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Maryland Climate Bulletin
July 2025

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DEPARTMENT OF
ATMOSPHERIC &
OCEANIC SCIENCE
Sumant Nigam, Chair

Maryland
State
Climatologist
Office

Summary

Statewide averages indicate that July 2025 was warmer and wetter than normal (i.e., 1991-2020 averages). Regionally, monthly mean temperatures were in the 72–82°F range, maximum temperatures were between 81 and 91°F, and minimum temperatures were in the 62–74°F range. Monthly total precipitation was between 3.0 and 8.5 inches.

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

- The mean temperature was warmer than normal throughout the state, especially over Garrett County (4.2 to 4.8°F), and parts of Harford and Carroll counties (3.3 to 3.6°F).

- The maximum temperature was also warmer than normal in the entire state, particularly over Garrett County (3.6 to 4.2°F), parts of Allegany and Washington counties (3.3 to 3.6°F), and Frederick County (2.7 to 3.0°F).

- The minimum temperature was warmer than normal over all of the state, too, notably over Garrett County (5.4 to 6.0°F), and Harford County (4.5 to 4.8°F).

- Precipitation was above normal in more than half of the state, largely over the coastal counties around the Chesapeake Bay and northern Garrett County. In particular, Caroline and Talbot counties (3.6 to 4.4 inches) received between 90 and 110% more than their climatological precipitation for the month; Anne Arundel, Calvert, and Baltimore counties (2.4 to 3.2 inches) received 50 to 70% more than their climatological precipitation. Precipitation was below normal in the western counties, especially over Frederick County (1.2−1.6 inches deficit), which received between 30% and 40% less than its climatological precipitation.

- Drought conditions kept improving by the end of July, as approximately 97% of the state was drought-free, and only around 3% of the state, over southern Baltimore County and Baltimore City, was under Abnormally Dry conditions. The Abnormally Dry conditions reflect the transition of these areas toward improved conditions. Streams and rivers experienced normal to much above-normal streamflow throughout the state, with above-normal streamflow in some of them in western Maryland, the central and southwestern Piedmont, and the coastal plains on both sides of the Bay; much above-normal streamflow appeared in some rivers and streams in the central and southwestern Piedmont.

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

- All climate divisions were warmer than normal, with Climate Division 8, Allegheny Plateau, being the warmest (4.7°F above). On the other hand, seven of the climate divisions were wetter than normal, with Climate Division 2, Central Eastern Shore, being the wettest (3.42 inches), and Climate Division 7, Appalachian Mountains, being the only one drier than normal (0.59 inches deficit).

- The statewide temperature was warmer than normal (3.2°F) in July 2025 for the sixth month since February. Statewide precipitation was above normal (1.41 inches) in July, following a drier-than-normal June, which replaced a wetter-than-normal May.

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

- Statewide maximum and minimum daily temperatures from January 1 to July 31, 2025, indicated that the number of days with extreme temperatures has been larger than normal. There were seven more hot days (maximum temperatures larger than 86°F) than normal (38 vs. 31), and one more heat wave than normal (7 vs. 6); the mean temperature of all the hot days was 90.7°F, while the maximum was 98.5°F, which occurred on June 25. There were three more warm days (maximum temperature larger than 80°F) than normal (63 vs. 60), but one fewer warm day spell than normal (6 vs. 7); the mean temperature of all the warm days was 87.9°F. There were fifteen more warm nights (minimum temperature larger than 68°F) than normal (32 vs. 17), and a normal number of warm night spells (4) by the end of July; the mean temperature of all the warm nights was 72.0°F, while the maximum was 75.4°F, which occurred on June 24.

- Statewide daily total precipitation from January 1 to July 31 showed one more day with extreme precipitation (at least 0.64 inches; the 95th percentile in 1951−2000) than normal (11 vs. 10), with three of them occurring in July. The number of dry spells (two or more consecutive days with daily precipitation of no more than 0.04 inches) from January 1 to July 31 was fewer than normal by five spells (24 vs. 29) with two of them occurring in July. The mean duration of the dry spells was longer-than-normal by one day (5 vs. 4).

- The cumulative calendar year (January 1 to July 31) modified growing degree days (base 86/50°F) reached around 2555°FDD by the end of July and have been greater than normal since the second week of March, with a departure from normal of 274°FDD by the end of July. Similarly, growing degree days (base 50°F) reached around 2132°FDD by the end of July and have been above normal since the last week of March, with a departure from normal of 309°FDD by the end of July. The curve of the cumulative modified growing degree days in June and July was very similar to that of last year and is among the most extreme on record since 1951.

Historical Context (Figure 12, Tables A1 and A2)

- Statewide mean, maximum, and minimum temperatures in July 2025 (79.9, 89.3, 70.4°F) were above their long-term means (1895-2024); while the mean temperature was among the 5% of its highest values, and the maximum temperature was among the 10% of its highest values on record, the minimum temperature set a record. The mean temperature was very close to its historical record high of 80.1°F in 2020, the maximum temperature was more than 1°F from its historical record high of 90.6°F in 2011, while the record of the minimum temperature surpassed that of 69.6°F in 2020.

- Statewide mean, maximum, and minimum temperatures indicated that July 2025 was the second, eleventh, and first warmest July since 1895, respectively. Twenty-two of the counties experienced mean temperatures among the five warmest since 1895, with Frederick, Garrett, and Washington counties establishing records. In contrast, six counties experienced July maximum temperatures among the ten warmest. Notably, twenty counties set records in minimum temperatures.

- Statewide precipitation showed that July 2025 was the twentieth wettest July since 1895, and Caroline County had its sixth wettest July, while Talbot got its tenth wettest.

Century-Plus Trends, 1895-2025 (Figures 13, 14)

- Statewide mean temperature and cooling degree days in July showed significant trends: a warming trend (2.0°F/century) and an increasing cooling trend (68.3°FDD/century). Statewide precipitation had a very small, non-significant wetting trend (0.10 in/century).

- Regionally, mean temperatures in July showed significant warming trends in almost the entire state, except in western Maryland. The largest warming trends were over Baltimore City (3.0−3.2°F/century) and counties of the central Piedmont (2.6−2.8°F/century).

- Regionally, July precipitation had drying and wetting non-significant trends. The largest non-significant wetting trends (0.5–0.8 in/century) were over Cecil County, while the largest non-significant drying trends (0.3–0.4 in/century) were over Garrett and Washington counties.

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 aims to document and characterize monthly surface climate conditions in the state, situating them within 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 July 2025 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 warm daily maximum and 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, cooling 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 in tables and plots in Appendices A and B; climatology and variability maps are included in Appendices C and D, along with the percentage of normal precipitation and normalized anomalies.

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 August 12, 2025.

- NOAA Monthly U.S. Climate *Divisional* Dataset (NClimDiv – Vose et al., 2014). It is available in a preliminary status (v1.0.0-20250806) at: https://www.ncei.noaa.gov/pub/data/cirs/climdiv/
  Data was downloaded on August 8, 2025.

- 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 labeled as "scaled" was downloaded on August 8, 2025.

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) and 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 simply the climatology, is defined for the period 1991–2020.

About the anomalies: Anomalies for a given month (e.g., July 2025) are the departures of the monthly value from the corresponding month's 30-year average (i.e., from the average of 30 Julys) 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 a 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 anomalies are divided by the standard deviation, they are referred to as standardized anomalies.

About hot days, warm days, and warm nights. Extreme heat, detrimental to crops without irrigation and to populations lacking air conditioning, is tracked by the count of hot days, warm days and nights, and their consecutive occurrence (e.g., Tschurr et al. 2020, Barriopedro et al. 2023). A hot day is defined as one when the maximum temperature is greater than 86°F, a warm day is when the maximum temperature is greater than 80°F, while a warm night is when the minimum temperature is greater than 68°F. When these conditions persist for two or more days, they are referred to as heat waves for the hot days and warm spells for the warm days and nights. These threshold values correspond to the 89th and 75th percentiles of statewide daily maximum temperatures and the 95th percentile of statewide daily minimum temperatures for the period 1951- 2000.

About degree days. Degree days represent the difference between the daily mean temperature (calculated by averaging the high and low temperatures) and a predefined base temperature. Since energy demand is cumulative, degree-day totals are typically calculated on a daily, monthly, seasonal, and annual basis.

- *Heating and cooling degree days.* These are used to get a general idea of the amount of energy required to warm or cool buildings. The base temperature used for this purpose is 65°F, which is considered tolerable for human comfort (CPC, 2023).
- Growing Degree Days. These are used to estimate the growth and development of plants and insects during the growing season, under the assumption that development will only occur if the temperature exceeds a minimum development threshold temperature, or, in other words, if enough warmth is accumulated. Because actual development varies among different plants and insects, and the presence of weeds and precipitation can influence 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, such as corn, sweet corn, soybeans, tomatoes, and a few others.
    - Modified Growing degree days. The modified growing degree days are calculated by establishing base temperatures for the daily maximum and minimum temperatures before determining 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 referred to as dry spells if they persist for two or more consecutive days. The number and duration of dry spells 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. July 2025 Maps

