MDSCO-2025-12

Maryland Climate Bulletin December 2025

Prepared by
Dr. Alfredo Ruiz-Barradas
Maryland State Climatologist

This publication is available from:
https://mdsco.umd.edu/ClimateInfo/Bulletin.php

DEPARTMENT OF ATMOSPHERIC & OCEANIC SCIENCE
Sumant Nigam, Chair

Maryland State Climatologist Office

Summary

Statewide averages indicate that December 2025 was colder and drier than normal (i.e., 1991-2020 averages). Regionally, monthly mean temperatures were between 29 and 38°F, maximum temperatures were in the 37–47°F range, and minimum temperatures were between 20 and 29°F. Monthly total precipitation was in the 1.2–2.8 inches range.

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

- The mean temperature was colder than normal throughout the state, particularly over Harford and Cecil counties (4.5–4.8°F below), the counties of the Eastern Shore (3.9−4.5°F below), and the central Piedmont (3.6−4.2°F below).

- The maximum temperature was colder than normal over most of the state, especially over counties of the Eastern Shore (3.9–4.5°F below), and the central to eastern Piedmont (3.6–4.2°F below). On the other hand, temperatures were warmer than normal only over southeastern Garrett County (0.3°F).

- The minimum temperature was colder than normal everywhere in the state, notably over Harford and Cecil counties (4.8–5.1°F below), and counties of the central Piedmont and Eastern Shore (4.2−4.8°F below).

- Precipitation was below normal in the entire state, particularly over the southern and western perimeters of the Piedmont (2.1–2.2 inches deficit), the northern Piedmont (1.9–2.0 inches deficit), and western Maryland and northern Eastern Shore (1.7–1.9 inches deficit). In general, these regions received 50–59% less precipitation than normal for the month, with western Montgomery and Frederick counties receiving the least (59–62%).

- Drought conditions worsened by the end of December. While the extent of the state affected by drought conditions remains the same as at the start of the month (~100%), the extent of Moderate and Severe drought conditions increased by approximately 10 and 20%, respectively. Moderate conditions covered the state westward of the Bay, with Severe conditions over Montgomery, Frederick, Washington, and Allegany counties, as well as portions of Garrett and Charles counties. Throughout the state, streams and rivers experienced Below-normal to Much-Below-normal streamflow, with more streams and rivers in the Much-Below-normal category than in November.

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

- All the climate divisions were colder than normal, with those on the Eastern shore among the coldest, especially Climate Division 5, Northeastern Shore, which was the coldest (4.5°F below). All climate divisions were drier than normal, in particular Climate Divisions 6 and 4, North Central and Upper Southern, respectively, which were the driest (a 2-inch deficit).

- The statewide mean temperature has been colder than normal in the past three months, while precipitation has been consistently drier than normal. The statewide mean temperature was much colder than normal (3.7°F below) in December, after a slightly colder-than-normal November (0.1°F below) and October (0.2°F below). Statewide precipitation was drier than normal (1.85 inches deficit) in December, following drier-than-normal November (1.73 inches deficit) and October (1.54 inches deficit).

Extreme daily temperatures, precipitation, and growing degree days (Figures 9-10)

- Statewide minimum daily temperatures from January 1 to December 31 indicated the number of freezing days with minimum temperatures equal to or colder than 32°F has been three days more than normal (93 vs. 90) with two freezing spells below normal (i.e., two or more consecutive freezing days; 12 vs. 14); twenty seven of these days, and two of the spells occurred in December. Similarly, the number of days with minimum temperatures equal to or below 28°F has been four days above normal for the calendar year (63 vs. 59), with two fewer spells than normal (10 vs. 12); twenty of these days and three of the spells were in December. Likewise, the number of days with minimum temperatures at or below 24°F has been eight days more than normal for the calendar year (43 vs. 35), but with a normal number of spells (8); ten of these days and three of the spells occurred in December.

- Statewide daily total precipitation from January 1 to December 31 showed that the number of days with extreme precipitation (at least 0.64 inches –the 95th percentile in 1951−2000) has been five days below normal (14 vs. 19), with none in December. The number of dry spells (two or more consecutive days with daily precipitation of no more than 0.04 inches) for the calendar year has been also fewer than normal by two spells (46 vs. 48), with five of them occurring in December and the longest lasting seven days; the mean duration to date of the dry spells has been normal (5 days).

Historical Context (Figure 11, Tables A1 and A2)

- Statewide mean, maximum, and minimum temperatures in December 2025 (34.4, 43.4, 25.5°F) were below their (1895-2024) long-term means, but not by much. All three temperatures were far from their coldest records of 24.6, 33.2, and 16.0°F set in 1989.

- Statewide mean, maximum, and minimum temperatures indicated that December 2025 was the forty-fourth, forty-seventh, and forty-second coldest December since 1895, respectively.

- Statewide precipitation in December 2025 (1.83 inches) was below its (1895-2024) long-term mean and within the 25% of its lowest values on record. Still, it was far from its

record of 0.50 inches set in 1955. Statewide, this was the eighteenth-driest December since 1895, the sixteenth driest in Allegany and Garrett counties, the seventeenth in Montgomery County, and the nineteenth in Anne Arundel, Howard, and Washington counties.

Century-Plus Trends, 1895-2025 (Figures 12, 13)

- Statewide mean temperature and heating degree days in December showed significant trends: a warming trend (3.8°F/century) and a decreasing heating trend (–121.8°FDD/century). Statewide precipitation had a non-significant wetting trend (0.43 in/century).

- Regionally, mean temperatures in December showed significant warming trends throughout the state. The largest warming trends were observed over the Piedmont (above 3.8°F/century), particularly in northern Harford and Cecil counties (4.2–4.4°F/century), southwestern Baltimore, northeastern Howard, and southeastern Carroll counties, and Montgomery County (4.2°F/century). Large warming trends were also over the counties of the Eastern Shore (3.8–4.0°F/century).

- Regionally, December precipitation had wetting trends everywhere in the state, but significant trends were only found in Calvert, Saint Mary's, and Dorchester counties (around 0.6 in/century).

Chesapeake Bay Sea Surface Temperatures (Figures 14, 15, E1)

- Sea surface temperatures in the Chesapeake Bay in December 2025 were in the 38–46°F range. Regionally, they were colder than their 2007-2020 mean everywhere, notably in the western coastal waters of the Middle Basin and southwestern Upper Basin, the Potomac River, the Chincoteague Bay and the mouth of rivers in the Eastern Shore (5°F below); anomalies in the coastal waters along the eastern side of the Bay (3°F or more below normal) were colder than those on the western side (2°F or less below normal). The all-basin mean temperature of 41.8°F was below the mean of the 2007-2020 base period (44.6°F) and far from the coldest December temperature in the 19-year data set (2007-2025), which was 38.7°F set in 2010.

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 December 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 cold daily minimum temperatures and precipitation, 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. Monthly sea surface temperatures (SST) in the Chesapeake Bay are presented in Section 8. Ancillary statewide, climate division, and county-level information for air temperatures and precipitation are 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; mean and variability of the sea surface temperatures in the Chesapeake Bay are displayed in Appendix E.

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) for 1895-present. Available in preliminary status at: https://www.ncei.noaa.gov/data/nclimgrid-monthly/access/
  Data was downloaded on January 13, 2026.

- NOAA Monthly U.S. Climate *Divisional* Dataset (NClimDiv – Vose et al., 2014) for 1895-present. Available in preliminary status (v1.0.0-20260107) at:
  https://www.ncei.noaa.gov/pub/data/cirs/climdiv/
  Data was downloaded on January 14, 2026.

- NOAA area averages of daily temperatures and precipitation dataset (nClimGrid−Daily −Durre et al., 2022) for 1951-present. 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 January 8, 2026.

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

Data and sources for the Chesapeake Bay are the following:

- Satellite-based sea surface temperatures from NOAA's CoastWatch Program. The data was made available by the Program's East Coast Node. This satellite-based sea surface temperature data uses data from the Advanced Very High Resolution Radiometer (AVHRR) on the European MetOp satellites, and the Visible Infrared Imaging Radiometer Suite (VIIRS) on the U.S. SNPP and NOAA JPSS satellites. In creating this product, nighttime overpasses for the U.S. East Coast are used, thereby avoiding daytime solar heating of the ocean surface and the associated warm bias in the data. In particular, the acquired product consists of monthly sea surface temperature data for the Chesapeake and Delaware Bays, with a nominal horizontal resolution of 750 m from 2007 to the present. This product is available at:
  https://eastcoast.coastwatch.noaa.gov/data/avhrr-viirs/sst-ngt
  Data was downloaded on January 5, 2026.

- A shapefile of watersheds for the state from the Maryland Department of the Environment and the Department of Natural Resources: the Maryland Watersheds – 8 Digit Watersheds. It contains 138 separate watersheds, identified with an 8-digit numeric code from which three are on the main steam of the Chesapeake Bay: the Upper Chesapeake Bay (code: 02139996; from the mouth of the Susquehanna River to northern side of the mouth of the Gunpowder River), the Middle Chesapeake Bay (code: 02139997; from the Gunpowder River to the mouth of the Chester River), and the Lower Chesapeake Bay (code: 02139998; from the south side of the mouth of the Chester River to the mouth of the Potomac River), which in turn are used to create a one-watershed shapefile for the entire basin. These four watersheds are used to create area-averaged sea surface temperatures for the Bay. The shapefile and associated files are available at:
  https://data.imap.maryland.gov/datasets/maryland::maryland-watersheds-8-digit-watersheds/about

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 long-term average of weather elements. 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 average 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 because 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.

It should be noted that the satellite-based sea surface temperature data set has a short temporal coverage of 19 years, from 2007 to the present, which prevents the calculation of its current climate normal (1991-2020). Instead, the 2007-2020 mean will be used without referring to it as a climatology.

About the anomalies: Anomalies for a given month (e.g., December 2025) are the departures of the monthly value from the corresponding month's 30-year average (i.e., from the average of 30 Decembers) 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. In the case of the sea surface temperature anomalies, they are calculated with respect to their 2007-2020 mean.

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 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 by 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 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).

About extreme precipitation. This is defined as the number of days per year on which statewide-averaged daily total precipitation is 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. December 2025 Maps

