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Maryland Climate Bulletin

September 2025

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This publication is available from:
<https://www.atmos.umd.edu/~climate/Bulletin/>



Summary

Statewide averages indicate that September 2025 was slightly warmer and drier than normal (i.e., 1991-2020 averages). Regionally, monthly mean temperatures were in the 59–71°F range, while monthly total precipitation was between 0.5 and 3.0 inches.

Maryland Regional Features (Figures 1–3, A1)

- The mean temperature was warmer than normal over the majority of the state. Warmer-than-normal anomalies appeared over the northern half of the state, especially over parts of Carroll, Frederick, and Washington counties (around 1.0°F). Colder-than-normal conditions appeared over the southern counties to both sides of the Bay, particularly over Charles County (around 1.0°F below).
- Precipitation was below normal for the majority of the state, notably over Frederick and Washington counties (2.0 to 3.0 inches deficit), and over Garrett, Allegany, Carroll, Montgomery, Howard, Baltimore, Harford, Cecil, Charles, and Prince George’s counties (1.0 to 2.0 inches deficit). Above normal precipitation appeared over some areas in the Eastern Shore, over Queen Anne’s, Kent, and Worcester counties (larger than 2 inches), as well as over portions of Dorchester and Wicomico counties (1.0 to 2.0 inches). The first of these regions, over the western states, received 25 to 50% less precipitation than normal, while the regions in the Eastern Shore got 25 to 50% more precipitation than normal for the month.
- Drought conditions intensified in September, primarily in the western counties. While the extent of the state affected by drought diminished from 70% to 50%, Moderate Drought conditions affected Garrett, Allegany, and Washington counties along the limits with West Virginia, as well as western and central Montgomery County. Severe Drought conditions also developed over the western counties, and even Extreme Drought conditions started to creep over the southern tip of Garrett County. The rest of these counties were under Abnormally Dry conditions, which also affected Frederick, Carroll, Baltimore, Howard, Prince George’s, Charles, Calvert, Saint Mary’s, and Caroline. Several streams and rivers in the Piedmont and western Maryland had Below-normal streamflow, with a few experiencing Much-below-normal streamflow.

Chesapeake Bay Sea Surface Temperatures (Figures 4, 5, C1)

- The Chesapeake Bay sea surface temperatures (SST) in September 2025 ranged between 73 and 78°F, marking the second consecutive month they remained below their 2007–2020 mean across the entire region. A distinct north-to-south gradient defined the magnitude of the cold anomalies. The most significant deficit (3–4°F below average) was

recorded in the southeastern Lower Bay, encompassing Tangier Sound waters off Somerset, Wicomico, and Dorchester counties. Moving northward, along the coasts of Talbot and Queen Ann counties up to Eastern Bay, the anomalies lessened to 2–3°F below the mean. The waters off Kent and Baltimore counties, and farther northward in the Upper Bay, showed the smallest cold anomalies (1–2°F below). Chincoteague Bay temperatures were also notably colder than normal (2–3°F below). The all-basin mean temperature of 74.0°F was still warmer than the coldest September in the 19-year dataset (2007-2025), which recorded 72.8°F in 2009.



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1. Introduction

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

This edition, however, has been affected by circumstances beyond our control, impacting NOAA's National Centers for Environmental Information (NCEI) and their ability to process the main data source we use for the Bulletin. This time, the monthly surface climate conditions for September 2025 are presented via anomaly (i.e., departures from normal) maps of the mean surface air temperature and total precipitation; they are complemented by drought conditions, as given by the U.S. Drought Monitor, and streamflow anomalies as given by the U.S. Geological Survey Water Watch in Section 3. Monthly sea surface temperatures (SST) in the Chesapeake Bay are presented in Section 4. Ancillary climatology maps, the percentage of normal precipitation for September 2025, and variability maps are included in Appendices A and B. The mean and variability of the SSTs in the Chesapeake Bay are displayed in Appendix C.