A. Mean Temperatures

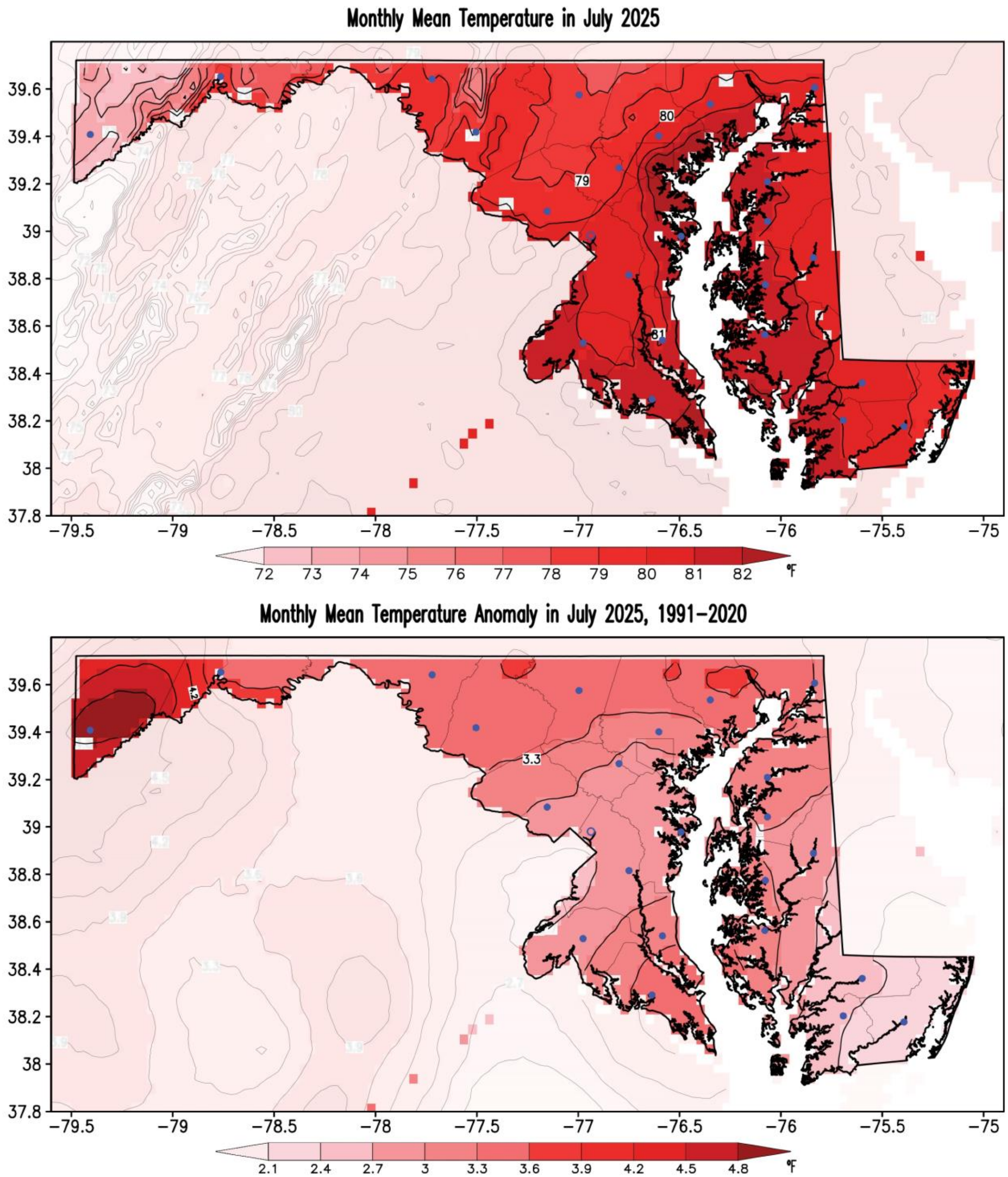


Figure 1. Monthly mean surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for July 2025. Temperatures are in °F following the color bar. Red shading in the anomaly map marks warmer than normal conditions. Note shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

B. Maximum Temperatures

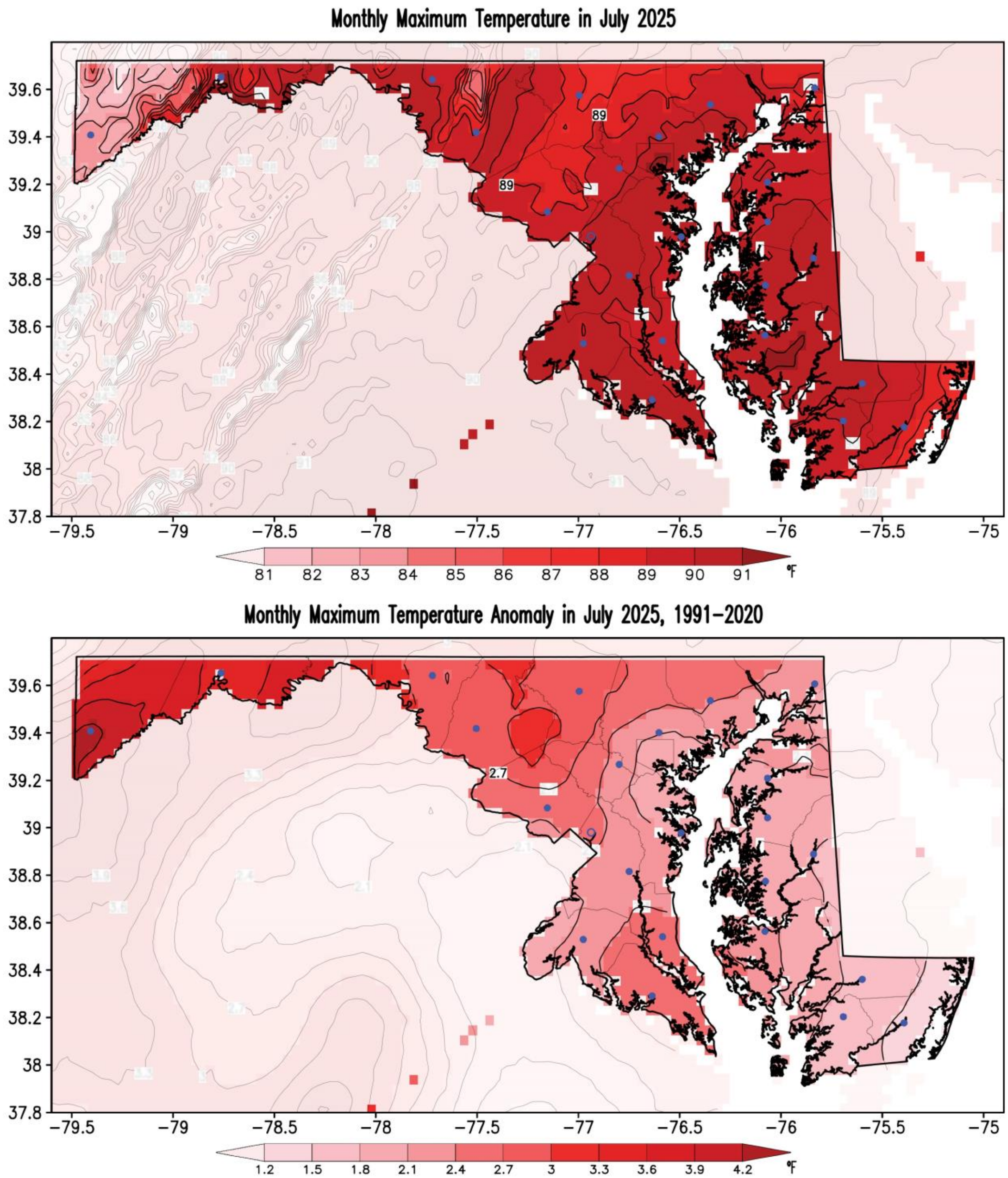


Figure 2. Monthly maximum surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for July 2025. Temperatures are in °F following the color bar. Red shading in the anomaly map marks warmer than normal conditions. Note shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

C. Minimum Temperatures

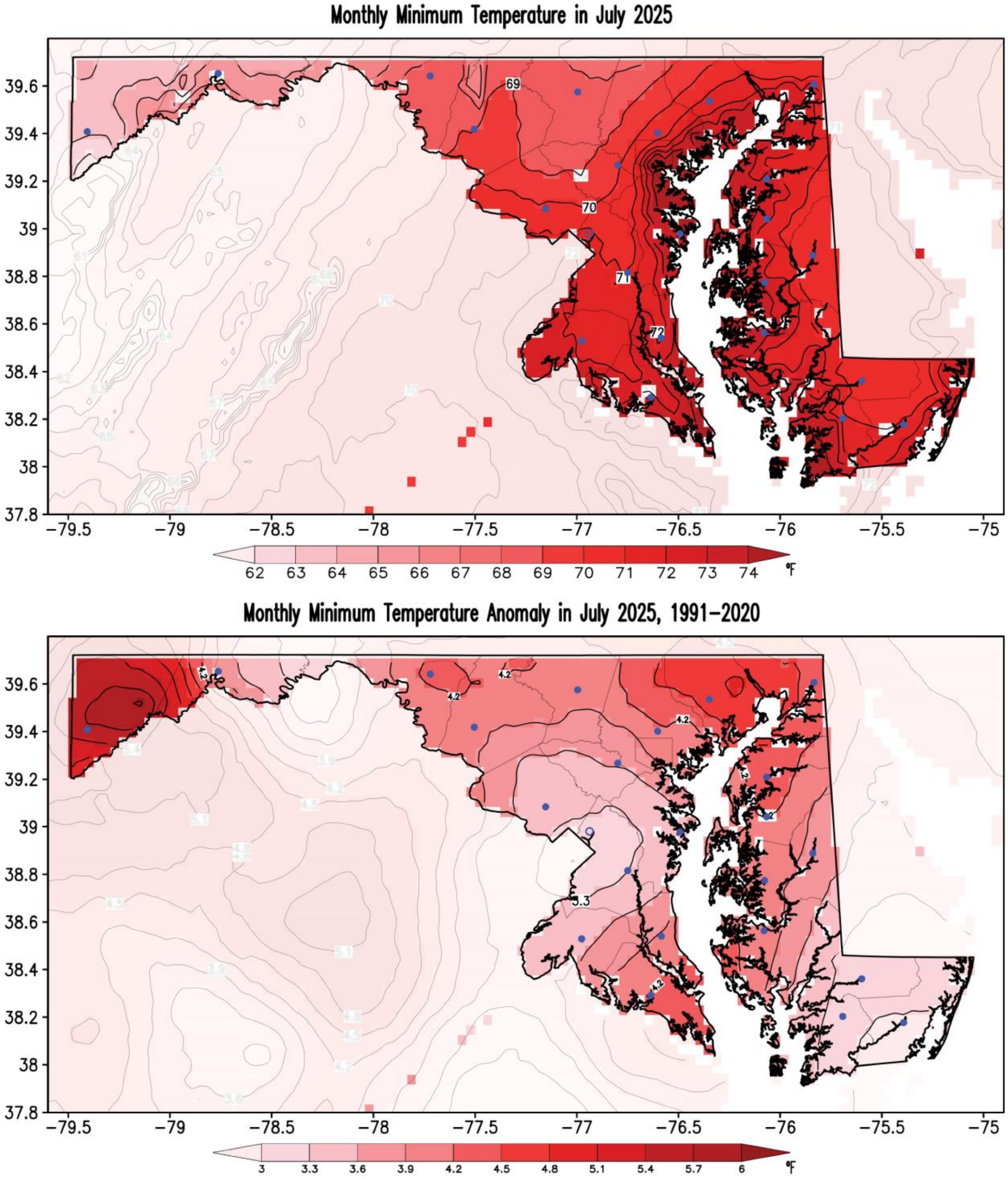


Figure 3. Monthly minimum surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for July 2025. Temperatures are in °F following the color bar. Red shading in the anomaly map marks warmer than normal conditions. Note shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