A. Mean Temperatures

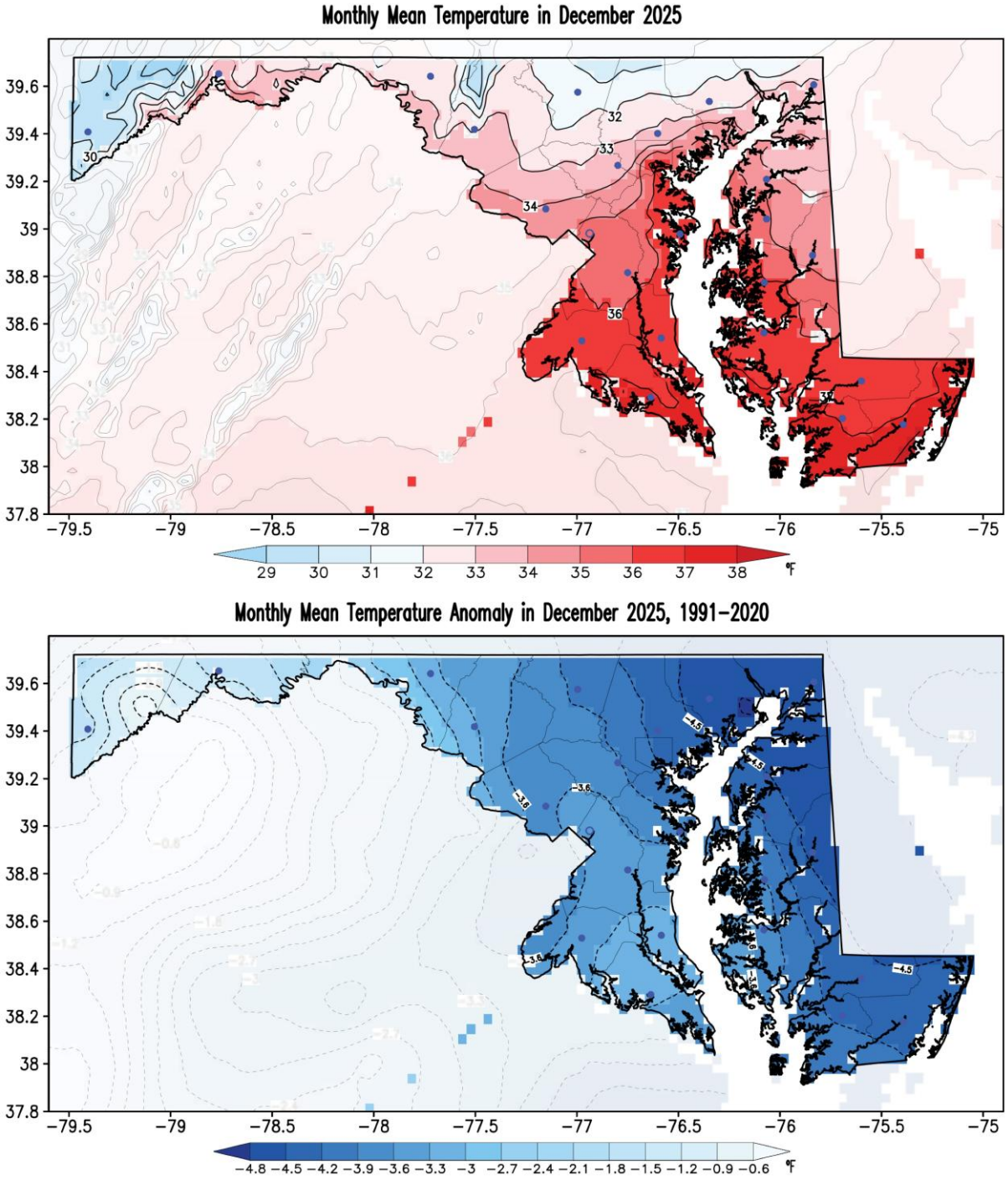

Figure 1. Monthly mean surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for December 2025. Temperatures are in °F following the color bar. Blue/red shading in the temperature map shows temperatures below/above 32°F. Blue shading in the anomaly map marks colder than normal conditions. Note shading outside the state has been washed out to facilitate focus on Maryland. Filled blue circles mark the county seats.

B. Maximum Temperatures

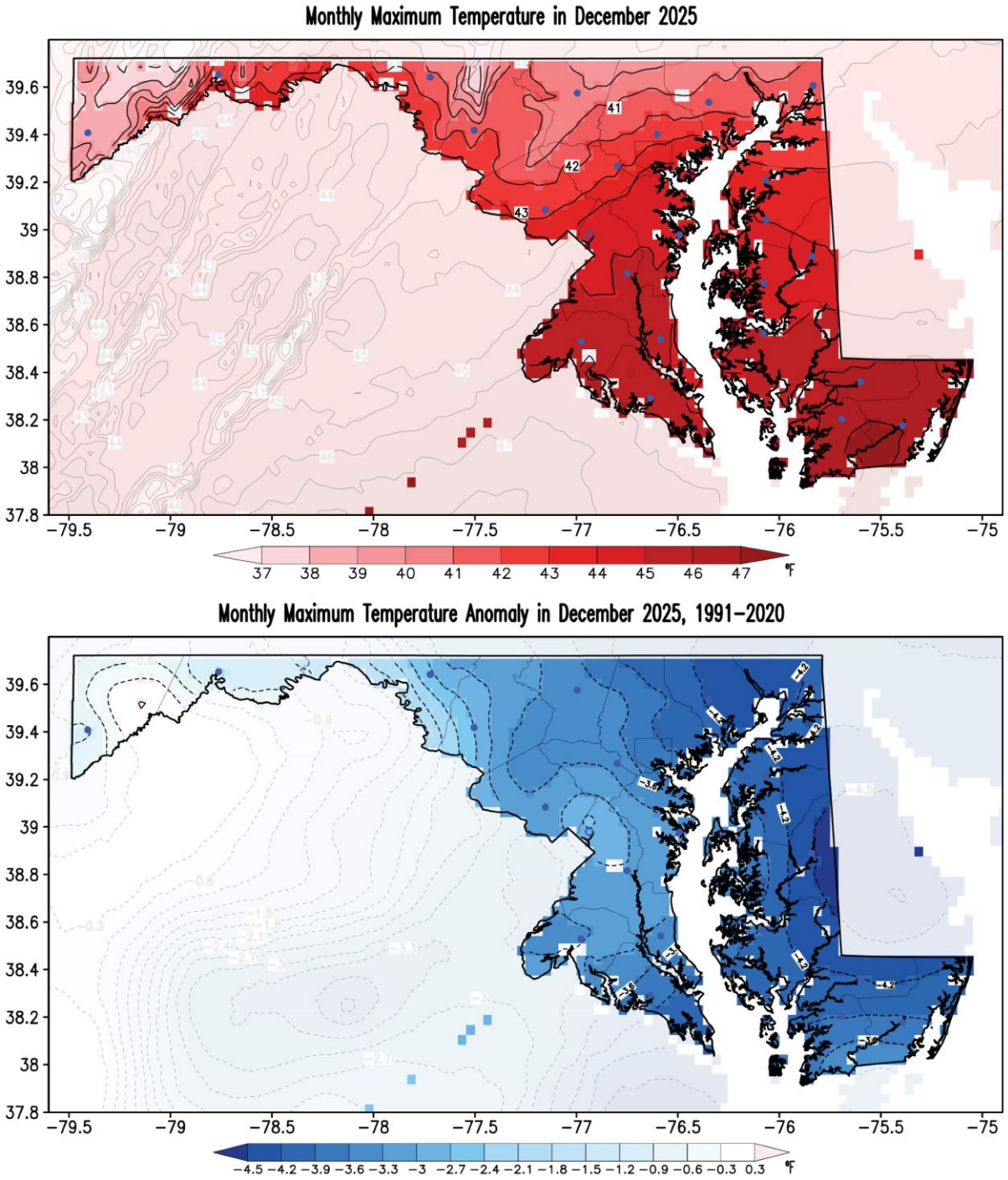

Figure 2. Monthly maximum surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for December 2025. Temperatures are in °F following the color bar. Blue/red shading in the anomaly map marks colder/warmer than normal conditions. Note shading outside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

C. Minimum Temperatures

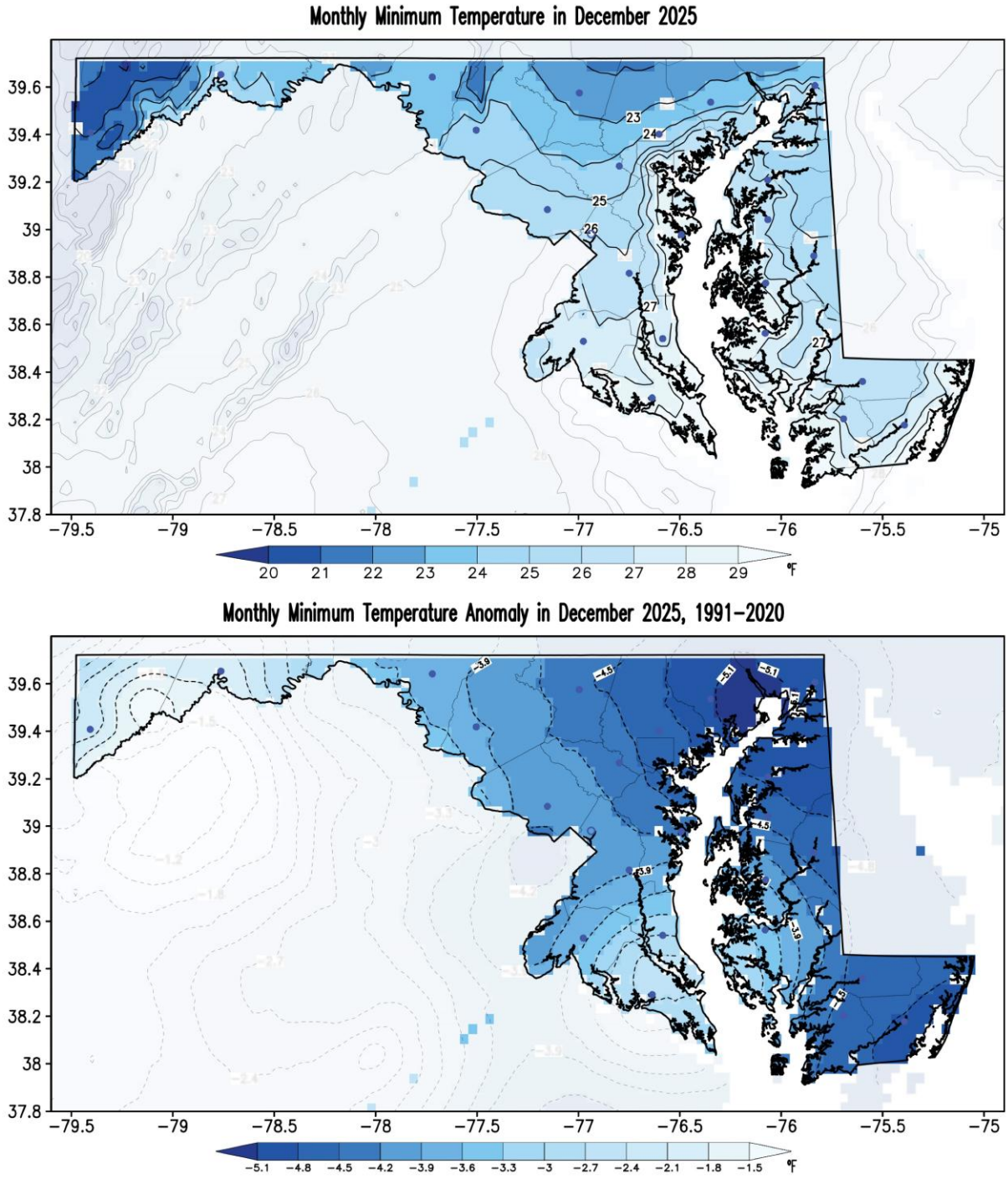

Figure 3. Monthly minimum surface air temperature (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for December 2025. Temperatures are in °F following the color bar. Blue shading in the anomaly map marks colder than normal conditions. Note shading outside the state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

