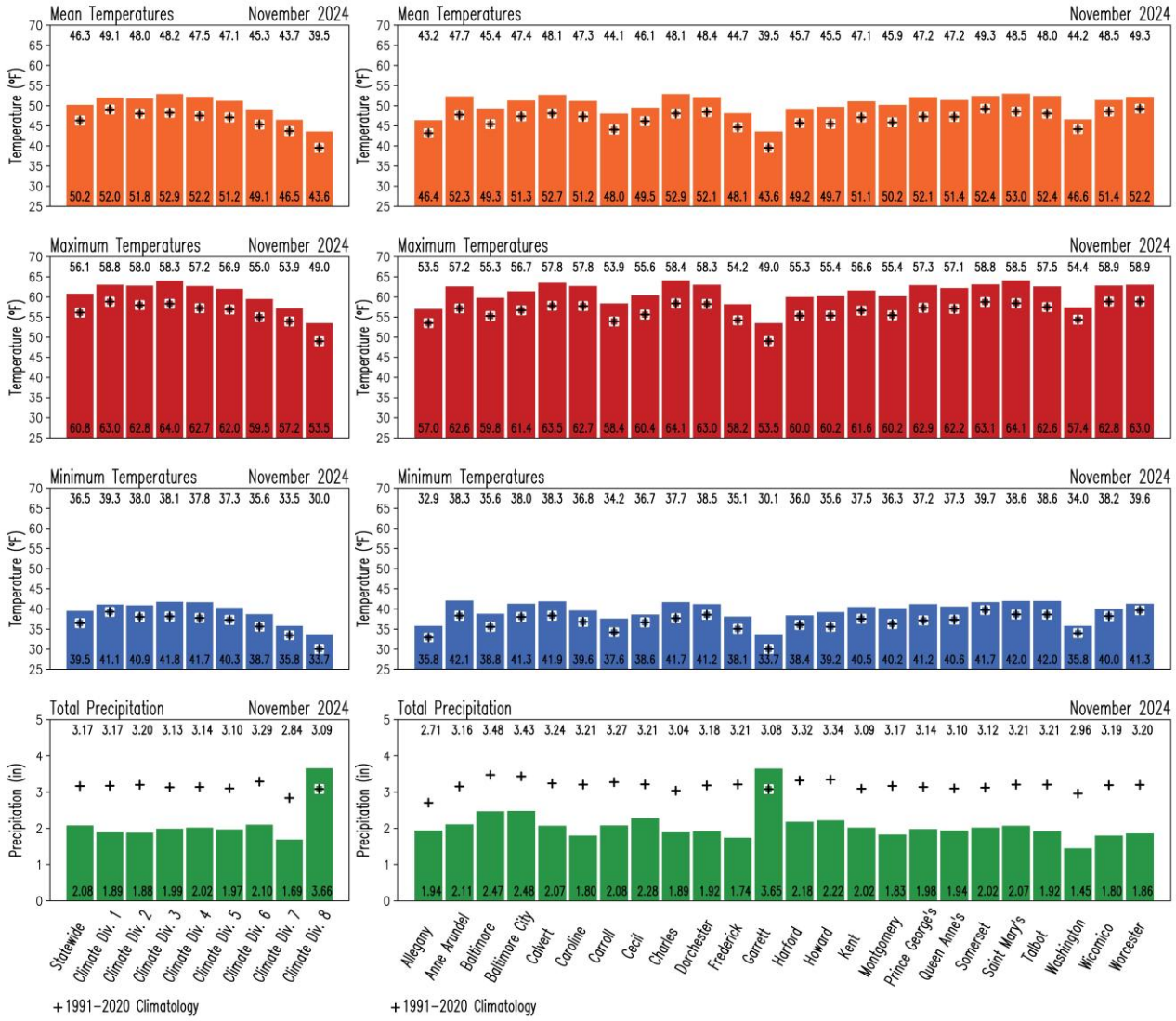

Figure B1. Monthly surface variables in Maryland for November 2024. Color bars represent the variables as follows: mean surface air temperature (orange), maximum surface air temperature (red), minimum surface air temperature (blue), and total precipitation (green) at statewide and climate division (left column), and 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 November 2024. For comparison, the corresponding 1991-2020 climatological values for November are displayed as black addition signs, and their magnitudes are shown at the top of the panels.