D. Precipitation

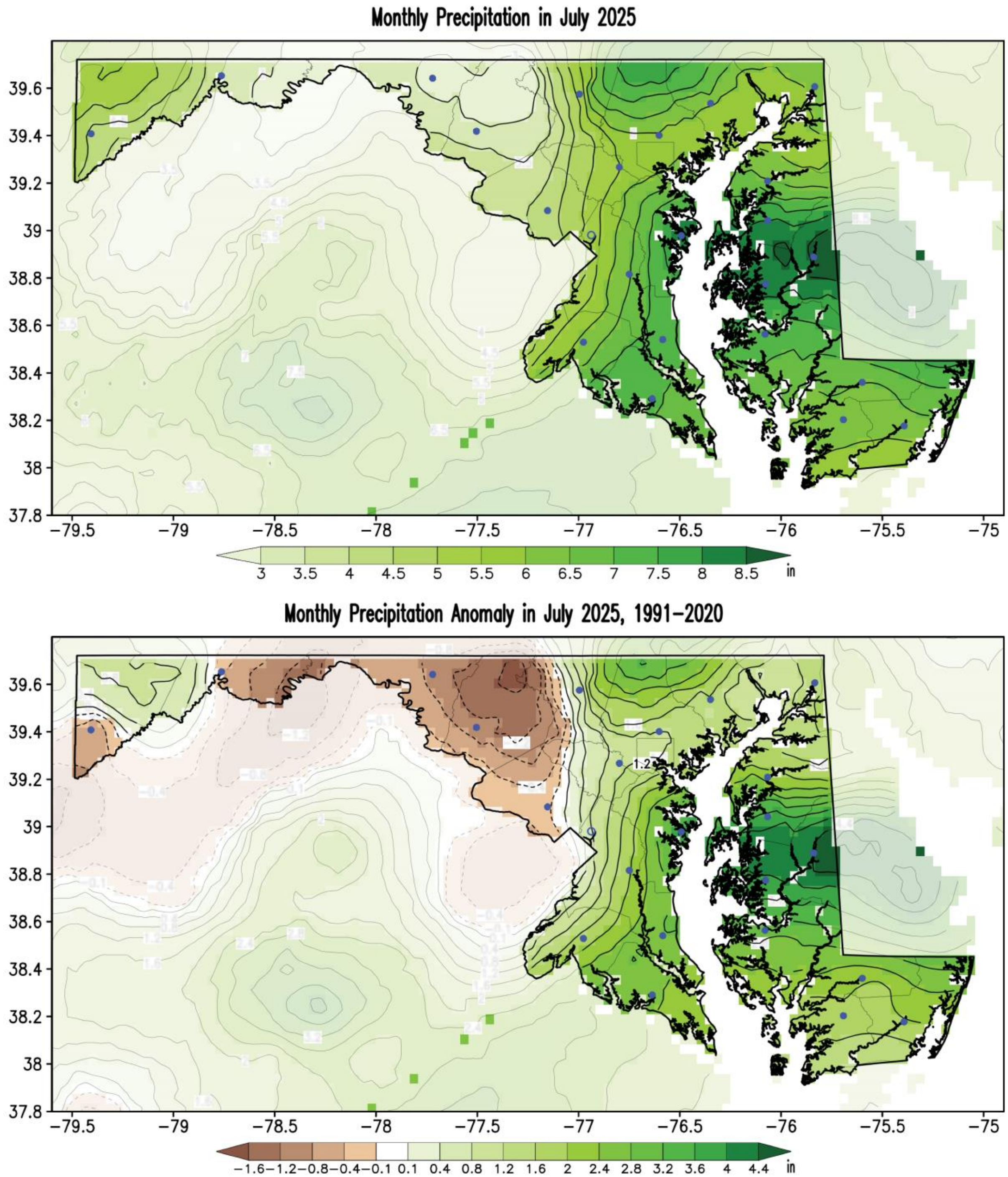


Figure 4. Monthly total precipitation (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for July 2025. Precipitation is measured in inches, as indicated by the color bar. Brown/green shading in the anomaly map marks drier/wetter than normal conditions. Note shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats.

E. Drought

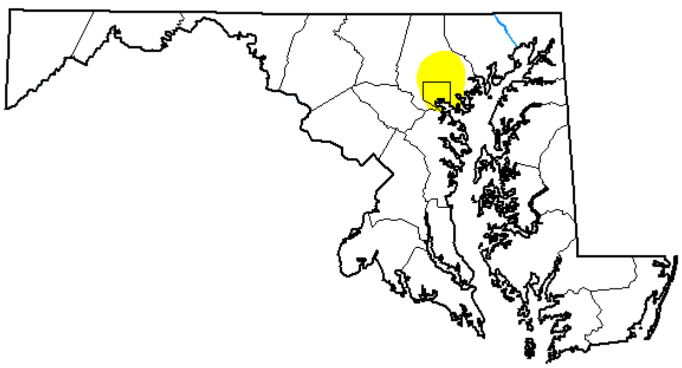
U.S. Drought Monitor

Maryland

July 29, 2025

(Released Thursday, Jul. 31, 2025)

Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0	D1	D2	D3	D4
Current	97.03	2.97	0.00	0.00	0.00	0.00
Last Week 07-22-2025	97.03	2.97	0.00	0.00	0.00	0.00
3 Months Ago 04-29-2025	19.36	15.28	22.33	43.03	0.00	0.00
Start of Calendar Year 01-07-2025	1.19	3.51	43.73	51.57	0.00	0.00
Start of Water Year 10-01-2024	18.77	59.58	11.76	5.82	4.07	0.00
One Year Ago 07-30-2024	32.74	27.50	16.32	14.92	8.52	0.00

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
David Simeral
Western Regional Climate Center

droughtmonitor.unl.edu

Figure 5. Drought conditions as reported by the U.S. Drought Monitor on July 29, 2025. Conditions improved for a fourth consecutive month, as 97% of the state was drought-free, and only 3% was under abnormally dry conditions. Yellow shading indicates abnormally dry regions. Numbers in the table indicate the percentage of the state covered under the particular drought category at the time (in the left column). Areas shown in yellow (Abnormally Dry) indicate land that is going into or coming out of drought. Current conditions can be monitored on the U. S. Drought Monitor website. If interested, you can help monitor drought conditions by submitting a report of your local soil conditions through the National Drought Mitigation Center's Drought Impact Toolkit by using the Condition Monitoring Observer Reports system.

F. Streamflow

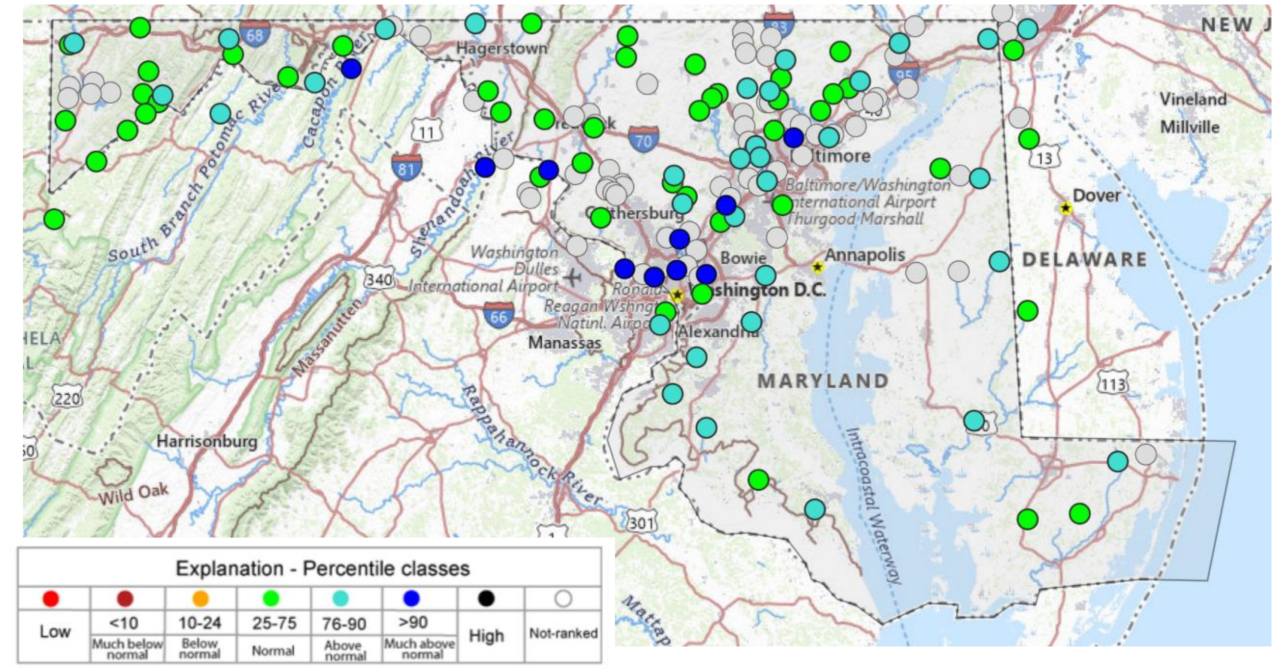


Figure 6. Monthly averaged streamflow class anomalies as reported by the U.S. Geological Survey (USGS) Water Watch for July 2025. Cyan to navy blue-filled circles denote Above-normal to Much above-normal streamflow conditions, and green-filled circles represent Normal streamflow conditions. Streams and rivers in the central and southwestern Piedmont experienced Much above-normal streamflow. Current conditions can be monitored on the [U. S. Geological Survey website](#).