D. Precipitation

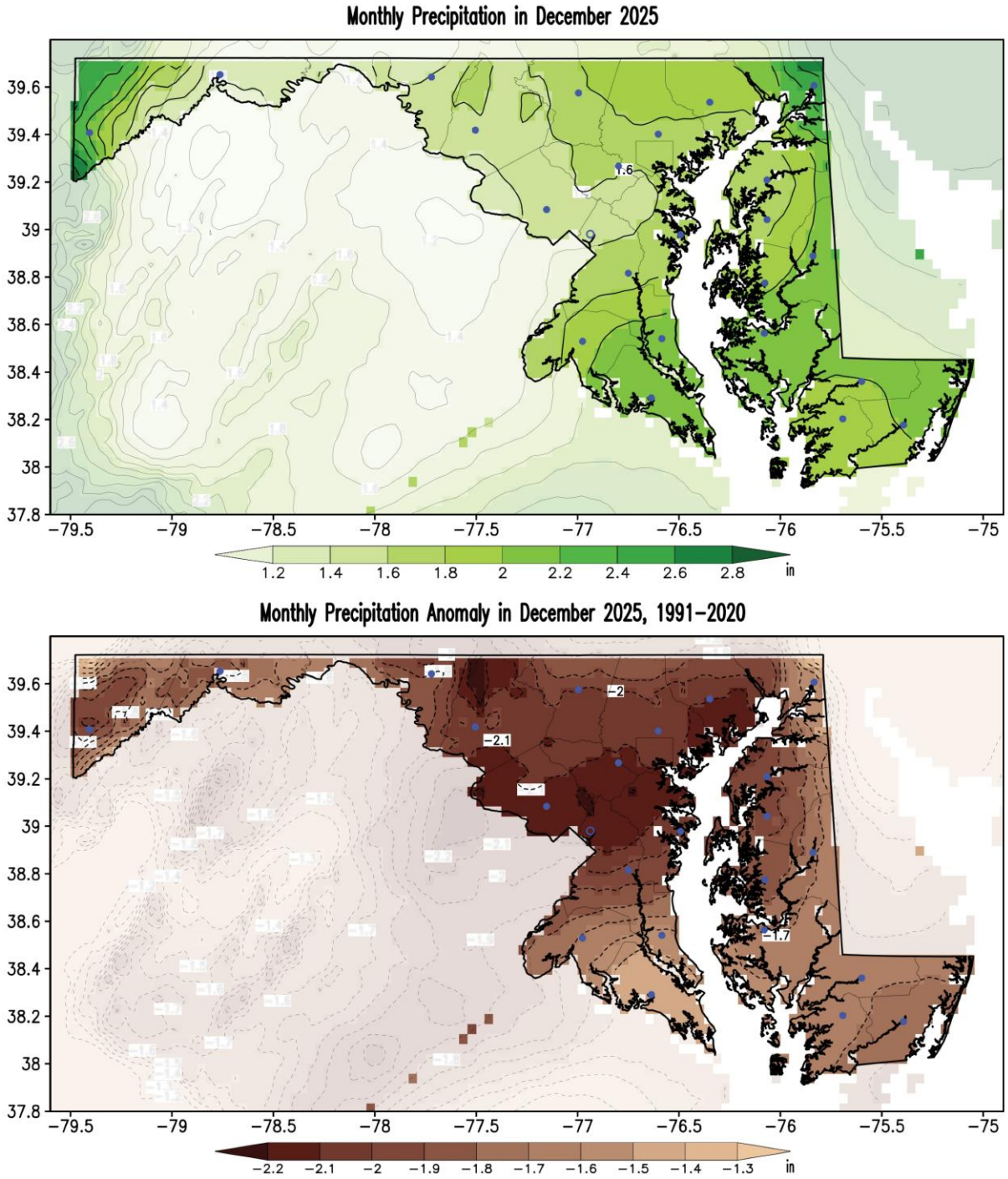

Figure 4. Monthly total precipitation (top panel) and its anomaly with respect to the 1991-2020 climatology (bottom panel) for December 2025. Precipitation is measured in inches, as indicated by the color bar. Brown shading in the anomaly map indicates drier-than-normal conditions. Note shading outside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

E. Drought

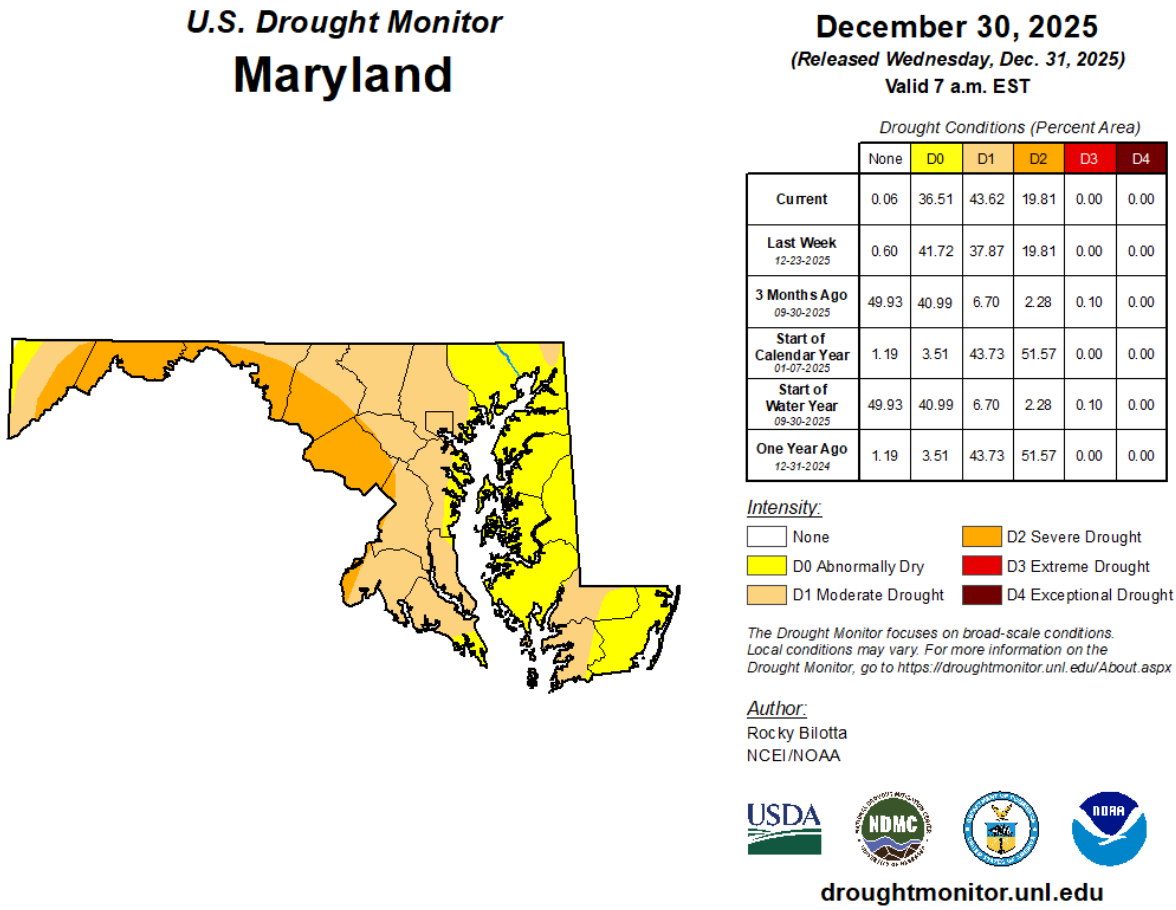

Figure 5. Drought conditions as reported by the U.S. Drought Monitor on December 30, 2025. While the extent of Abnormally Dry conditions diminished, that of Moderate Drought and Severe Drought conditions increased by around 10% and close to 20%, respectively, from the start to the end of December. Yellow shading indicates abnormally dry regions; light orange shading shows regions under a moderate drought. 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. 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. 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

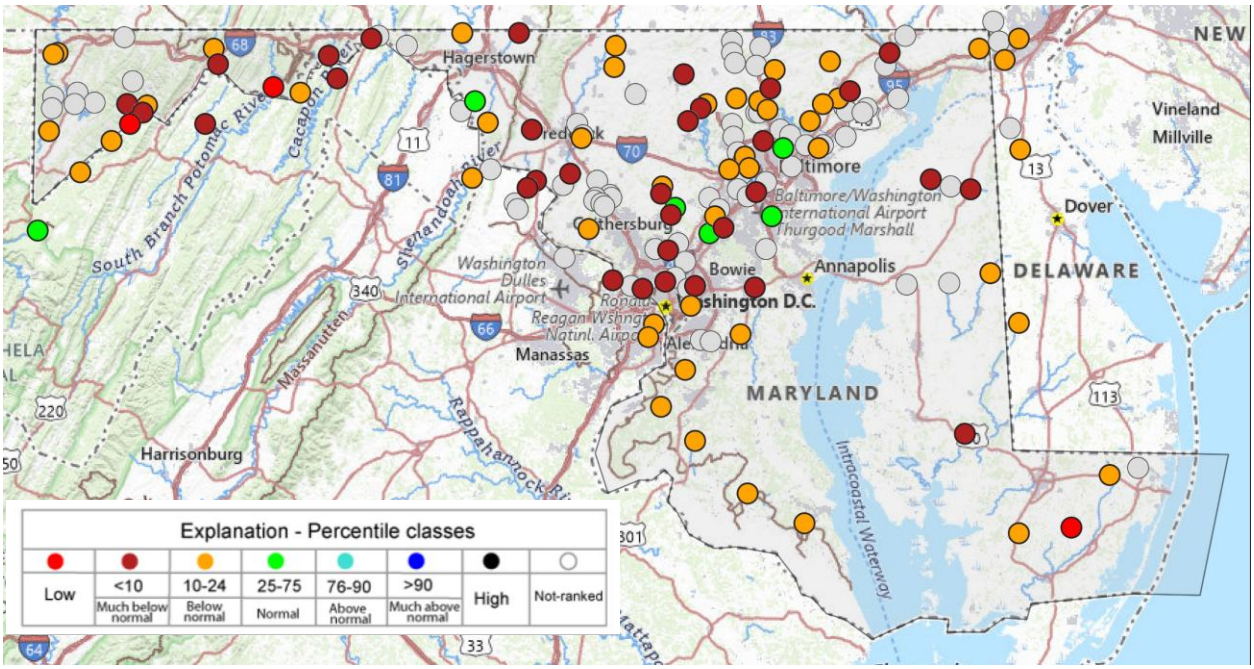

Figure 6. Monthly averaged streamflow class anomalies as reported by the U.S. Geological Survey (USGS) Water Watch for December 2025. Green-filled circles represent Normal streamflow conditions, while orange to red-filled circles denote Below-normal and Much-Below-normal streamflow conditions. Most streams and rivers had Below-normal and Much-Below-normal streamflow. Current conditions can be monitored on the U. S. Geological Survey website.

4. December and OND 2025 Climate Divisions Averages

A. December 2025 Scatter Plots

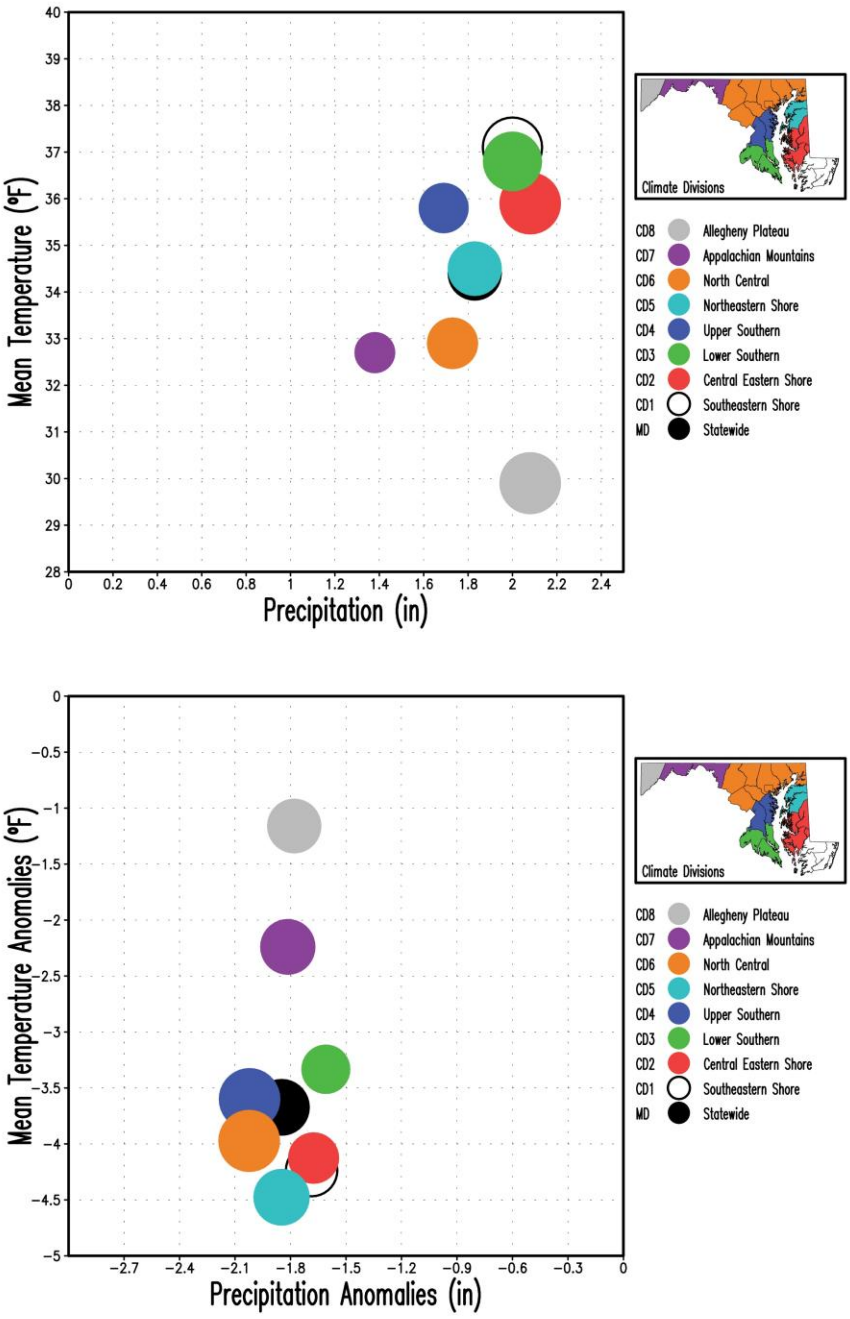

Figure 7. Scatter plots of Maryland (statewide) and Climate Divisions (CD#) monthly mean surface air temperature vs. total precipitation for December 2025. The upper panel displays the mean temperature and total precipitation, while the bottom panel displays their anomalies relative to the 1991-2020 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 (2.08 inches in CD8, top panel) and by the maximum precipitation anomaly (|−2.02| inches in CD4, 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. October – December 2025 Scatter Plots