B. Temperatures and Precipitation Anomalies

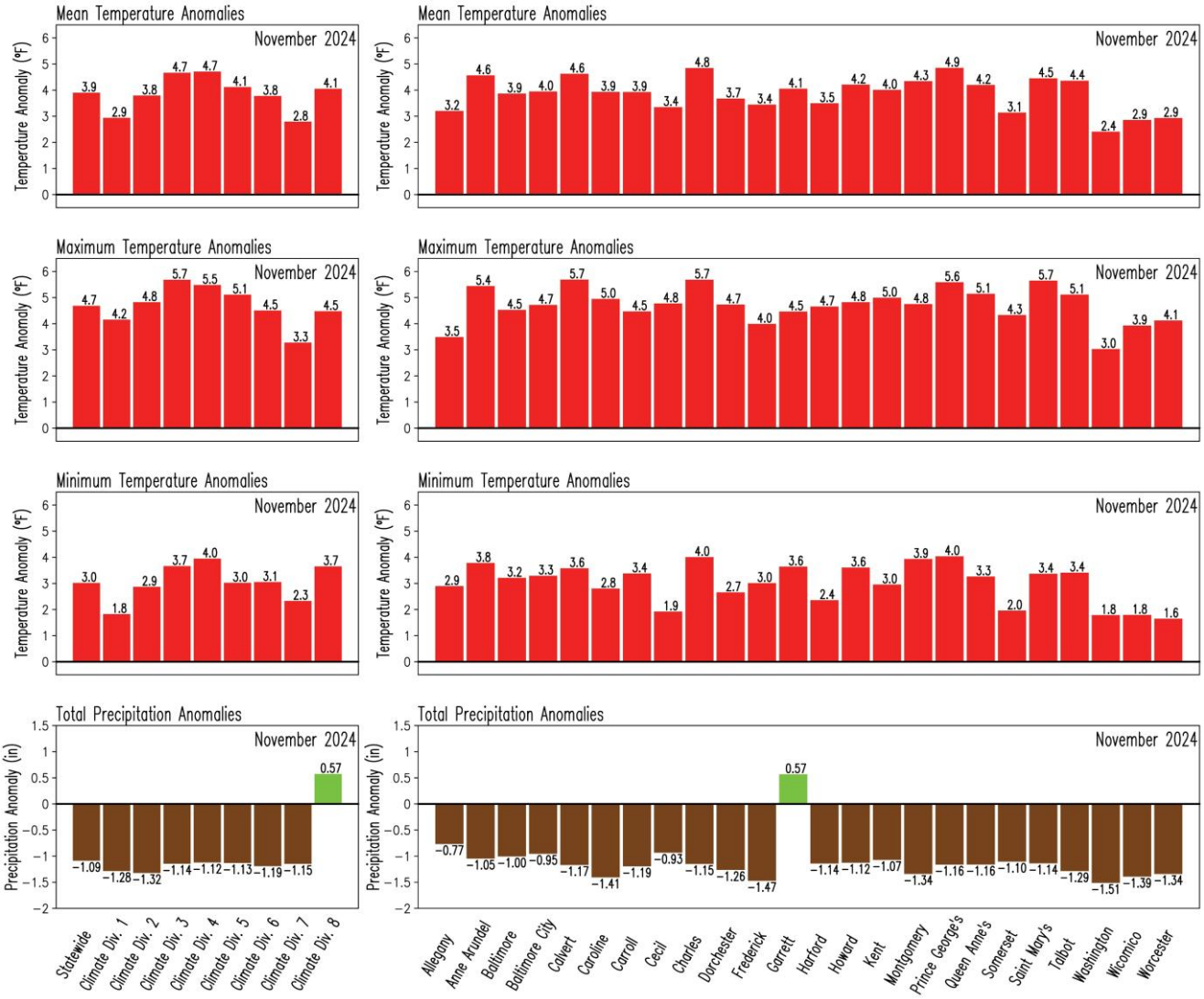

Figure B2. Anomalies of the monthly surface variables in Maryland for November 2024. Anomalies are with respect to the 1991-2020 climatology. Red color represents positive (warmer than normal) anomalies for mean surface air temperature (upper row), maximum surface air temperature (second row from top), and minimum surface air temperature (third row from top), while green/brown color indicates positive/negative (wetter/drier than normal) anomalies in total precipitation (bottom row) at statewide and climate division (left column) and county (right column) levels. Temperatures are in °F, and precipitation is in inches. The numbers outside the bars indicate the magnitude of the anomaly for November 2024.