4. July and MJJ 2025 Climate Divisions Averages

A. July 2025 Scatter Plots

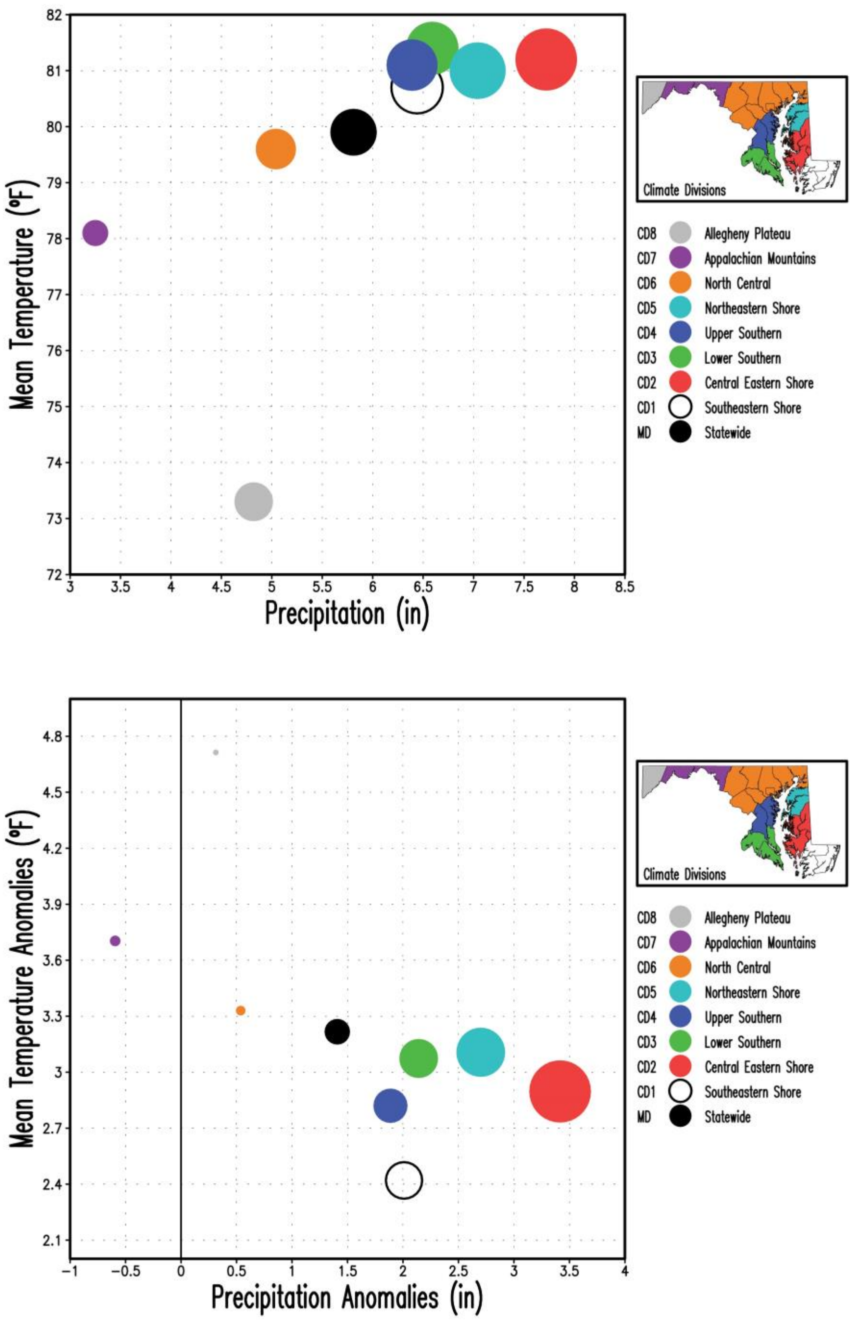
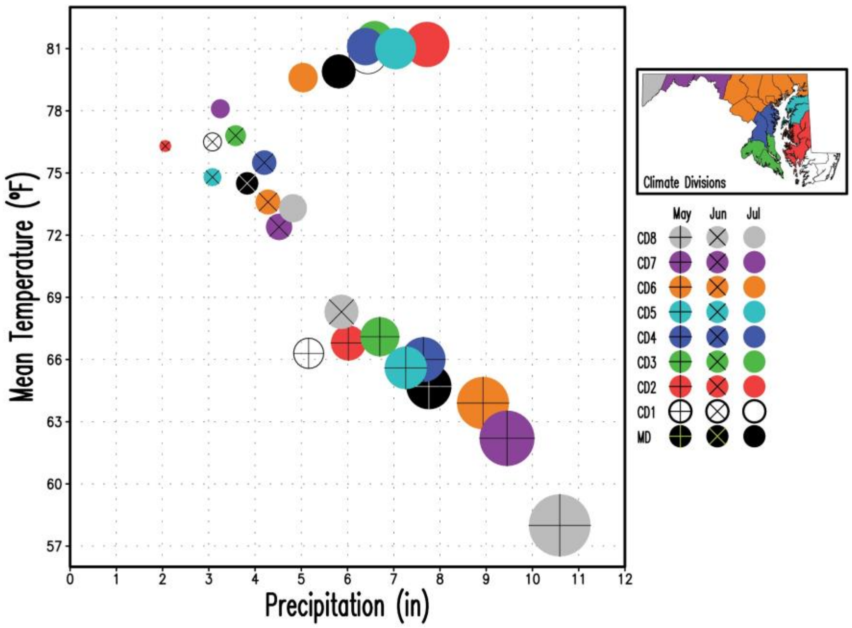


Figure 7. Scatter plots of Maryland (statewide) and Climate Divisions (CD#) monthly mean surface air temperature vs. total precipitation for July 2025. The upper panel displays the mean temperature and total precipitation, while the bottom panel displays their anomalies relative to the 1991-2020 climatology. 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 (7.72 inches in CD2, top panel) and by the maximum precipitation anomaly (3.42 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. May – July 2025 Scatter Plots



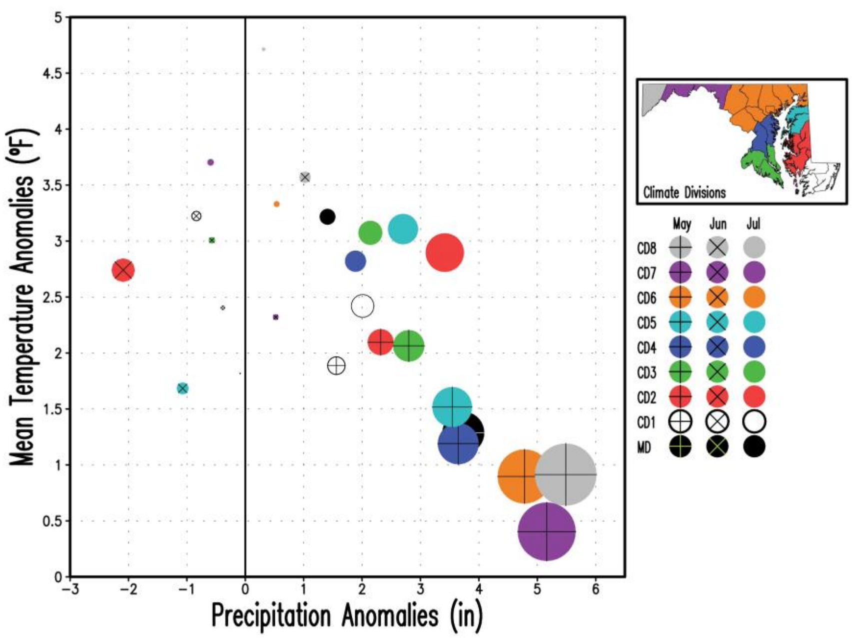


Figure 8. Scatter plots of Maryland (statewide) and Climate Divisions (CD#) monthly mean surface air temperature vs. total precipitation for May, June and July 2025. The upper panel displays the mean temperature and total precipitation, while the bottom panel shows their anomalies relative to the 1991-2020 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 (10.59 inches in CD8 in May, top panel) and by the maximum precipitation anomaly (5.49 inches in CD8 in May, bottom panel) among the nine regions and three months. July is displayed with filled circles only, while June and May are displayed with superposed multiplication and addition signs, respectively.

5. Extremes & Growing Degree Days

A. Hot Days, Warm Days, and Warm Nights

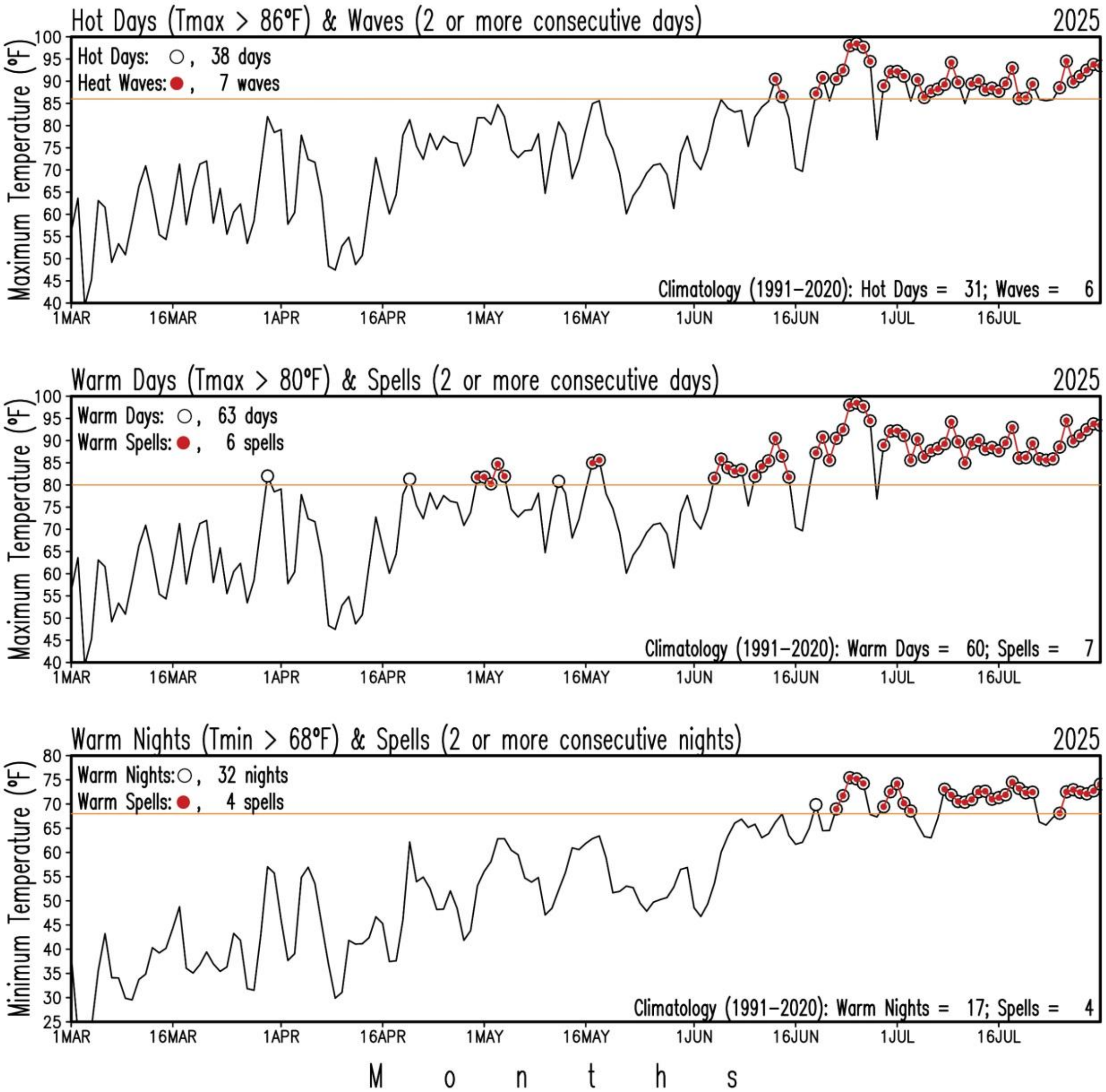


Figure 9. Maryland (statewide) number of hot days, warm days, warm nights, and their consecutive occurrence for the period January 1 – July 31, 2025. The upper panel displays hot days in open circles and heat waves in red-filled circles from statewide daily maximum temperatures. The middle panel shows warm days in open circles and warm day spells in red-filled circles from statewide daily maximum temperatures. The bottom panel displays warm nights in open circles and warm night spells in red-filled circles from statewide daily minimum temperatures. The orange line in each panel marks the threshold temperatures of 86°F, 80°F, and 68°F for each case. Figures at the county and climate division levels, as well as summary tables, are available on the [MDSCO website](#).