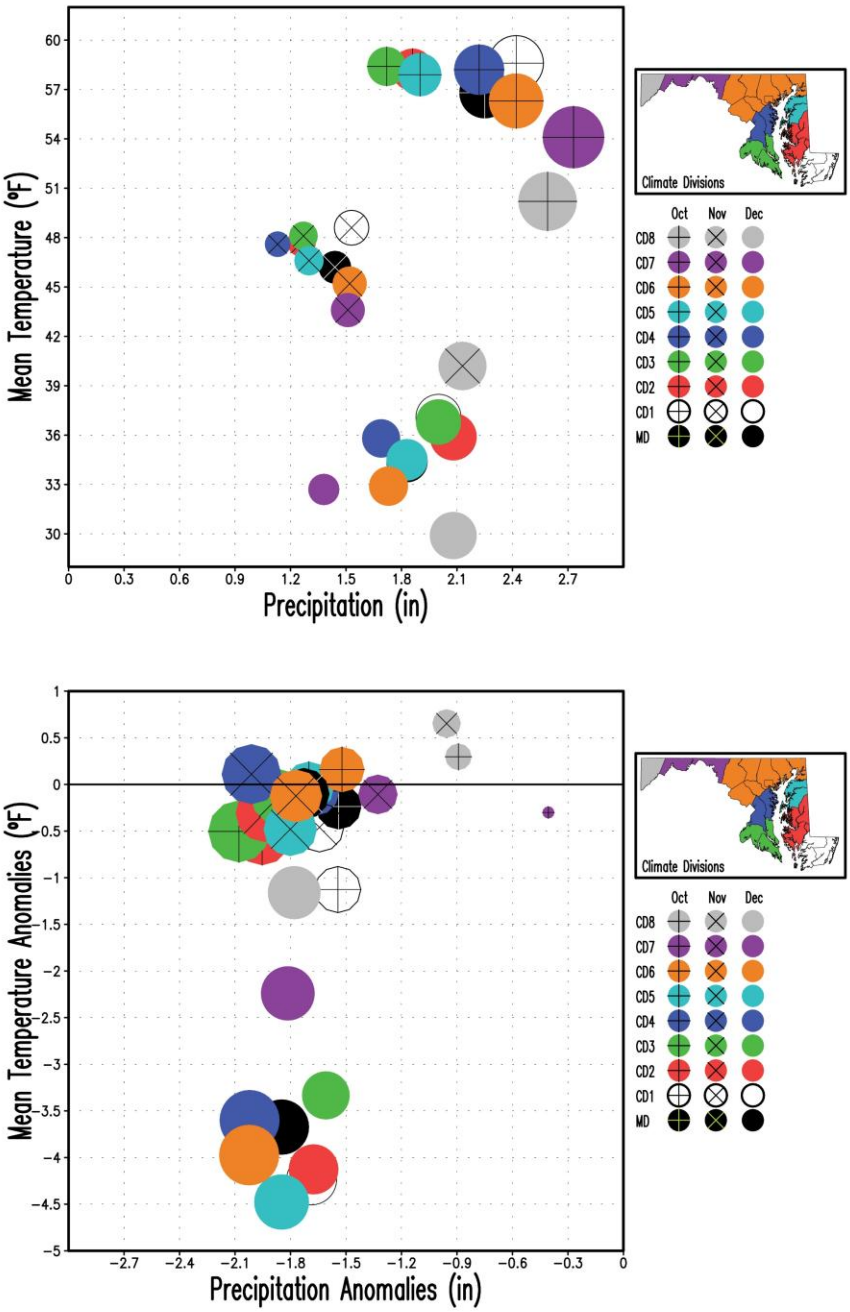

Figure 8. Scatter plots of Maryland (statewide) and Climate Divisions (CD#) monthly mean surface air temperature vs. total precipitation for October, November and December 2025. The upper panel displays the mean temperature and total precipitation, while the bottom panel shows their anomalies relative 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 (2.73 inches in CD7 in October, top panel) and by the maximum precipitation anomaly (|−2.08| inches in CD3 in October, bottom panel) among the nine regions and three months. December is displayed with filled circles only, while November and October are displayed with superposed multiplication and addition signs, respectively.

5. Extremes

A. Freezing Days

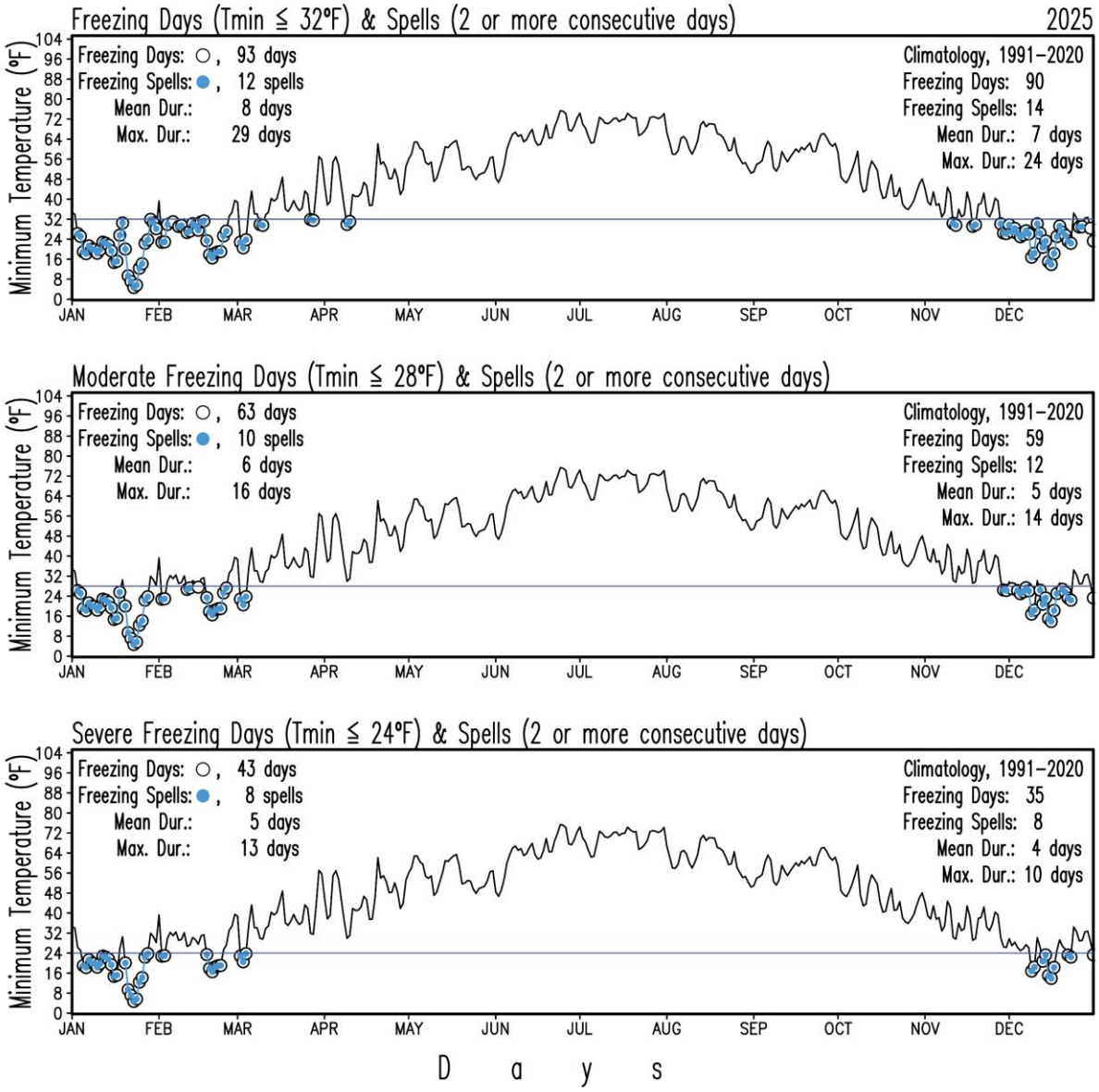

Figure 9. Maryland (statewide) number of freezing days, and their consecutive occurrence for the period January 1 - December 31, 2025. The panels show freezing days in open circles and spells of freezing days in blue-filled circles from statewide daily minimum temperatures. The upper panel displays freezing 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 levels, as well as summary tables, are available on the MDSCO website.

B. Extreme Precipitation and Dry Spells

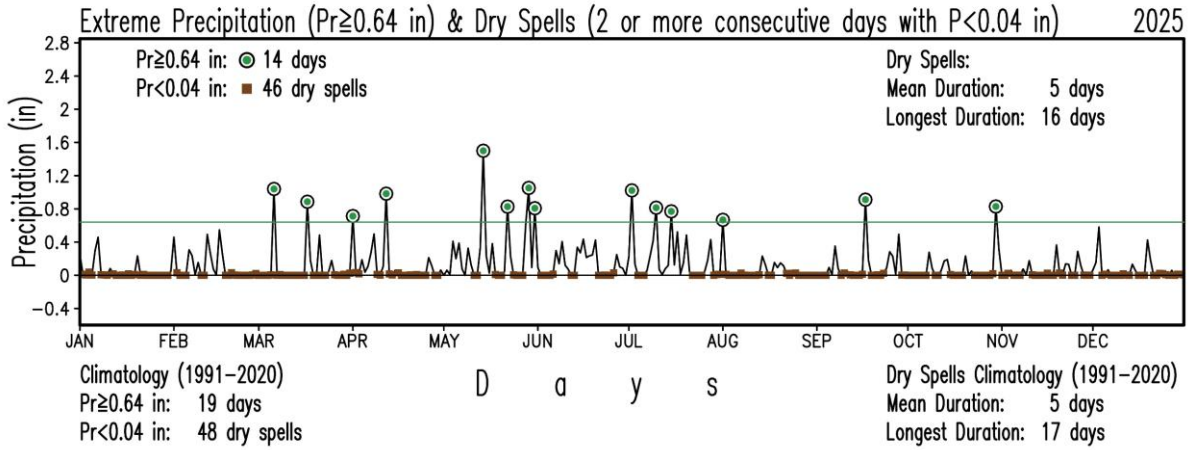

Figure 10. Maryland (statewide) number of days with extreme precipitation and dry day spells for the period January 1 – December 31, 2025. Days with extreme precipitation (precipitation equal to or larger than 0.64 in) are identified by green-filled circles. Dry spells (consecutive days with daily total 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.