2. Data & Methods

Surface air temperatures and total precipitation maps for September 2025 are from the Northeast Regional Climate Center:

- In particular, the Monthly Maps website:
<https://www.nrcc.cornell.edu/regional/monthly/monthly.html>
 The maps were downloaded on October 21, 2025.
 Note that the data used to generate the downloaded maps are from a product on a 5×5km grid put together by NOAA Regional Climate Centers' Applied Climate Information System (ACIS).
- Statewide averages were obtained online through the ACIS website:
<https://scacis.rcc-acis.org>

The drought conditions map is from the U.S. Drought Monitor website:

<https://droughtmonitor.unl.edu/Maps/MapArchive.aspx>



The streamflow conditions map is 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 km from 2007 to the present. This product is available at:
<https://eastcoast.coastwatch.noaa.gov/data/avhrr-viirs/sst-ngt>
 Data was downloaded on October 2, 2025.
- 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 stem 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 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 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 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.

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). This will be referred to as the 2007-2020 mean and not as a climatology.

About the anomalies: Anomalies for a given month (e.g., September 2025) are the departures of the monthly value from the corresponding month’s 30-year average (i.e., from the average of 30 Septembers) 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 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. September 2025 Maps

A. Mean Temperature and Precipitation Anomalies

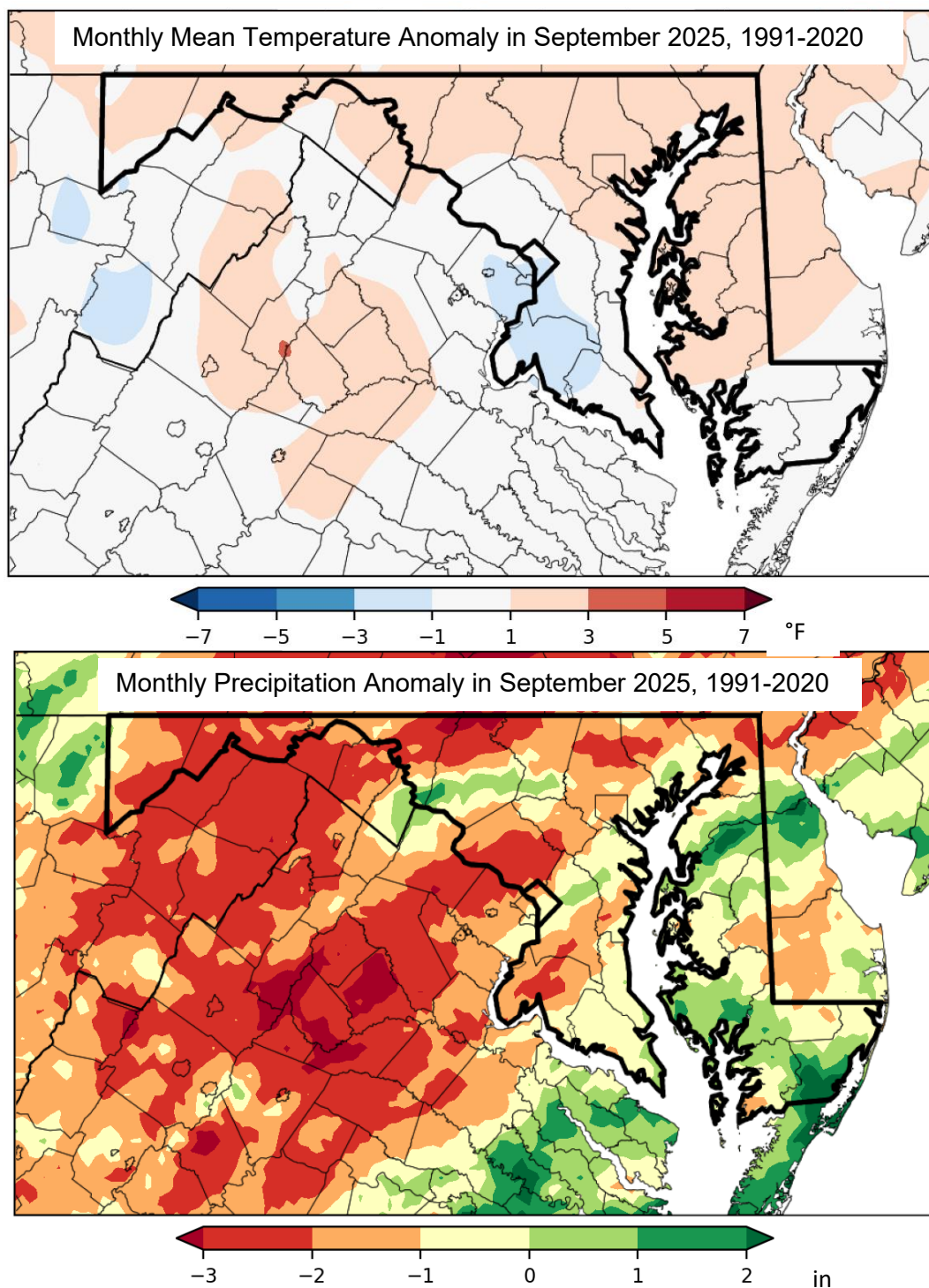


Figure 1. Monthly anomalies in mean surface air temperature (top panel) and precipitation (bottom panel) with respect to the 1991-2020 climatology for September 2025. Temperatures are in °F following the color bar with blue/pink shading marking colder/warmer than normal conditions. Precipitation is measured in inches with yellow-orange-red/green shading marking drier/wetter than normal conditions.