Appendix C. November 1991-2020 Climatology Maps and November 2024 Precipitation as Percentage of Climatology

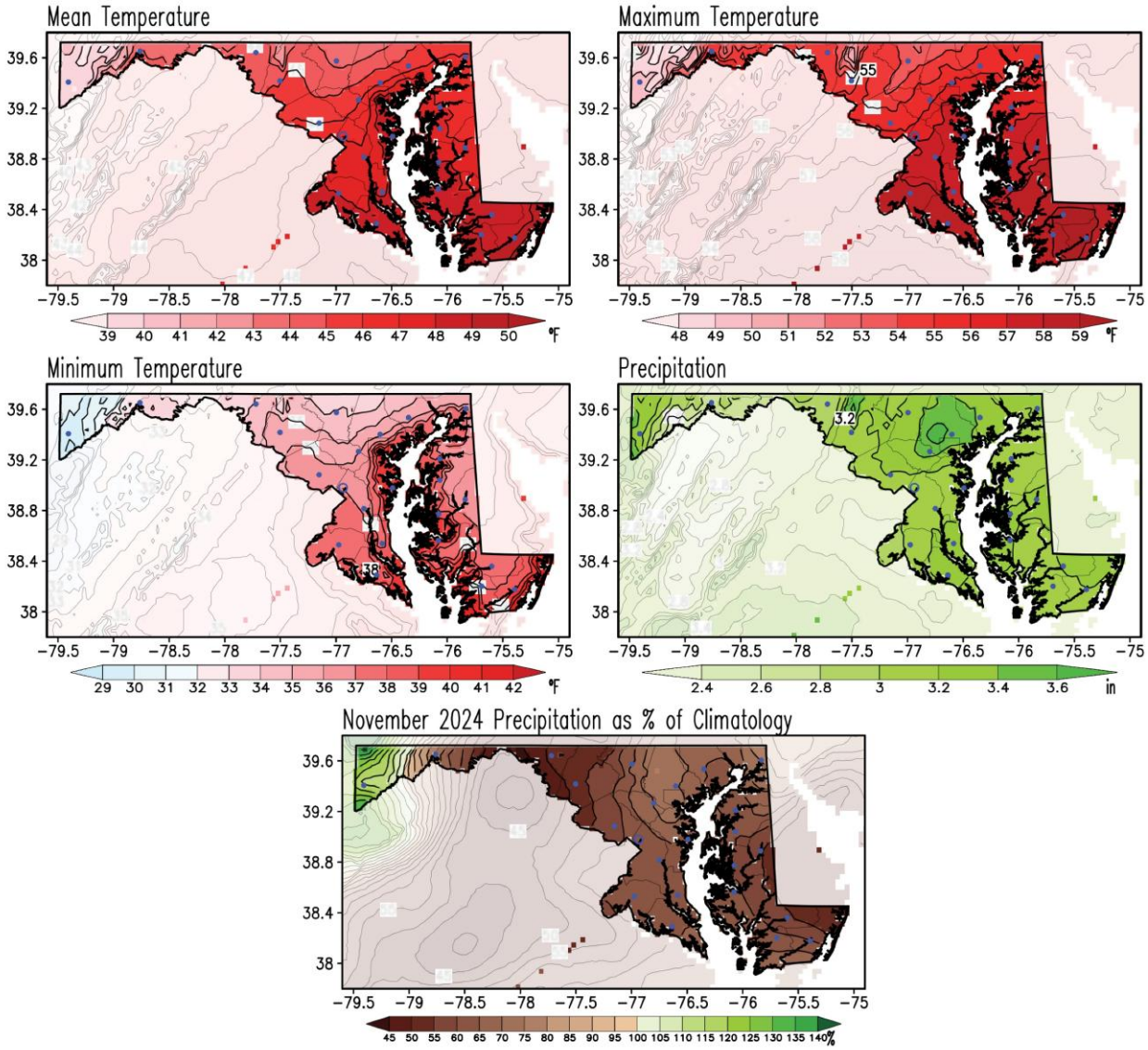

Figure C1. November climatology of the monthly mean, maximum and minimum surface air temperatures, and total precipitation for the period 1991-2020 (upper and middle rows), and precipitation in November 2024 as a percentage of climatology (bottom row). Temperatures are in °F, and precipitation is in inches according to the color bars. This is the current climate normal against which the November 2024 conditions are compared to obtain the November 2024 anomalies (from Figures 1 to 4). The precipitation as a percentage is obtained by dividing the total precipitation (from Figure 4) by the climatology (from the middle right panel) and multiplying that ratio by 100 so units are in percent of climatology (%); brown shading in this map shows drier than normal conditions. Note that shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