6. December 2025 Statewide Averages in the Historical Record

A. Box and Whisker Plots

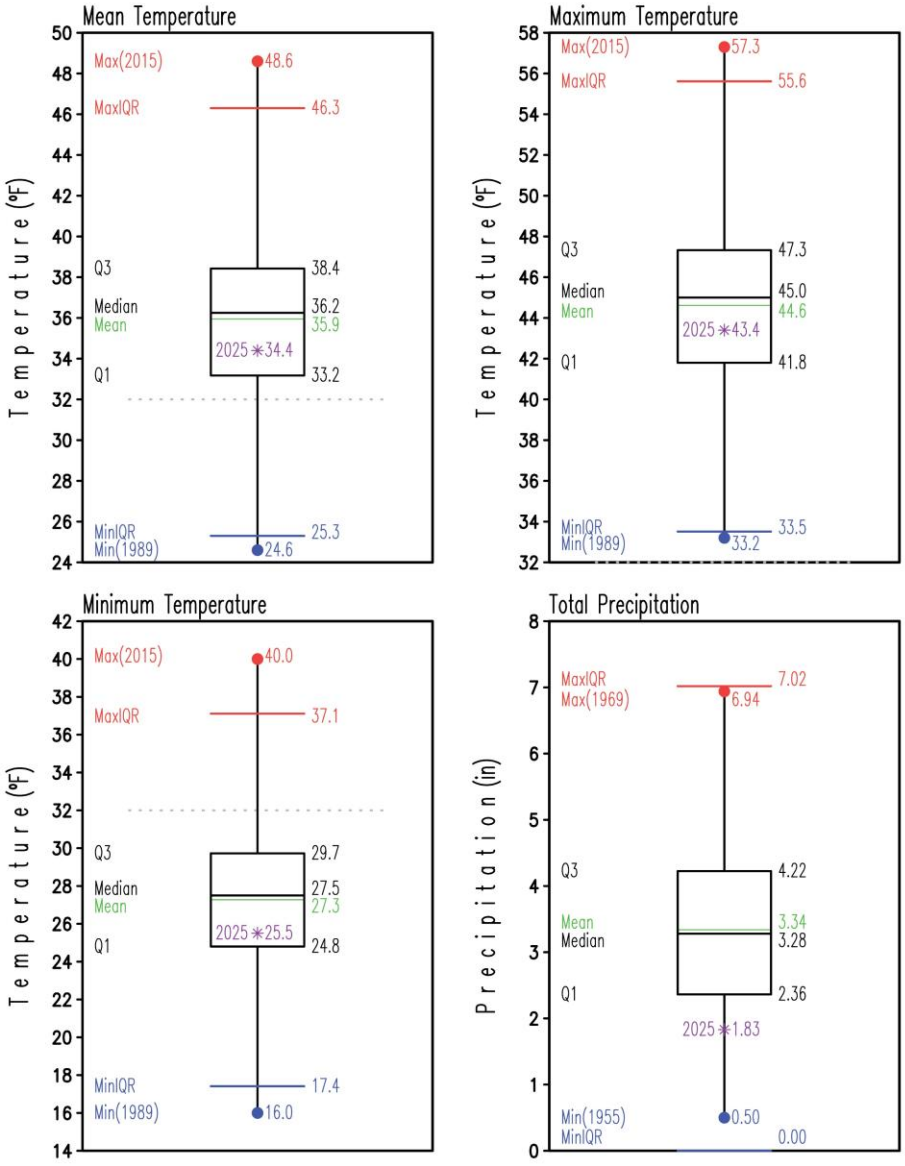

Figure 11. Box and Whisker plots of Maryland (statewide) monthly mean (upper left), maximum (upper right), minimum (lower left) surface air temperatures, and total precipitation (lower right) for December for the period 1895-2024. Conditions for December 2025 are represented by the label and asterisk in purple. 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 32°F temperature is displayed with a horizontal dotted, gray 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 December Trends

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

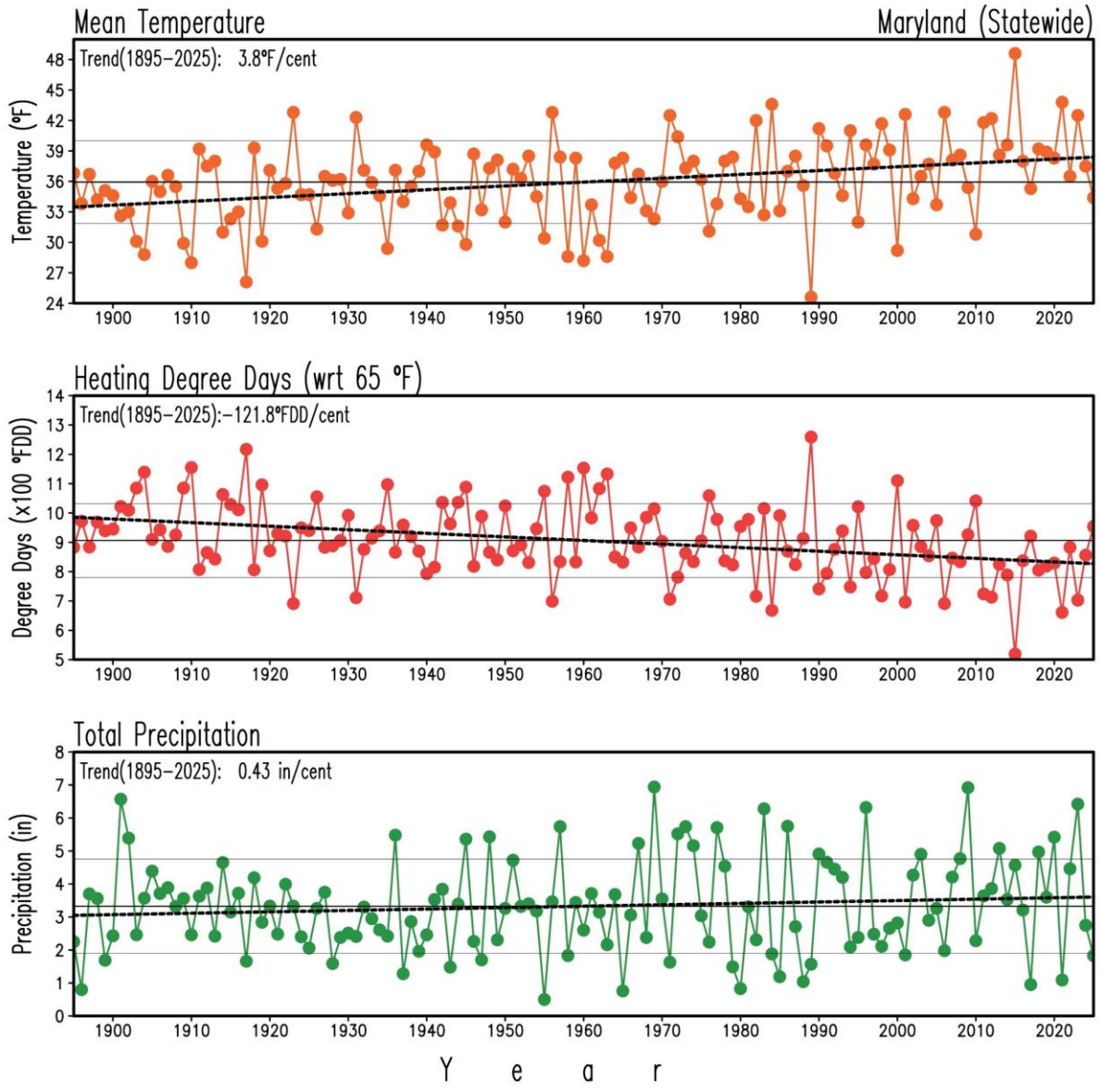

Figure 12. Maryland (statewide) mean surface air temperature, heating degree days, and precipitation in December for the period 1895-2025. Temperature is in °F, degree-days are in °F degree-days (°FDD), and precipitation is in inches. The thin, continuous black lines in each panel display the long-term means (35.9°F, 906.2°FDD, and 3.33 in, 1895-2025), and the double thin, continuous gray lines indicate the standard deviation (4.1°F, 125.8°FDD, and 1.43 in) above/below the long-term mean. The thick dashed black lines show the long-term linear trend. The warming temperature trend (3.8°F/century) and the decreasing heating degree-days trend (−121.8°FDD/century) are statistically significant at the 95% level (*Student's t-test* −Santer et al. 2000), but not the precipitation wetting trend (0.43 in/century).

B. Temperature and Precipitation Maps

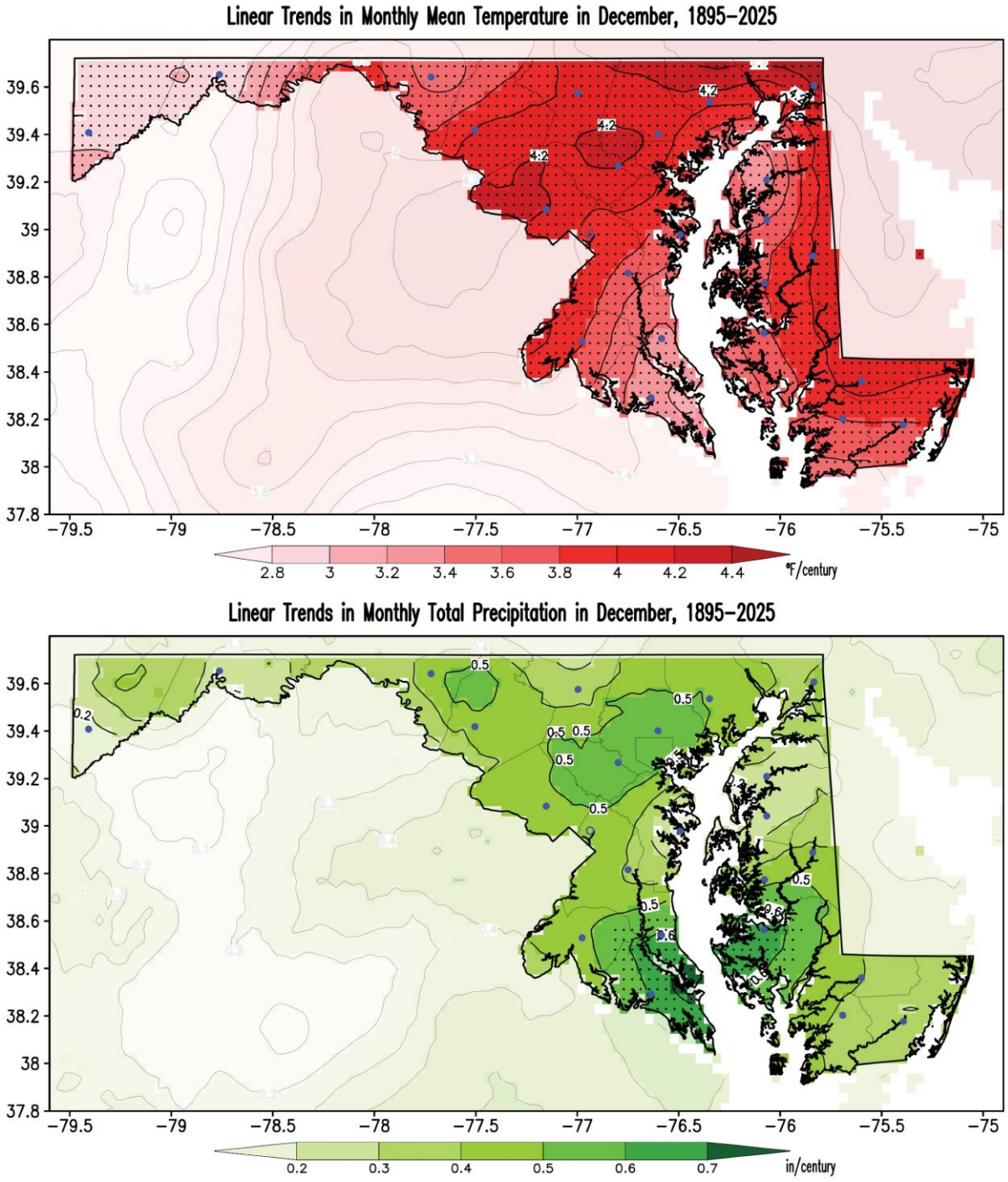

Figure 13. Linear trends in surface air mean temperature and precipitation in December for the period 1895-2025. Temperatures are in °F/century, and precipitation is in inches/century following the color bars. Red shading in the temperature map marks warming trends. Green shading in the precipitation map shows 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 focus on Maryland. Filled blue circles mark the county seats.