B. Drought

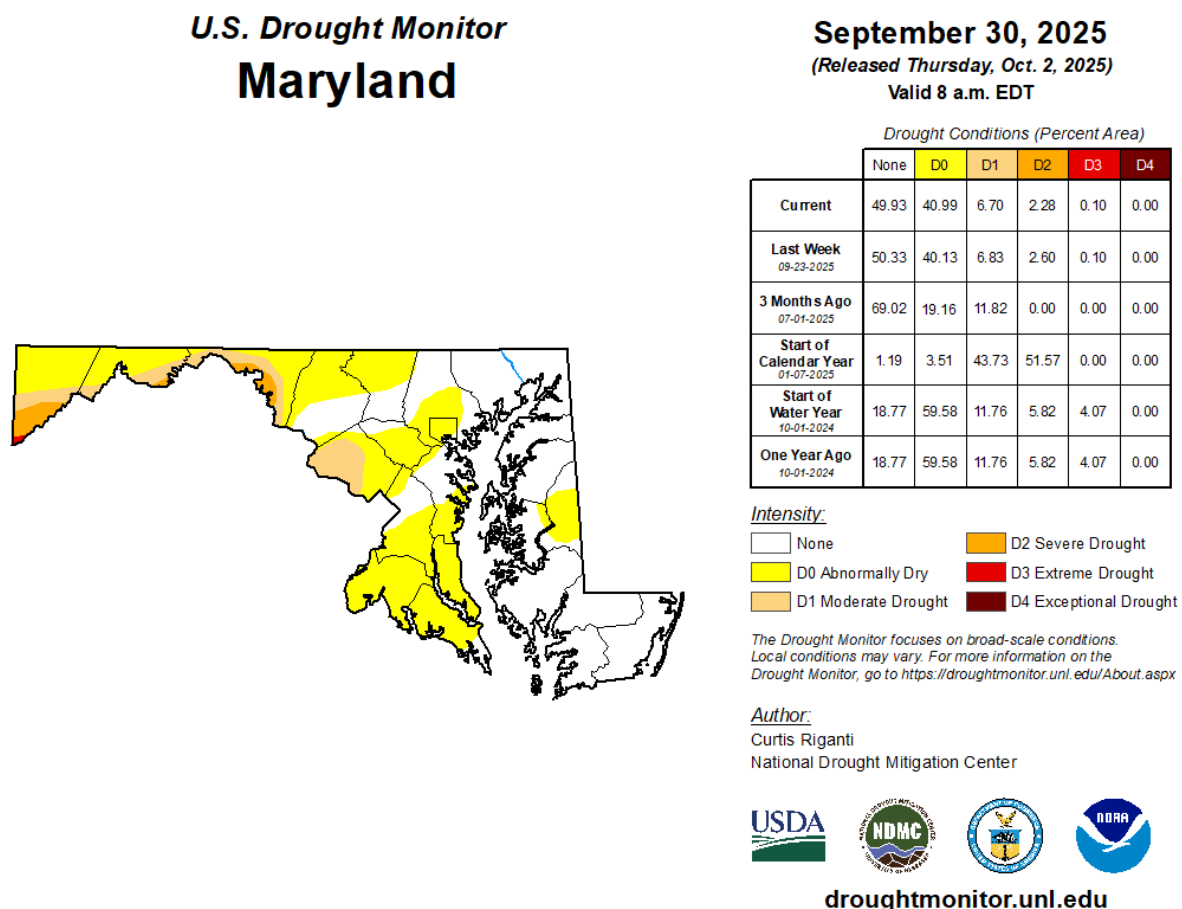


Figure 2. Drought conditions as reported by the U.S. Drought Monitor on September 30, 2025. While the extent of the state under drought conditions has decreased by 20% since the start of the month, the intensity of the drought has intensified in the western counties with Moderate, Severe, and even Extreme Drought conditions. Yellow shading indicates abnormally dry regions, 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). 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. 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 on the [U. S. Drought Monitor website](https://droughtmonitor.unl.edu). 