B. Extreme Precipitation and Dry Spells

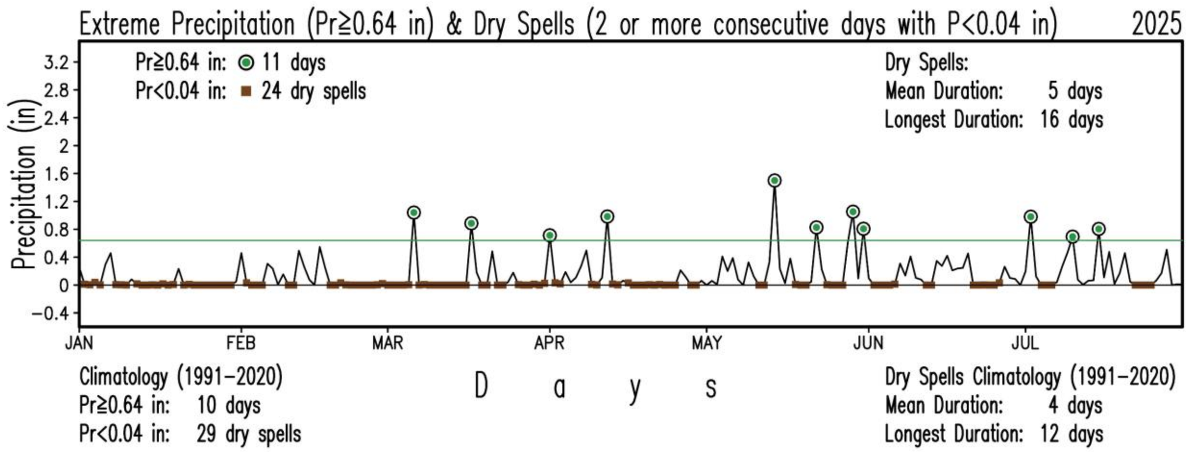


Figure 10. Maryland (statewide) number of days with extreme precipitation and dry day spells for the period January 1 – July 31, 2025. Extreme precipitation days (precipitation equal to or larger than 0.64 in) are identified by green-filled circles. Dry spells (consecutive days with daily total precipitation less than 0.04 in) are shown by brown-filled squares. Both extremes are identified from the statewide total daily precipitation. Figures at the county and climate division levels, as well as summary tables, are available on the MDSCO website.

C. Growing Degree Days

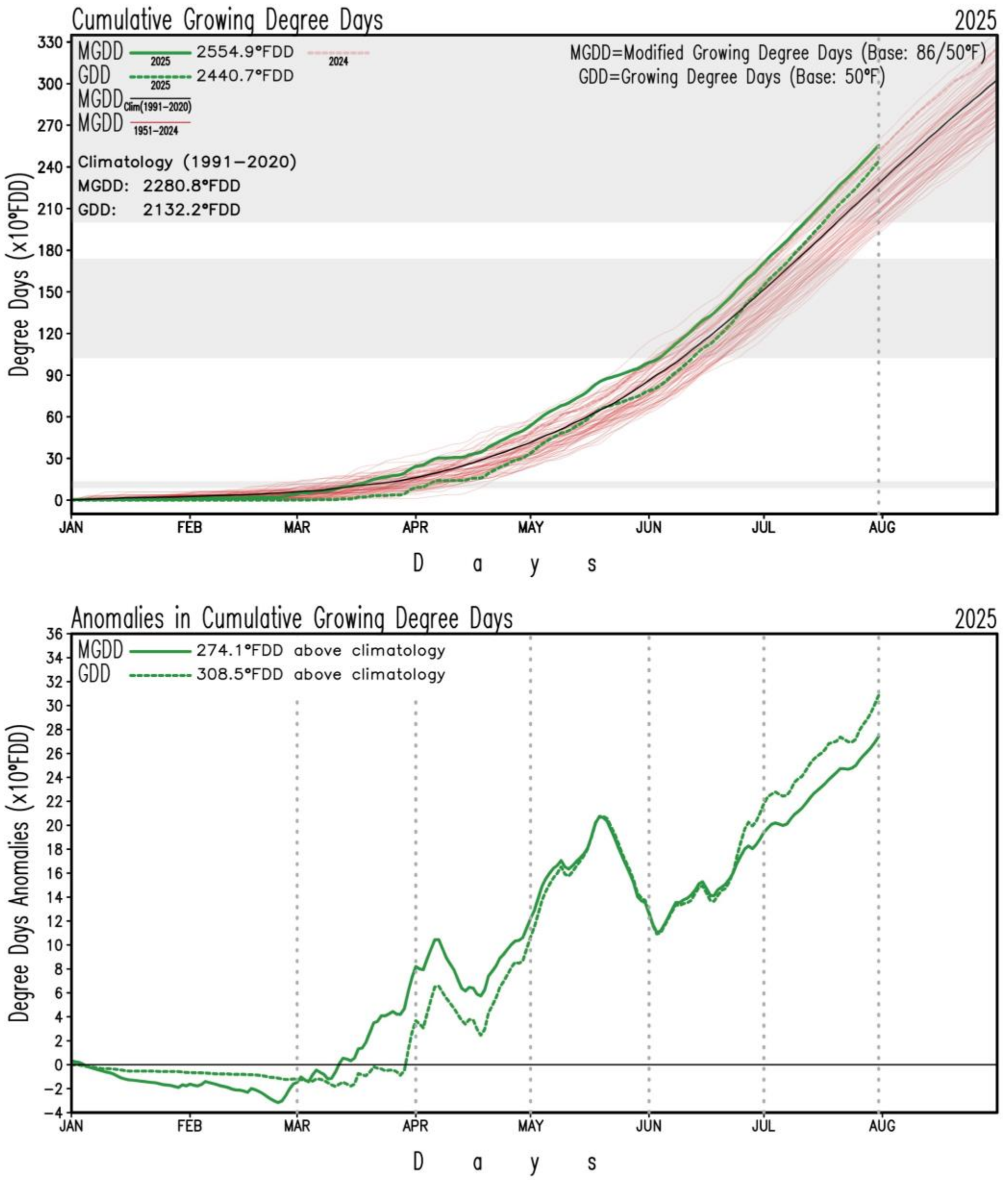


Figure 11. Maryland (statewide) cumulative growing degree days (upper panel) and its anomaly with respect to the 1991-2020 climatology (lower panel) for the period January 1 - July 31, 2025. The growing degree days are displayed with the dashed green line, while the modified growing degree days are shown with the continuous green line in the upper panel; for reference the modified growing degree days for 2024 are displayed with a dashed red line; the black line shows the 1991-2020 climatology of the cumulative modified growing degree days; the thin red lines display the cumulative modified growing degree days every year from 1951 to 2023. The gray shaded areas mark a range of values for emergence (82-140), tassel-silk (1024-1740), and physiological maturity (2000-3350) in corn development (IPAD, 2023). Anomalies with respect to the 1991-2020 climatology in the cumulative modified growing degree days (bottom panel) are displayed with the continuous green line, while those for the cumulative growing degree days are shown with the dashed green line. The vertical dotted gray lines mark the start of the months since March. The accumulated growing degree days and their anomalies as of July 31 are displayed at the top left of each panel. Analysis is from statewide daily maximum and minimum temperatures. Figures at the county and climate division levels, as well as summary tables, are available on the [MDSCO website](#).

6. July 2025 Statewide Averages in the Historical Record

A. Box and Whisker Plots

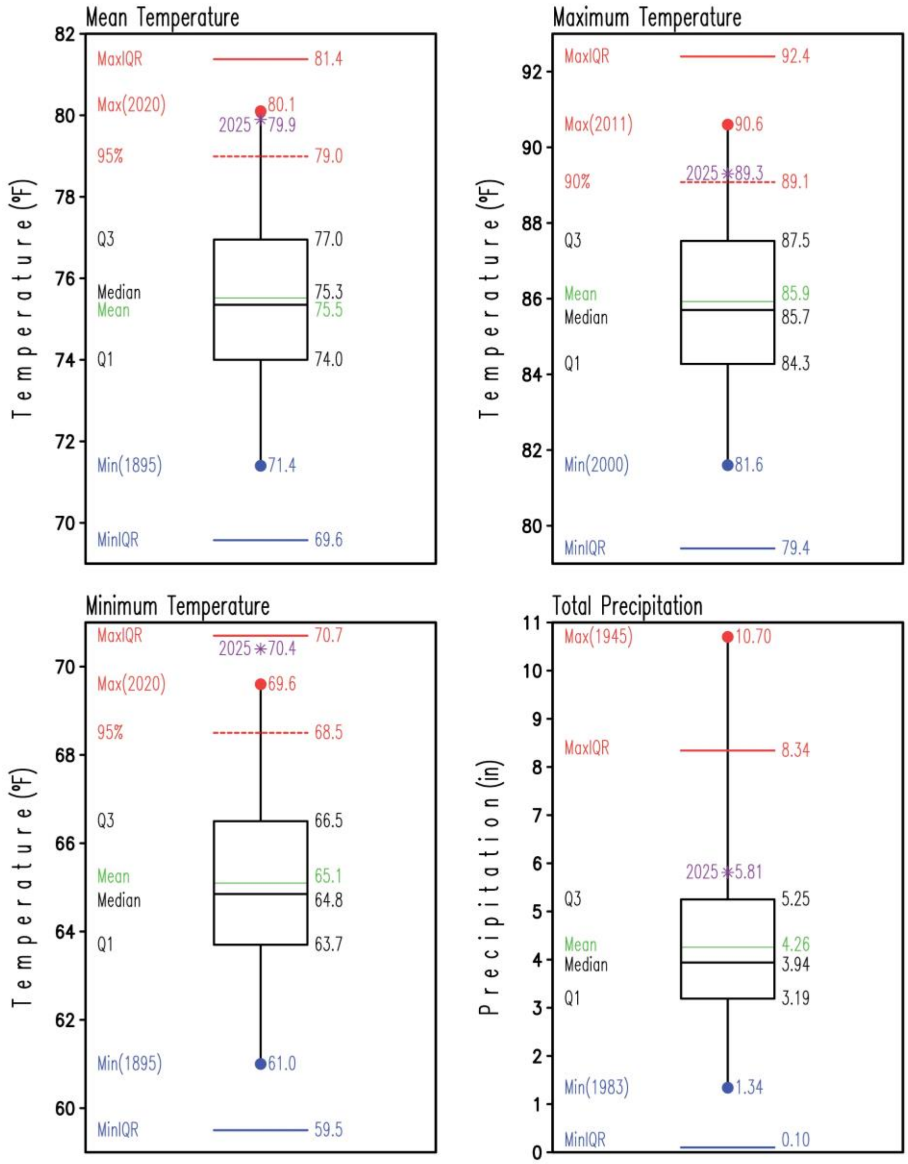


Figure 12. Box and Whisker plots of Maryland (statewide) monthly mean (upper left), maximum (upper right), minimum (lower left) surface air temperatures, and total precipitation (lower right) for July for the period 1895-2024. The label and asterisk in purple represent conditions for July 2025. Statistics for the period 1895-2024 are labeled at the left side of each box and whisker plot, and their values are 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. For reference, the 95th percentile in mean and minimum temperatures and the 90th percentile for maximum temperature are displayed with a red dashed line. 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 parentheses. The blue and red horizontal lines represent extreme values defined by Q1-1.5×(Q3-Q1) and Q3+1.5×(Q3-Q1), respectively.