8. Chesapeake Bay's Satellite Sea Surface Temperatures

A. Maps

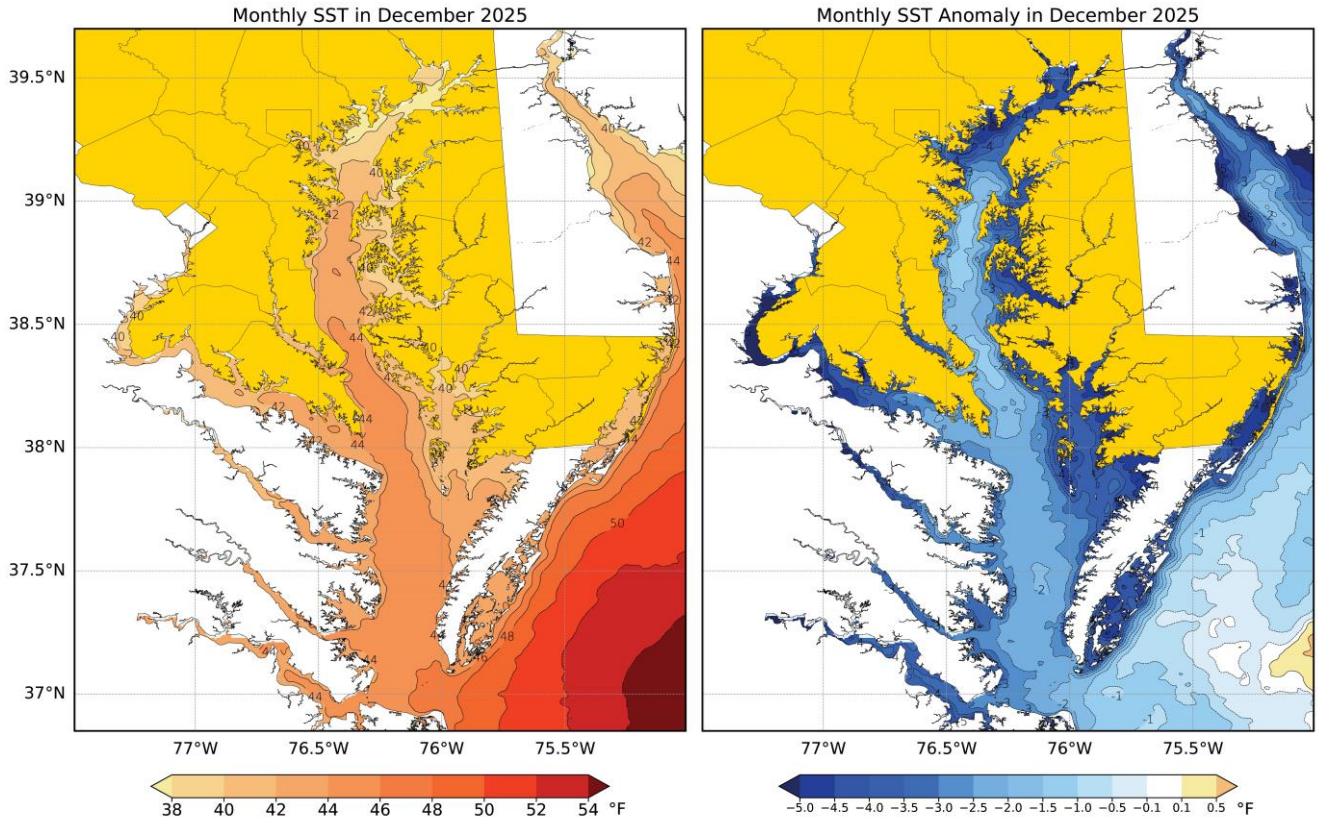

Figure 14. Monthly sea surface temperature (left panel) and its anomaly (right panel) in the Chesapeake Bay and surrounding coastal areas in December 2025. Temperatures are in °F following the color bar. Blue/orange shading in the anomaly map marks colder/warmer temperatures than the 2007-2020 mean. For clarity, the temperatures and their anomalies have been smoothed using a 9-point spatial smoother applied four times. Note that Maryland has been shaded yellow to facilitate focus on the state waters.

B. Upper, Middle, Lower, and Entire Basins Averages

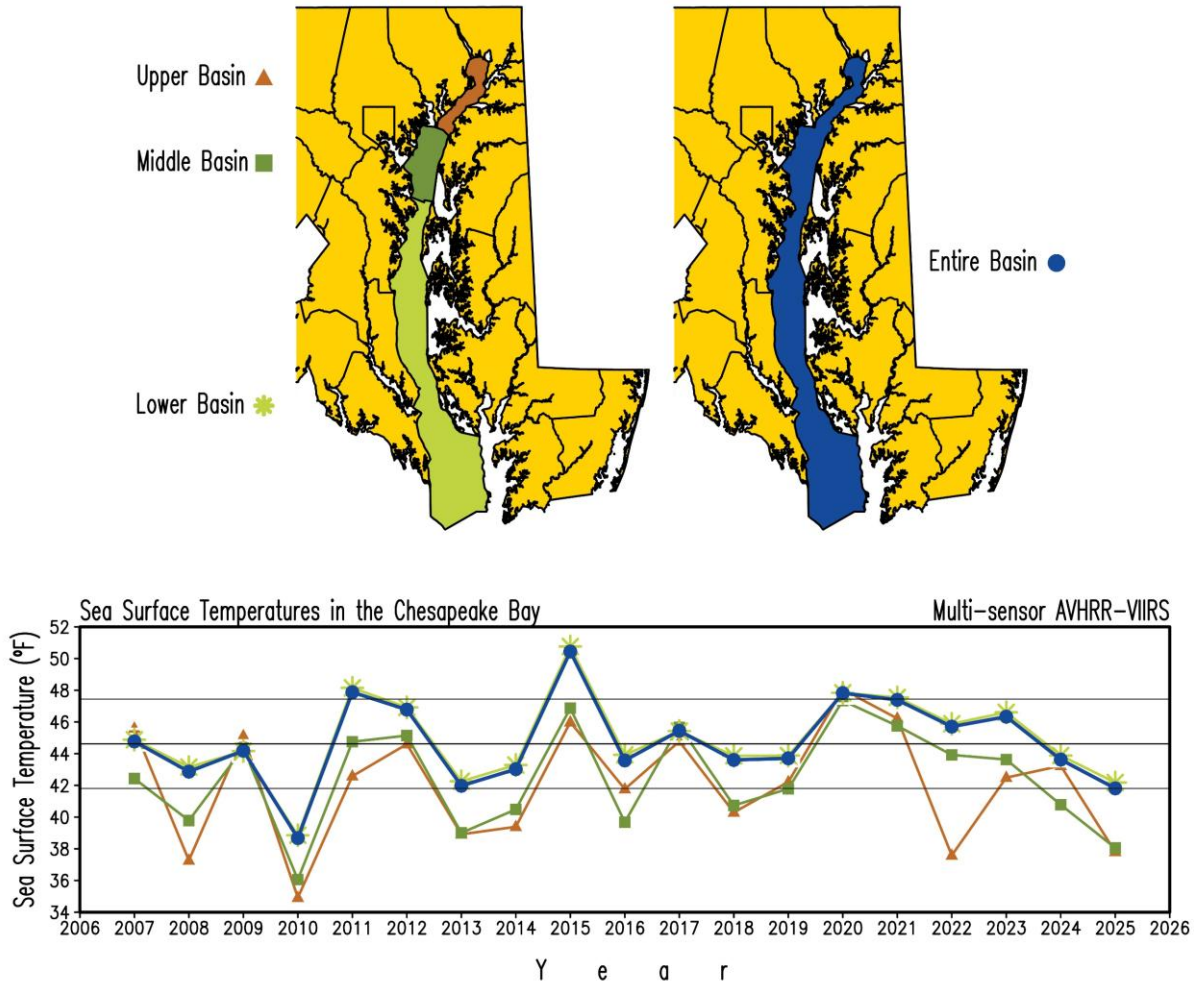

Figure 15. Watersheds in the Chesapeake Bay (top panel) and their area-averaged sea surface temperatures in December for the period 2007-2025 (bottom panel). Temperatures are in °F. The color of the lines corresponds to the color of the watersheds in the Bay, as indicated on the maps: Brown for the Upper Bay, dark green for the Middle Bay, light green for the Lower Bay, and Navy Blue for the Entire Bay. The mean temperature for the Entire basin in December 2025 was 41.8°F, while for the Upper, Middle, and Lower basins was 37.8, 38.1, and 42.2°F, respectively. The thin, continuous black line in the lower panel displays the 2007-2025 mean for the Entire Basin (44.7°F), and the double thin, continuous gray lines indicate the standard deviation (2.6°F) above/below the long-term mean. The 2007-2025 mean temperatures for the Upper, Middle, and Lower basins in December were 42.0, 42.4, and 44.9°F, respectively, while their standard deviations were 3.5, 3.1, and 2.6°F, respectively.

Appendix A. December 2025 Data Tables: Statewide, Climate Divisions, and Counties

A. Mean Temperature and Precipitation

Region	Mean Air Temperature (°F)	Rank (#)
Statewide	34.4	44
Climate Division 1	37.1	38
Climate Division 2	35.9	38
Climate Division 3	36.8	45
Climate Division 4	35.8	45
Climate Division 5	34.5	36
Climate Division 6	32.9	42
Climate Division 7	32.7	57
Climate Division 8	29.9	65
Allegany	32.8	63
Anne Arundel	35.9	42
Baltimore	32.9	41
Baltimore City	34.9	40
Calvert	36.7	45
Caroline	34.9	38
Carroll	31.7	43
Cecil	33.0	38
Charles	36.5	46
Dorchester	36.5	40
Fredrick	32.5	45
Garrett	29.9	65
Harford	32.6	37
Howard	33.4	44
Kent	34.4	36
Montgomery	33.9	45
Prince George's	35.7	46
Queen Anne's	34.8	38
Saint Mary's	37.1	44
Somerset	37.3	40
Talbot	36.1	40
Washington	32.7	53
Wicomico	36.4	37
Worcester	37.3	37

Region	Total Precipitation (in)	Rank (#)
Statewide	1.83	18
Climate Division 1	2.00	23
Climate Division 2	2.08	27
Climate Division 3	2.00	23
Climate Division 4	1.69	18
Climate Division 5	1.83	20
Climate Division 6	1.73	20
Climate Division 7	1.38	19
Climate Division 8	2.08	16
Allegany	1.30	16
Anne Arundel	1.66	19
Baltimore	1.79	21
Baltimore City	1.67	18
Calvert	2.07	26
Caroline	2.08	26
Carroll	1.70	21
Cecil	2.26	33
Charles	1.87	22
Dorchester	2.08	28
Fredrick	1.54	21
Garrett	2.08	16
Harford	1.88	23
Howard	1.61	19
Kent	1.79	20
Montgomery	1.47	17
Prince George's	1.71	21
Queen Anne's	1.83	20
Saint Mary's	2.15	28
Somerset	1.93	23
Talbot	1.97	23
Washington	1.44	19
Wicomico	2.02	25
Worcester	2.04	22

Table A1. Monthly mean surface air temperature (left) and total precipitation (right) at Maryland (statewide), climate division, and county levels for December 2025. Temperatures are in °F, and precipitation is in inches. The rank is the position the variable for December 2025 occupies among the 131 Decembers, 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/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	43.4	47
Climate Division 1	46.4	42
Climate Division 2	44.8	41
Climate Division 3	45.6	45
Climate Division 4	44.8	51
Climate Division 5	43.5	42
Climate Division 6	41.7	51
Climate Division 7	41.9	62
Climate Division 8	38.6	72
Allegany	41.9	67
Anne Arundel	44.7	49
Baltimore	41.9	46
Baltimore City	43.5	49
Calvert	45.2	44
Caroline	44.2	39
Carroll	40.6	46
Cecil	41.6	42
Charles	45.7	48
Dorchester	45.3	41
Fredrick	41.1	55
Garrett	38.6	72
Harford	41.4	41
Howard	42.5	53
Kent	43.1	39
Montgomery	42.6	53
Prince George's	44.9	49
Queen Anne's	43.8	43
Saint Mary's	45.5	41
Somerset	46.4	43
Talbot	44.7	43
Washington	41.9	59
Wicomico	46.1	39
Worcester	46.6	42

Region	Minimum Air Temperature (°F)	Rank (#)
Statewide	25.5	42
Climate Division 1	27.7	32
Climate Division 2	27.0	34
Climate Division 3	28.0	49
Climate Division 4	26.8	39
Climate Division 5	25.6	29
Climate Division 6	24.1	37
Climate Division 7	23.6	54
Climate Division 8	21.2	63
Allegany	23.7	62
Anne Arundel	27.1	37
Baltimore	23.9	36
Baltimore City	26.4	33
Calvert	28.2	48
Caroline	25.5	30
Carroll	22.8	41
Cecil	24.4	30
Charles	27.3	47
Dorchester	27.7	38
Fredrick	23.8	41
Garrett	21.2	62
Harford	23.8	27
Howard	24.3	39
Kent	25.6	28
Montgomery	25.3	39
Prince George's	26.4	42
Queen Anne's	25.8	29
Saint Mary's	28.7	53
Somerset	28.2	32
Talbot	27.6	32
Washington	23.4	47
Wicomico	26.8	35
Worcester	27.9	29