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](https://droughtmonitor.unl.edu) system.

C. Streamflow

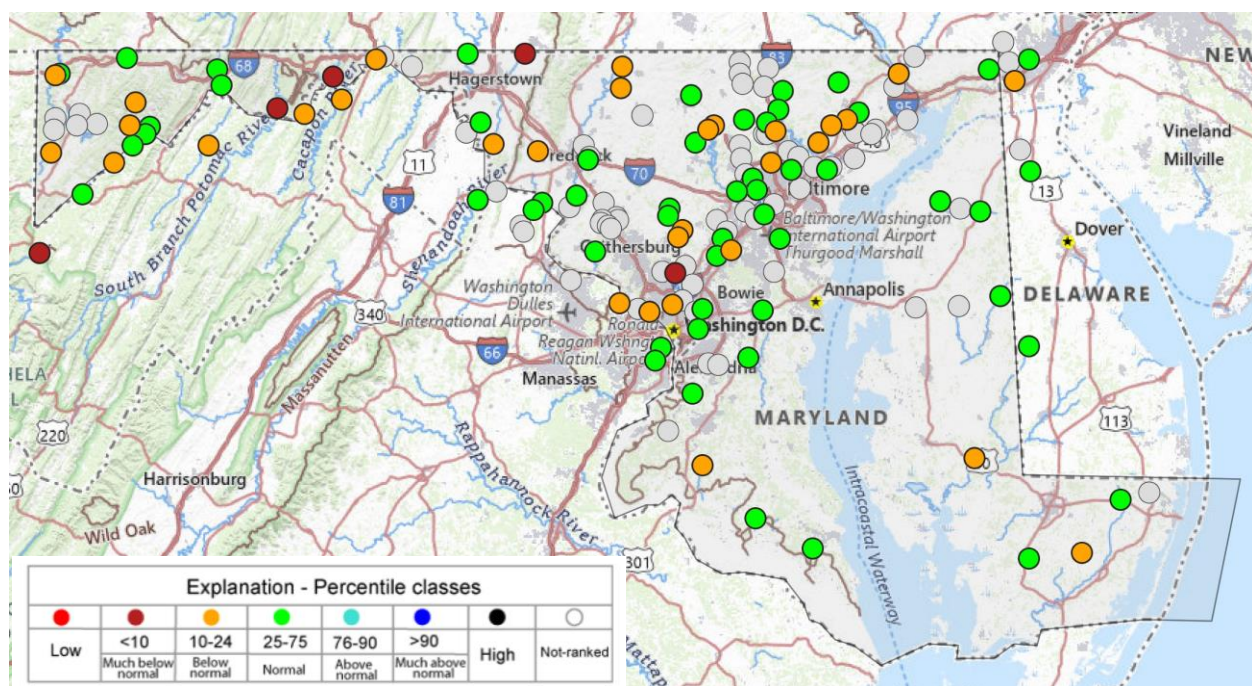


Figure 3. Monthly averaged streamflow class anomalies as reported by the U.S. Geological Survey (USGS) Water Watch for September 2025. Green-filled circles represent Normal streamflow conditions, while orange to red-filled circles denote Below-normal and Much below-normal streamflow conditions. More streams and rivers had below-normal streamflow than in the last month. Current conditions can be monitored on the [U. S. Geological Survey website](https://waterwatch.usgs.gov/).