Appendix D. November Standard Deviation and November 2024 Standardized Anomalies Maps

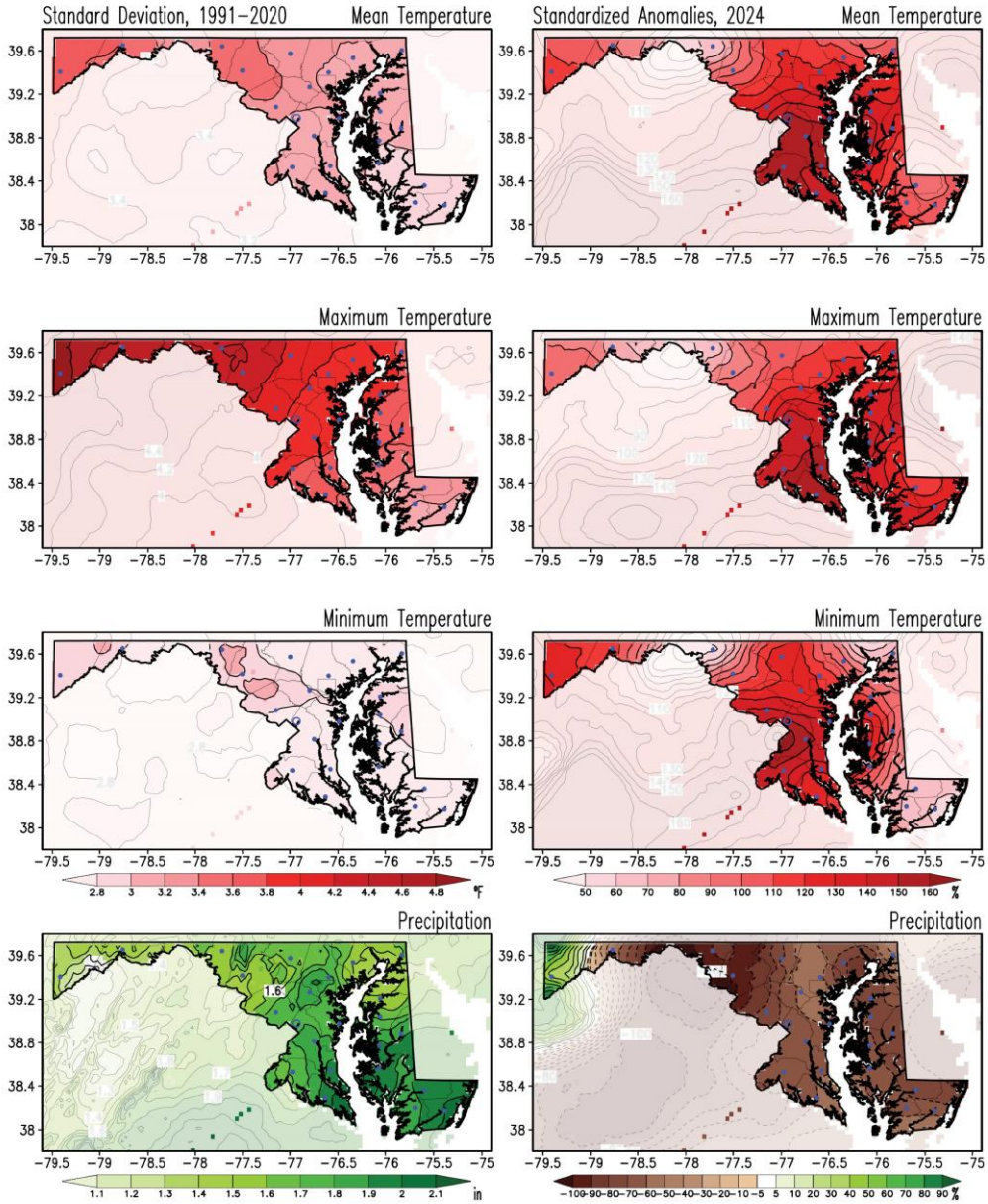

Figure D1. Standard deviation for November and standardized anomalies of temperatures and precipitation for November 2024. Standard deviations for monthly mean, maximum, and minimum surface air temperatures and total precipitation were obtained from the 1991-2020 period (left column). Anomalies for November 2024 (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. Red shading in the anomaly temperature maps marks 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.

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