Table A2. Monthly maximum (left) and minimum (right) surface air temperatures at Maryland (statewide), climate division, and county levels for December 2025. Temperatures are in °F. The rank is the position the variable for December 2025 occupies among the 131 Decembers, 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. December 2025 Bar Graphs: Statewide, Climate Divisions, and Counties

A. Temperatures and Precipitation

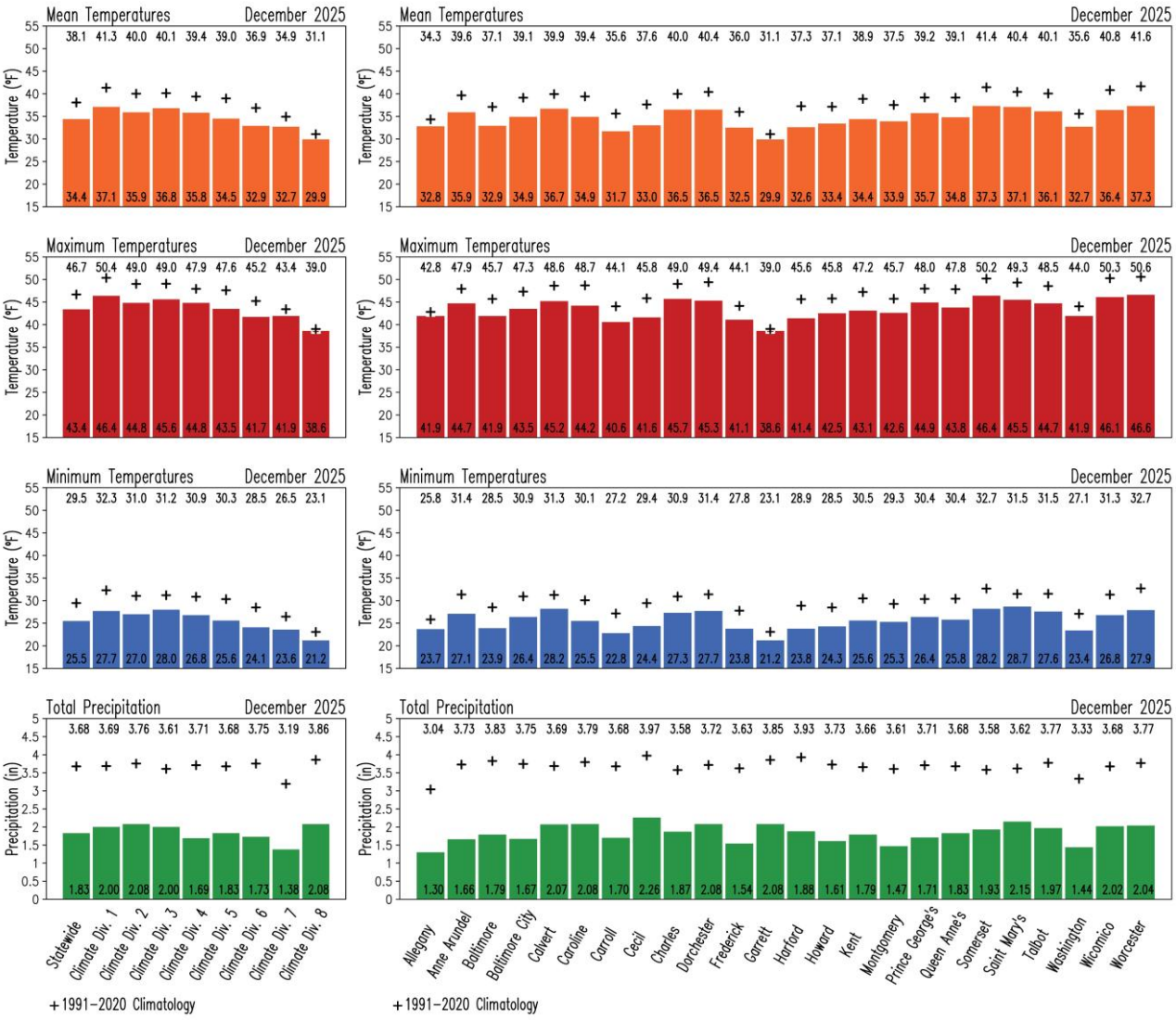

Figure B1. Monthly surface variables for Maryland in December 2025. Color bars represent the variables as follows: mean surface air temperature (orange), maximum surface air temperature (red), minimum surface air temperature (blue), and total precipitation (green) at statewide and climate division (left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

B. Temperatures and Precipitation Anomalies

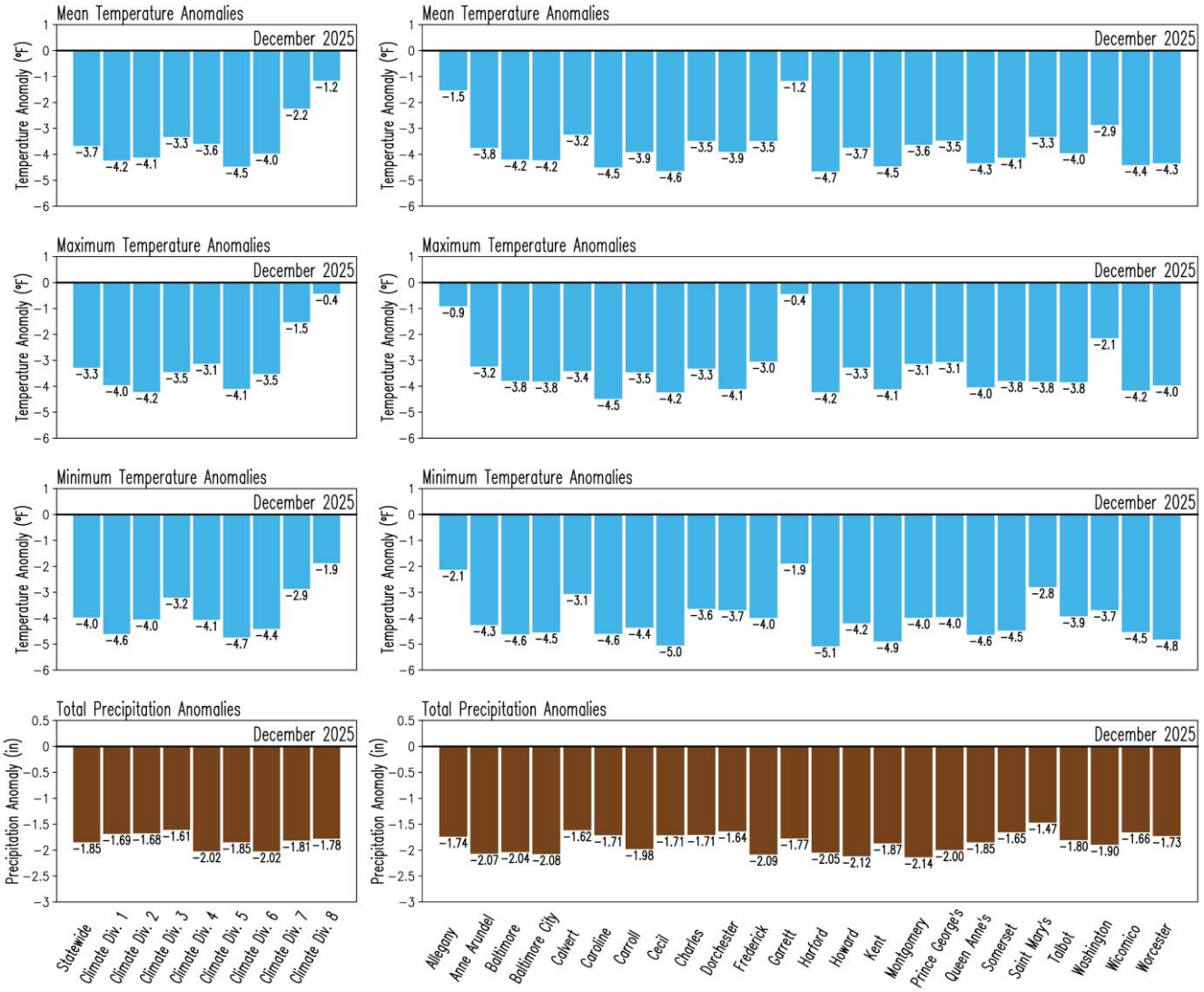

Figure B2. Anomalies in the monthly surface variables for Maryland in December 2025. Anomalies are with respect to the 1991-2020 climatology. Blue color represents negative (colder than normal) anomalies for mean surface air temperature (upper row), maximum surface air temperature (second row from top), and minimum surface air temperature (third row from top), while brown color indicates negative (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 December 2025.

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

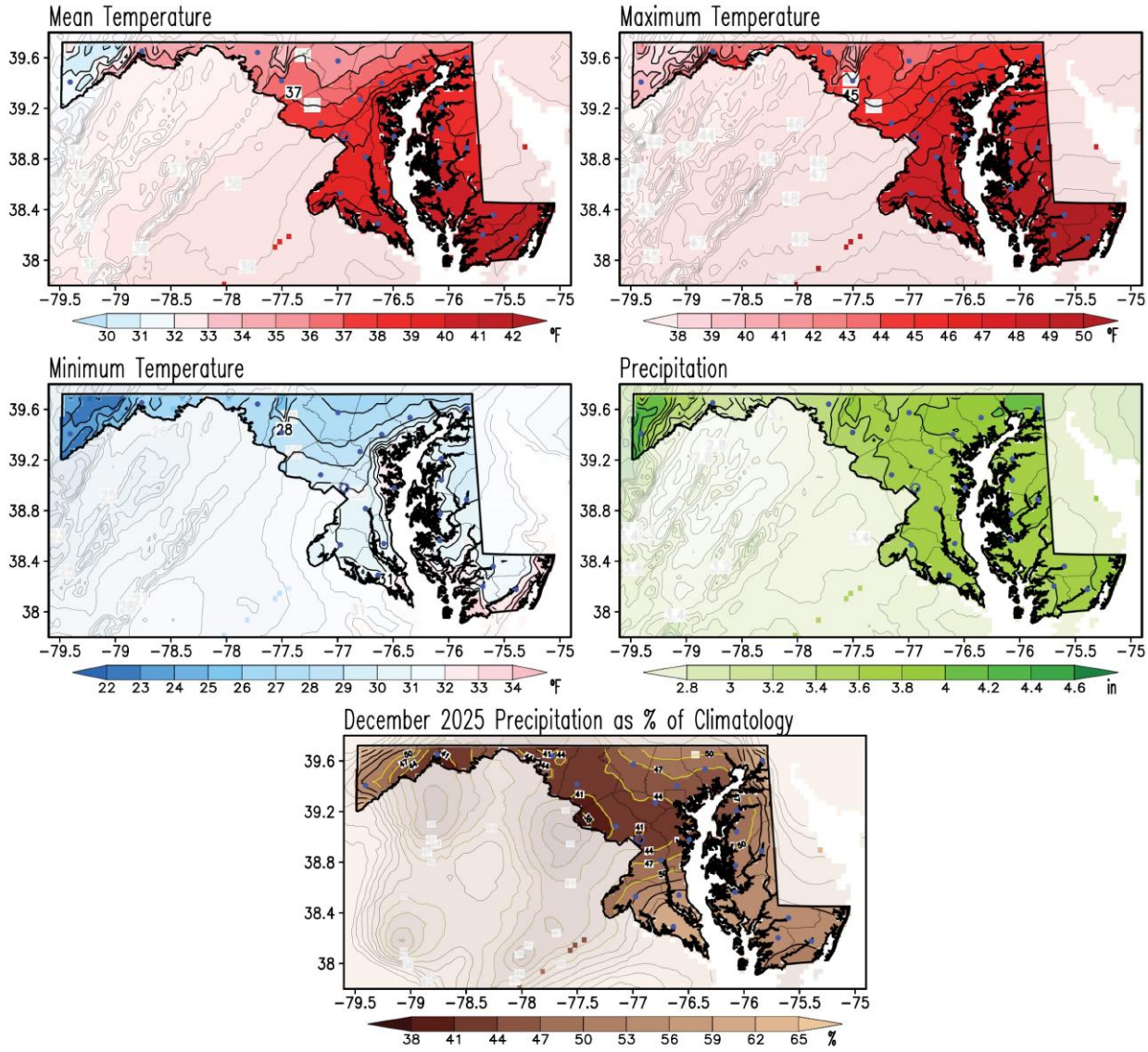

Figure C1. December climatology of the monthly mean, maximum, and minimum surface air temperatures, and total precipitation for the period 1991-2020 (upper and middle rows), and precipitation in December 2025 as a percentage of climatology (bottom row). Temperatures are in °F, and precipitation in inches according to the color bars. This is the current climate normal against which the December 2025 conditions are compared to obtain the December 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 shading in this map indicates drier than normal conditions, and yellow isolines are for percentages equal to or less than 50%. Note that shading outside the state has been washed out to facilitate focus on Maryland. Filled blue circles mark the county seats.