4. Chesapeake Bay's Satellite Sea Surface Temperatures

A. Maps

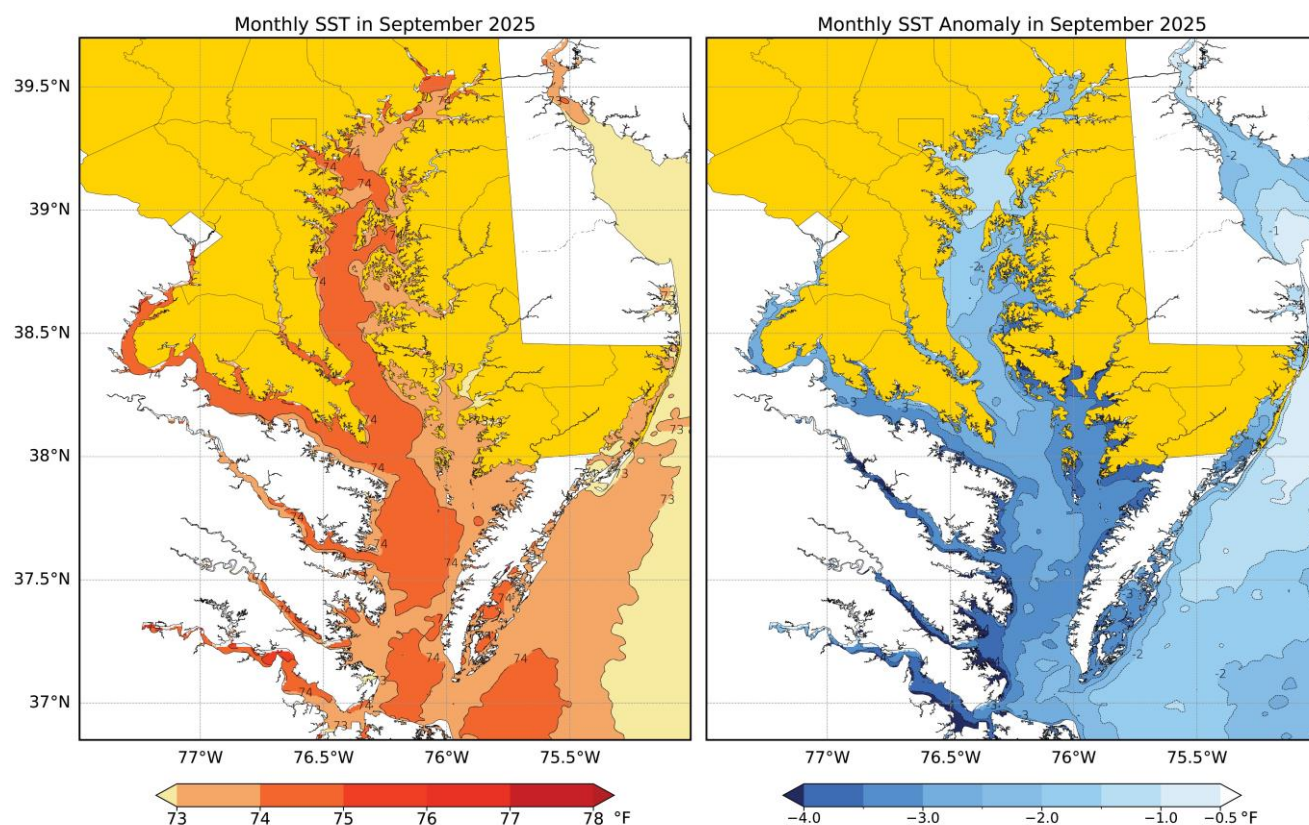


Figure 4. Monthly sea surface temperature (left panel) and its anomaly (right panel) in the Chesapeake Bay and surrounding coastal areas in September 2025. Temperatures are in °F following the color bar. Blue shading in the anomaly map marks colder temperatures than the 2007-2020 mean. For clarity, the 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 focusing on the state waters.