7. 1895-2025 July Trends

A. Mean Temperature, Cooling Degree-Days, and Precipitation

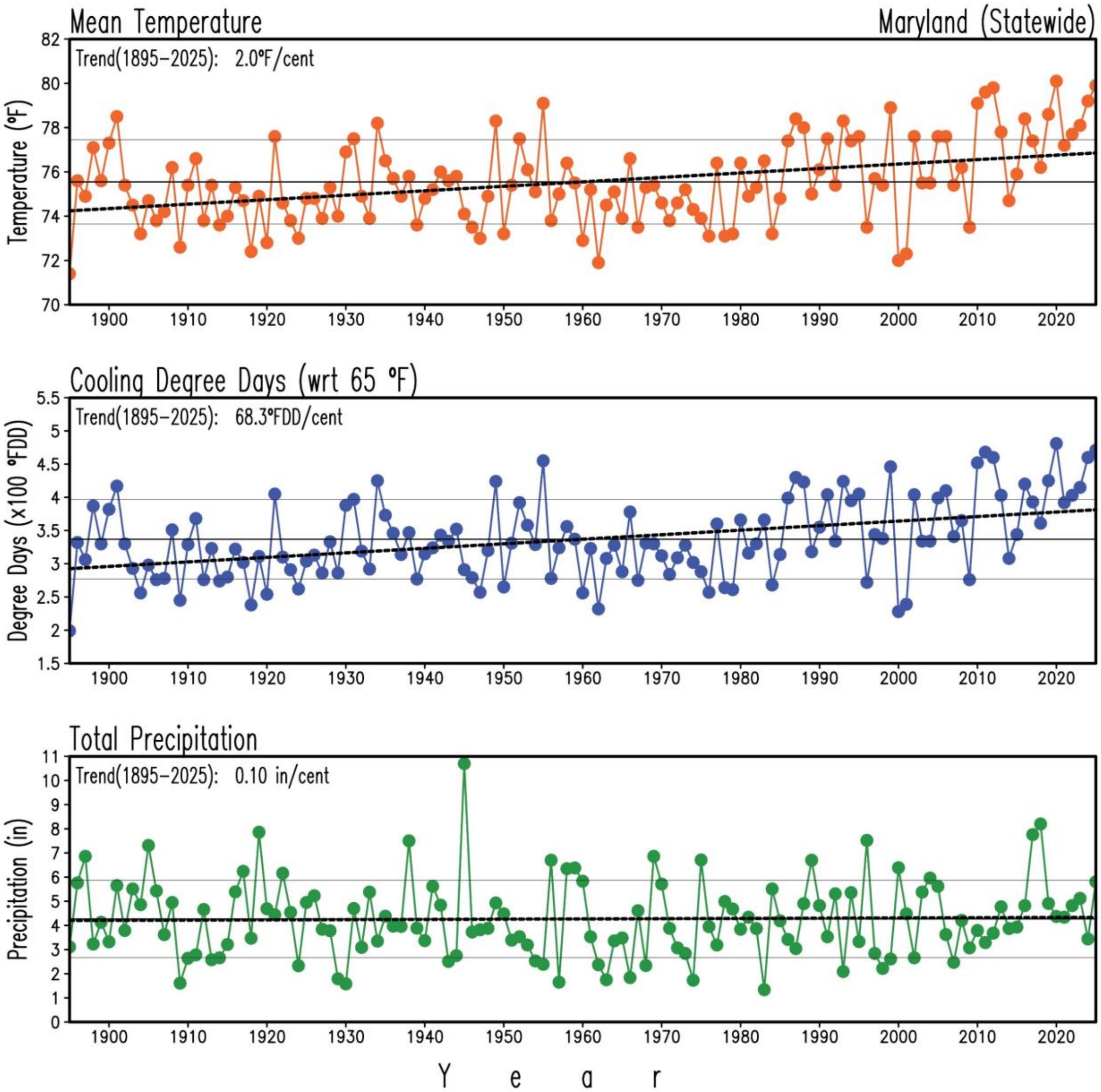


Figure 13. Maryland (statewide) mean surface air temperature, cooling degree days, and precipitation in July for the period 1895-2025. Temperature is in °F, degree-days are in °F degree-days (°FDD), and precipitation is in inches. The thin, continuous black lines in each panel display the long-term means (75.5°F, 336.9°FDD, and 4.27 in, 1895-2025), and the double thin, continuous gray lines indicate the standard deviation (1.9°F, 59.9°FDD, and 1.60 in) above/below the long-term mean. The thick dashed black lines show the long-term linear trend. The warming temperature trend (2.0°F/century) and the increasing cooling degree-days trend (68.3°FDD/century) are statistically significant at the 95% level (*Student's t-test* −Santer et al. 2000), but not the very small precipitation wetting trend (0.10 in/century).

B. Temperature and Precipitation Maps

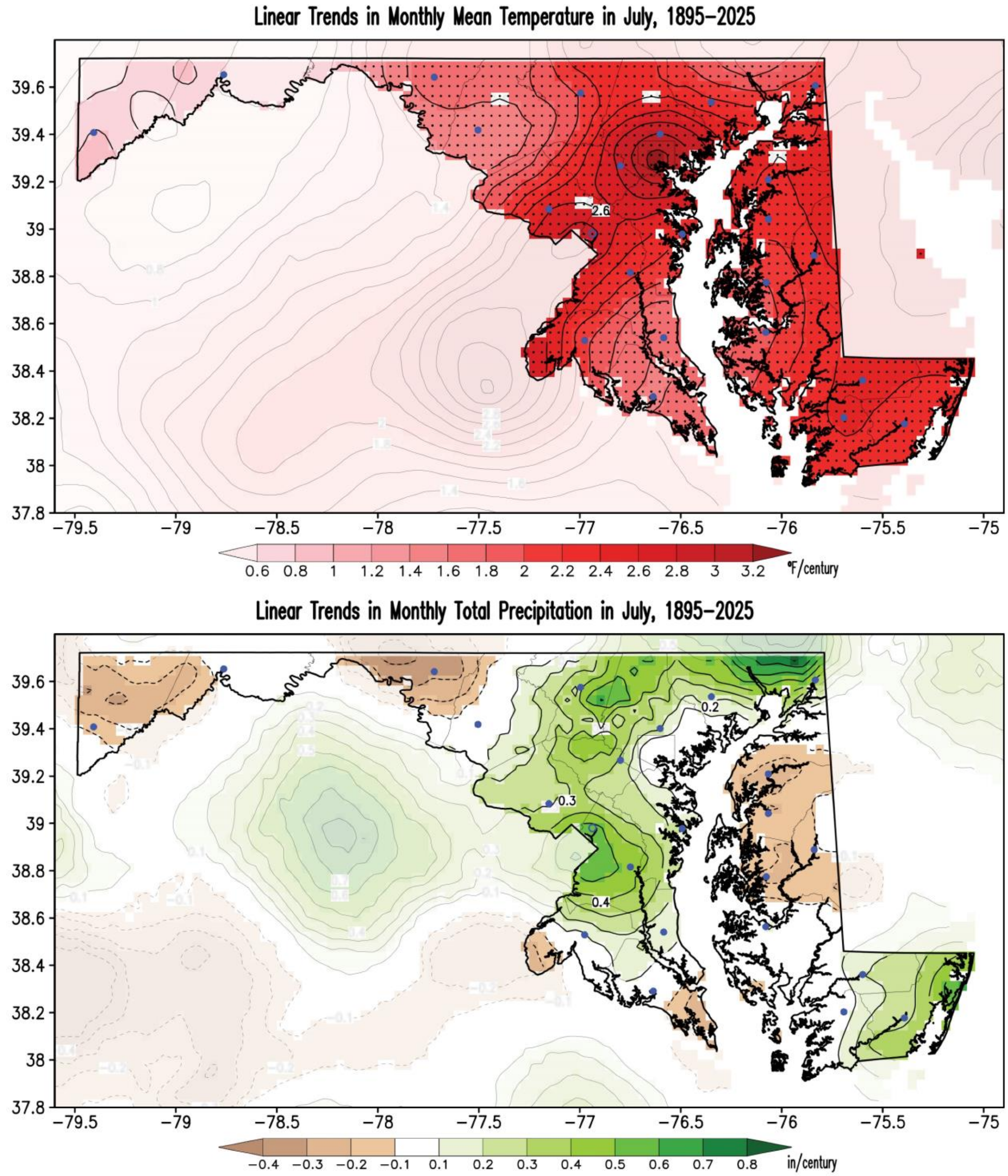


Figure 14. Linear trends in surface air mean temperature and precipitation in July for the period 1895-2025. Temperatures are in °F/century, and precipitation is in inches/century following the color bars. Red shading in the temperature map marks warming trends. Brown/green shading in the precipitation map shows drying/wetting trends. Stippling in the maps indicates 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. July 2025 Data Tables: Statewide, Climate Divisions, and Counties

A. Mean Temperature and Precipitation

Region	Mean Air Temperature (°F)	Rank (#)
Statewide	79.9	130
Climate Division 1	80.7	128
Climate Division 2	81.2	129
Climate Division 3	81.4	129
Climate Division 4	81.1	127
Climate Division 5	81.0	128
Climate Division 6	79.6	130
Climate Division 7	78.1	131
Climate Division 8	73.3	131
Allegany	77.3	129
Anne Arundel	81.4	127
Baltimore	79.9	129
Baltimore City	81.7	126
Calvert	81.3	130
Caroline	80.6	128
Carroll	78.5	130
Cecil	80.3	129
Charles	81.3	128
Dorchester	81.5	129
Fredrick	79.0	131
Garrett	73.3	131
Harford	80.5	130
Howard	79.2	128
Kent	81.2	128
Montgomery	79.6	129
Prince George's	80.7	127
Queen Anne's	81.0	128
Saint Mary's	81.7	130
Somerset	81.4	128
Talbot	81.5	130
Washington	78.8	131
Wicomico	80.7	128
Worcester	80.1	126