Appendix D. December Standard Deviation and December 2025 Standardized Anomalies Maps

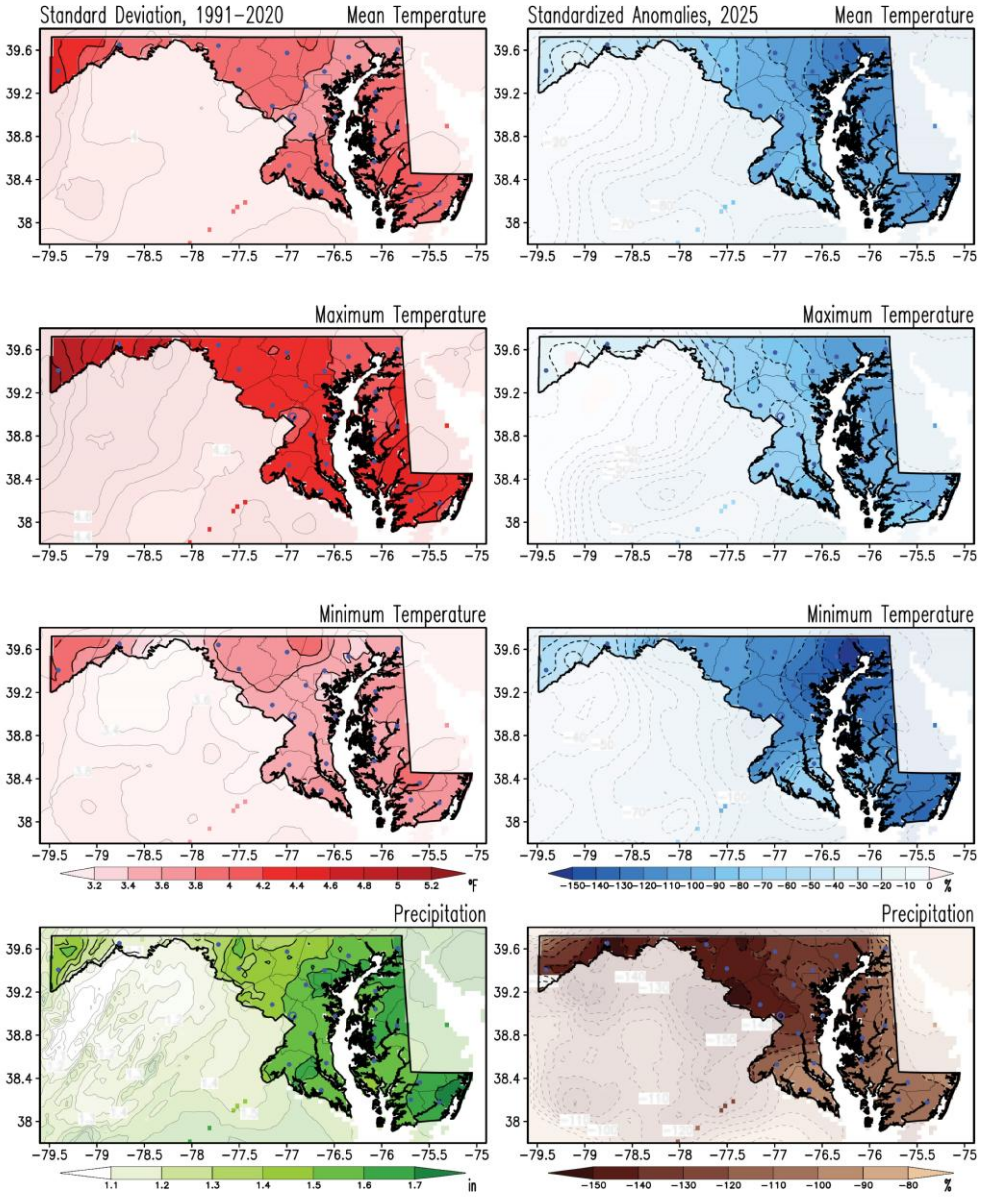

Figure D1. Standard deviation for December and standardized anomalies of temperatures and precipitation for December 2025. Standard deviations for monthly mean, maximum, and minimum surface air temperatures and total precipitation were obtained from the 1991-2020 period (left column). Anomalies for December 2025 (right column) are obtained as a percentage of the standard deviations. The standard deviations for temperature are in °F, and those for precipitation are in inches according to the color bars. Blue/red shading in the anomaly temperature maps marks colder/warmer than normal conditions; brown shading in the anomaly precipitation map marks drier than normal conditions. The standardized anomalies are obtained by dividing the raw anomalies (from Figures 1 to 4) by the standard deviation (from left column panels) and multiplying the ratio by 100; hence, units are in percent (%). Note that shading outside the state has been washed out to facilitate focus on Maryland. Filled blue circles mark the county seats.

Appendix E. 2007-2020 Mean and Standard Deviation of Sea Surface Temperatures in December

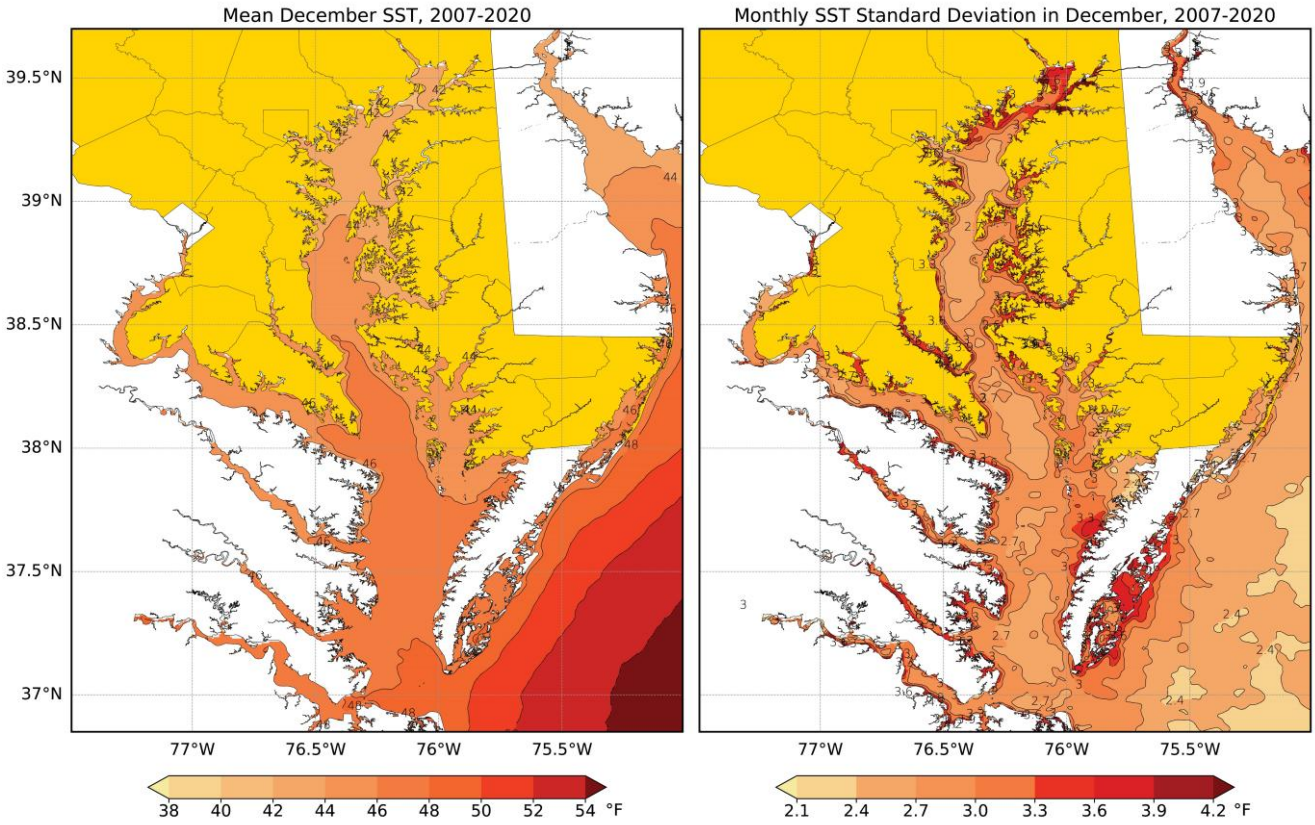

Figure E1. Mean (left panel) and standard deviation (right panel) of sea surface temperatures in the Chesapeake Bay and surrounding coastal areas in December for the period 2007-2020. The mean and standard deviation of the temperatures are in °F according to the color bars. The mean temperature map is the current mean against which the December 2025 conditions are compared to obtain the December 2025 anomalies (from Figure 14). For clarity, the mean and standard deviation of the temperature have been smoothed using a 9-point spatial smoother, applied four times. To facilitate comparison between the mean December map (left panel) and the December 2025 map (Figure 14, left panel), the shading schemes are the same. Note that Maryland has been shaded yellow to facilitate focusing on the state waters.

References

Arguez A., I. Durre, S. Applequist, R. S. Vose, M. F. Squires, X. Yin, R. R. Heim Jr, and T. W. Owen, 2012. NOAA's 1981-2010 U. S. Climate Normals. An Overview. *Bulletin of the American Meteorological Society*. 93, 1687-1697, doi:10.1175/BAMS-D-11-00197.1 https://www1.ncdc.noaa.gov/pub/data/normals/1981-2010/documentation/1981-2010-normals-overview.pdf.

CPC, Climate Prediction Center, 2023. Degree Days Explanation. https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/degree_days/ddayexp.shtml

Durre, I., A. Arguez, C. J. Schreck III, M. F. Squires, and R. S. Vose, 2022: Daily high-resolution temperature and precipitation fields for the Contiguous United States from 1951 to Present. Journal of Atmospheric and Oceanic Technology, doi:10.1175/JTECH-D-22-0024.1

Kunkel, K. E., and A. Court, 1990. Climatic Means and Normals—A Statement of the American Association of State Climatologists (AASC), *Bulletin of the American Meteorological Society*, 71(2), 201-204. Retrieved Aug 20, 2022, from https://journals.ametsoc.org/view/journals/bams/71/2/1520-0477-71_2_201.xml

Santer, B. D., and co-authors, 2000: Statistical significance of trends and trend differences in layer-averaged atmospheric temperature time series. *J. Geophys. Res.*, 105, 7337–7356, doi:10.1029/1999JD901105.

Tschurr, F., I. Feigenwinter, A. M. Fischer, and S. Kotlarski, 2020:. Climate Scenarios and Agricultural Indices: A Case Study for Switzerland. Atmosphere, 11, 535. https://doi.org/10.3390/atmos11050535

USDA, 2024. United States Department of Agriculture, Growing Season Dates and Length. https://www.nrcs.usda.gov/programs-initiatives/sswsf-snow-survey-and-water-supply-forecasting-program/wetlands-climate-tables

Vose and co-authors, 2014. NOAA Monthly U.S. Climate Gridded Dataset (NClimGrid), Version 3. *NOAA National Centers for Environmental Information*. DOI:10.7289/V5SX6B56.

WMO, 2017. WMO Guidelines on the Calculation of Climate Normals. WMO-No. 1203, Series. 29pp. https://library.wmo.int/doc_num.php?explnum_id=4166.