B. Upper, Middle, Lower, and Entire Basins

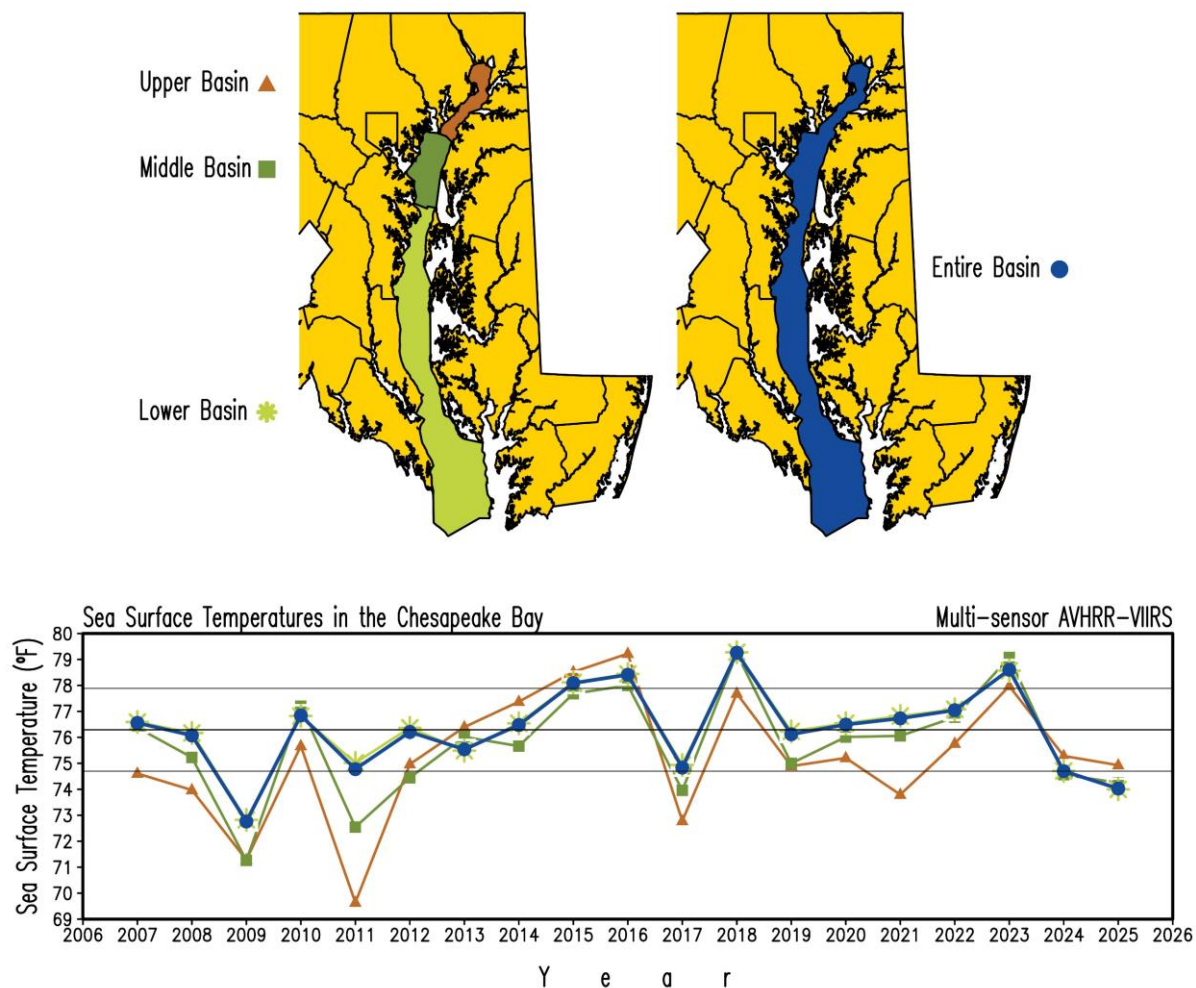


Figure 5. Watersheds in the Chesapeake Bay (top panel) and their area-averaged sea surface temperatures in September for the period 2007-2025 (bottom panel). Temperatures are in °F. The color of the lines corresponds to the color of the watersheds in the Bay, as indicated on the maps: Brown for the Upper 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 September 2025 was 74.0°F, while for the Upper, Middle, and Lower basins was 74.9, 74.3, and 74.0°F, respectively. The thin, continuous black line in the lower panel displays the 2007-2025 mean for the Entire Basin (76.3°F), and the double thin, continuous gray lines indicate the standard deviation (1.6°F) above/below the long-term mean. The 2007-2025 mean temperatures for the Upper, Middle, and Lower basins in September were 75.3, 75.8, and 76.3°F, respectively, while their standard deviations were 2.3, 2.0, and 1.6°F, respectively.