Region	Total Precipitation (in)	Rank (#)
Statewide	5.81	112
Climate Division 1	6.44	114
Climate Division 2	7.72	123
Climate Division 3	6.59	110
Climate Division 4	6.39	116
Climate Division 5	7.04	115
Climate Division 6	5.04	95
Climate Division 7	3.25	55
Climate Division 8	4.82	86
Allegany	3.42	64
Anne Arundel	6.96	120
Baltimore	6.45	118
Baltimore City	5.78	106
Calvert	7.07	113
Caroline	8.32	126
Carroll	4.94	99
Cecil	5.96	100
Charles	6.11	110
Dorchester	7.12	117
Fredrick	3.13	42
Garrett	4.81	86
Harford	6.29	107
Howard	5.01	93
Kent	6.39	114
Montgomery	4.14	72
Prince George's	5.93	105
Queen Anne's	7.50	121
Saint Mary's	7.00	112
Somerset	6.11	109
Talbot	8.11	122
Washington	3.08	51
Wicomico	6.73	119
Worcester	6.48	116

Table A1. Monthly mean surface air temperature (left) and total precipitation (right) at Maryland (statewide), climate division, and county levels for July 2025. Temperatures are in °F, and precipitation is in inches. The rank is the order in which the variable for July 2025 is positioned among the 131 Julys, after the 131 values have been arranged from the lowest to the highest in the *standard competition ranking method*. The closer to 131 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	89.3	121
Climate Division 1	89.4	122
Climate Division 2	90.4	123
Climate Division 3	90.3	119
Climate Division 4	90.2	118
Climate Division 5	89.9	120
Climate Division 6	89.2	120
Climate Division 7	89.5	121
Climate Division 8	82.9	121
Allegany	89.3	120
Anne Arundel	90.2	119
Baltimore	89.4	119
Baltimore City	90.6	119
Calvert	89.9	118
Caroline	90.5	120
Carroll	88.6	120
Cecil	89.0	121
Charles	90.4	115
Dorchester	90.6	124
Fredrick	89.2	121
Garrett	82.9	121
Harford	89.5	123
Howard	89.2	121
Kent	89.7	118
Montgomery	89.2	121
Prince George's	90.2	118
Queen Anne's	90.0	120
Saint Mary's	90.3	124
Somerset	89.8	124
Talbot	90.2	123
Washington	89.8	121
Wicomico	90.1	123
Worcester	88.6	121

Region	Minimum Air Temperature (°F)	Rank (#)
Statewide	70.4	131
Climate Division 1	71.9	129
Climate Division 2	72.0	131
Climate Division 3	72.6	131
Climate Division 4	71.9	131
Climate Division 5	72.0	131
Climate Division 6	70.0	131
Climate Division 7	66.6	131
Climate Division 8	63.7	131
Allegany	65.3	131
Anne Arundel	72.6	131
Baltimore	70.3	131
Baltimore City	72.8	131
Calvert	72.6	131
Caroline	70.8	131
Carroll	68.3	131
Cecil	71.6	131
Charles	72.1	131
Dorchester	72.5	131
Fredrick	68.9	131
Garrett	63.7	131
Harford	71.5	131
Howard	69.3	131
Kent	72.6	131
Montgomery	69.9	131
Prince George's	71.2	131
Queen Anne's	71.9	131
Saint Mary's	73.1	131
Somerset	72.9	129
Talbot	72.7	131
Washington	67.8	131
Wicomico	71.3	128
Worcester	71.6	128

Table A2. Monthly maximum (left) and minimum (right) surface air temperatures at Maryland (statewide), climate division, and county levels for July 2025. Temperatures are in °F. The rank is the order in which the variable for July 2025 is positioned among the 131 Julys, after the 131 values have been arranged from lowest to highest using the *standard competition ranking method*. The closer to 131 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. July 2025 Bar Graphs: Statewide, Climate Divisions, and Counties

A. Temperatures and Precipitation

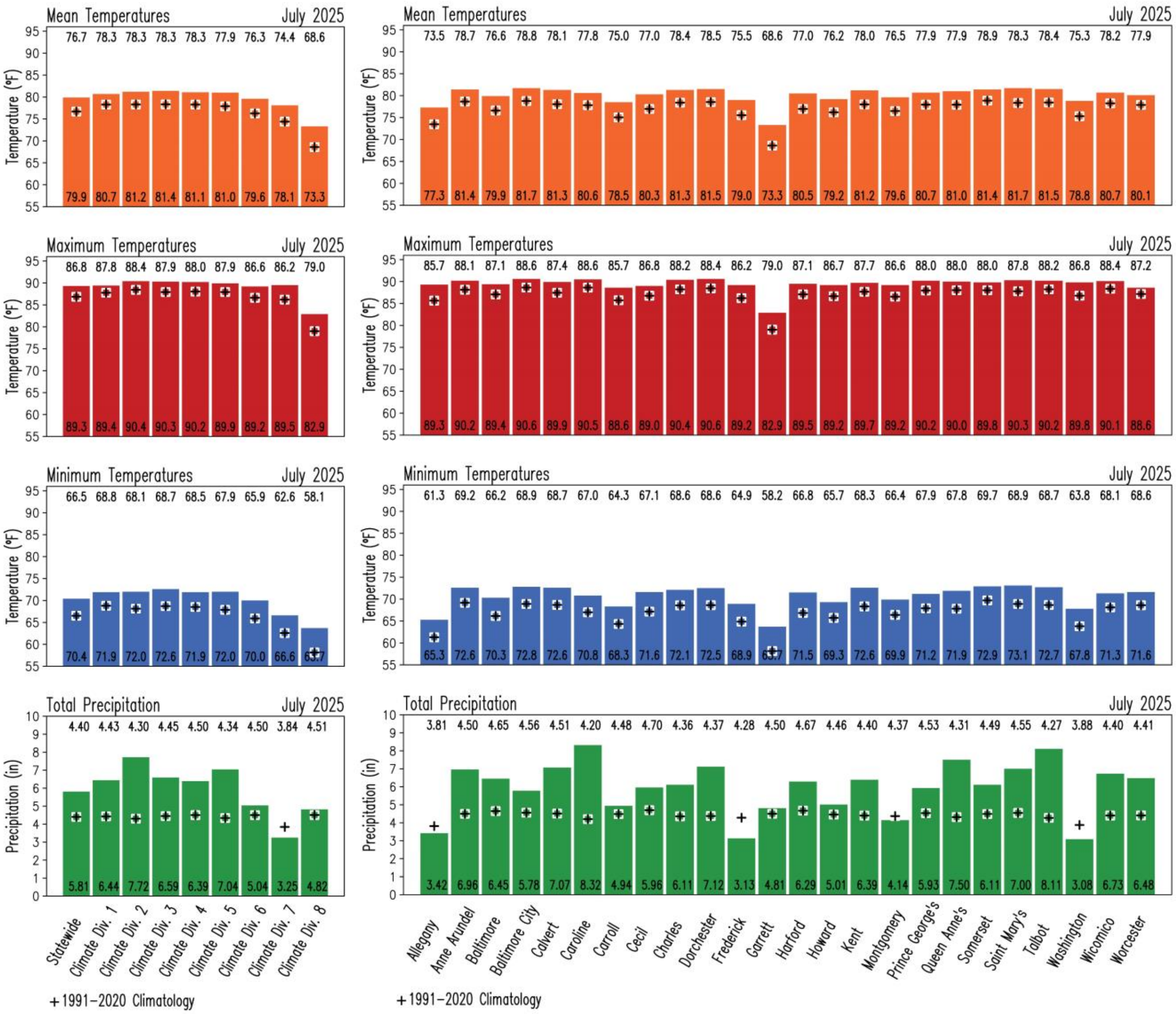


Figure B1. Monthly surface variables for Maryland in July 2025. Color bars represent the variables as follows: mean surface air temperature (orange), maximum surface air temperature (red), minimum surface air temperature (blue), and total precipitation (green) at statewide and climate division (left 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 July 2025. For comparison, the corresponding 1991-2020 climatological values for July are displayed as black addition signs, and their magnitudes are shown at the top of the panels.

B. Temperatures and Precipitation Anomalies

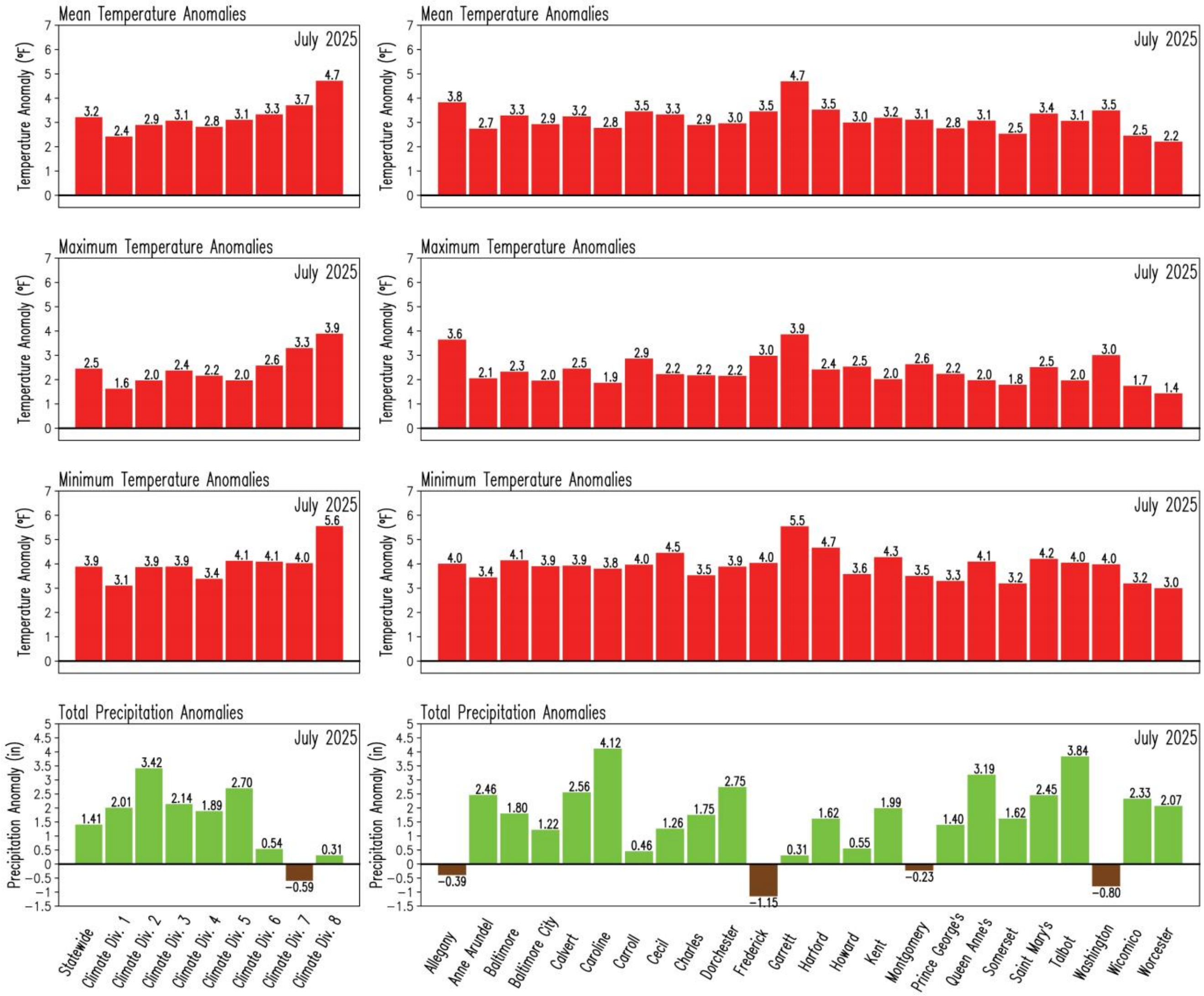


Figure B2. Anomalies in the monthly surface variables for Maryland in July 2025. Anomalies are with respect to the 1991-2020 climatology. Red color represents positive (warmer than normal) anomalies for mean surface air temperature (upper row), maximum surface air temperature (second row from top), and 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 July 2025.

Appendix C. July 1991-2020 Climatology Maps and July 2025 Precipitation as Percentage of Climatology

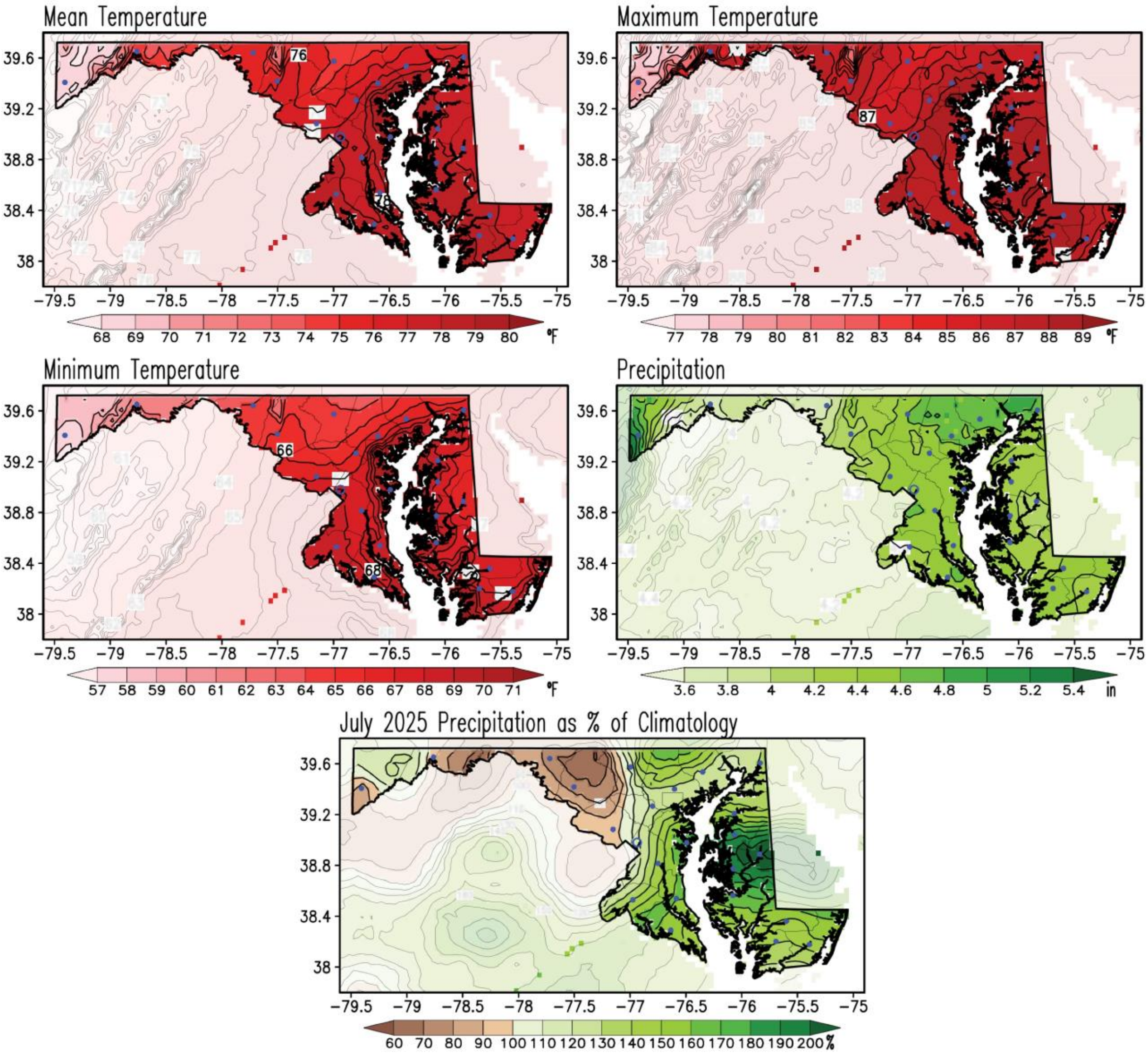


Figure C1. July climatology of the monthly mean, maximum, and minimum surface air temperatures, and total precipitation for the period 1991-2020 (upper and middle rows), and precipitation in July 2025 as a percentage of climatology (bottom row). Temperatures are in °F, and precipitation is in inches according to the color bars. This is the current climate normal against which the July 2025 conditions are compared to obtain the July 2025 anomalies (from Figures 1 to 4). Precipitation as a percentage is calculated by dividing the total precipitation (from Figure 4) by the climatology (from the middle right panel) and multiplying that ratio by 100, so the units are expressed as a percentage of the climatology (%); the brown/green shading in this map indicates drier/wetter 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. July Standard Deviation and July 2025 Standardized Anomalies Maps

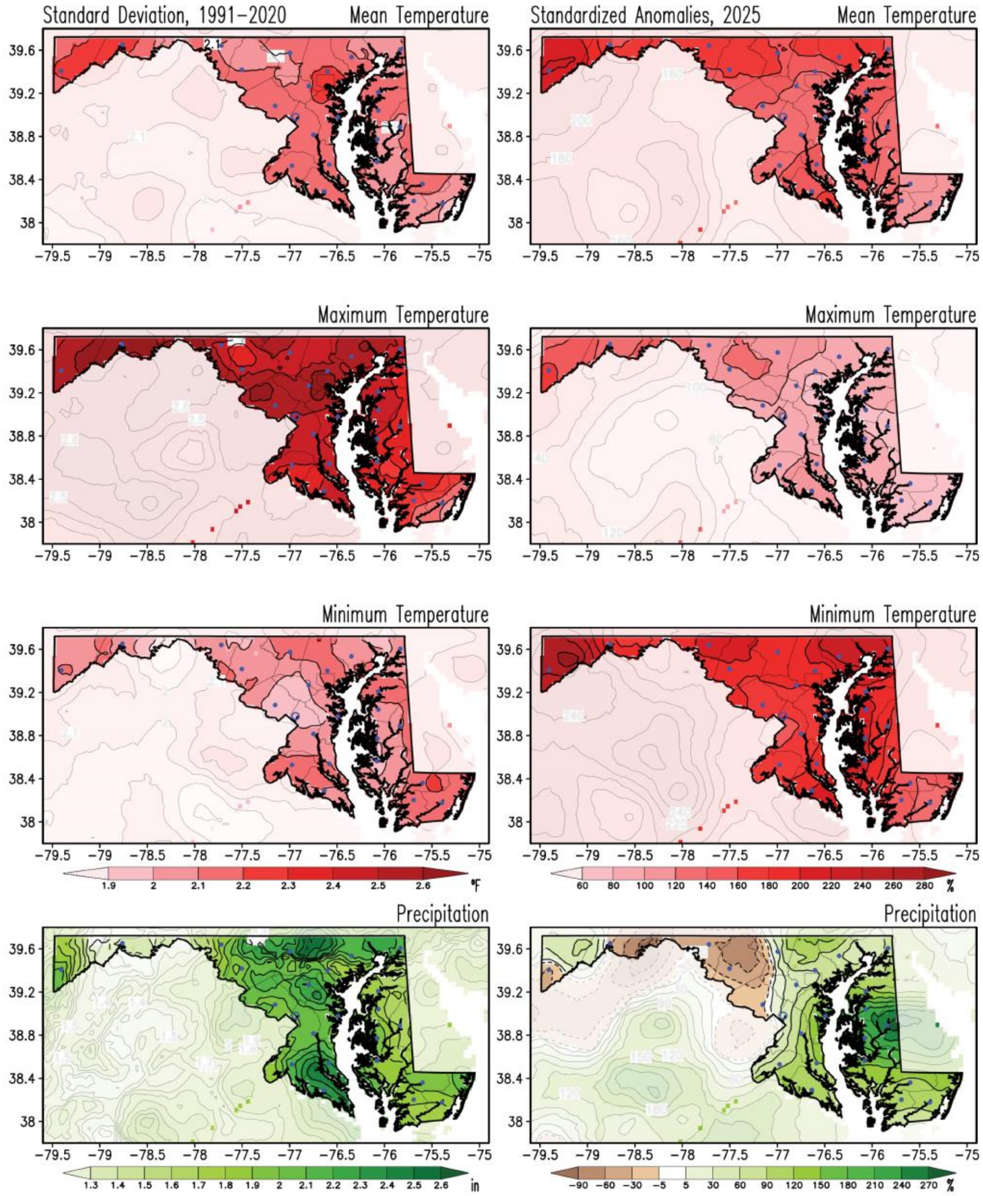


Figure D1. Standard deviation for July and standardized anomalies of temperatures and precipitation for July 2025. Standard deviations for monthly mean, maximum, and minimum surface air temperatures and total precipitation were obtained from the 1991-2020 period (left column). Anomalies for July 2025 (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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