Appendix A. September 1991-2020 Climatology Maps and September 2025 Precipitation as Percentage of Climatology

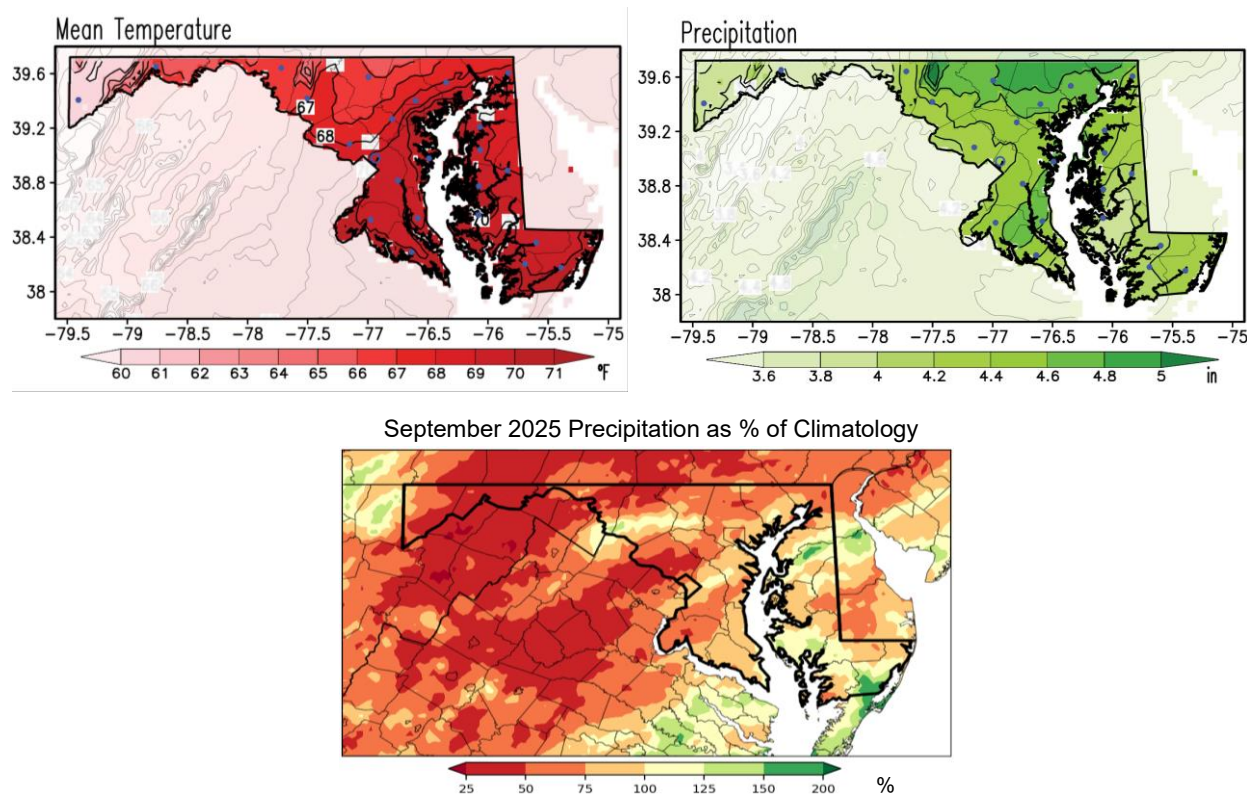


Figure A1. September climatology of the monthly mean surface air temperatures, and total precipitation for the period 1991-2020 (upper row), and precipitation in September 2025 as a percentage of climatology (bottom row). Temperatures are in °F, and precipitation is in inches according to the color bars. Precipitation as a percentage is calculated by dividing the total precipitation by the climatology and multiplying that ratio by 100, so the units are expressed as a percentage of the climatology (%); the orange-red/yellow-green shading in this map indicates drier/wetter than normal conditions; note that precipitation less than 50% of climatology is shaded reds. The climatology maps were obtained from an archived in-house NOAA Monthly U.S. Climate Gridded Dataset (NClimGrid – Vose et al., 2014), while the precipitation as a percentage in the climatology map was downloaded from the Northeast Regional Climate Center. Note that in the climatology maps, shading outside the state has been washed out to facilitate focusing on Maryland, and that filled blue circles mark the county seats.

Appendix B. September Standard Deviation Maps

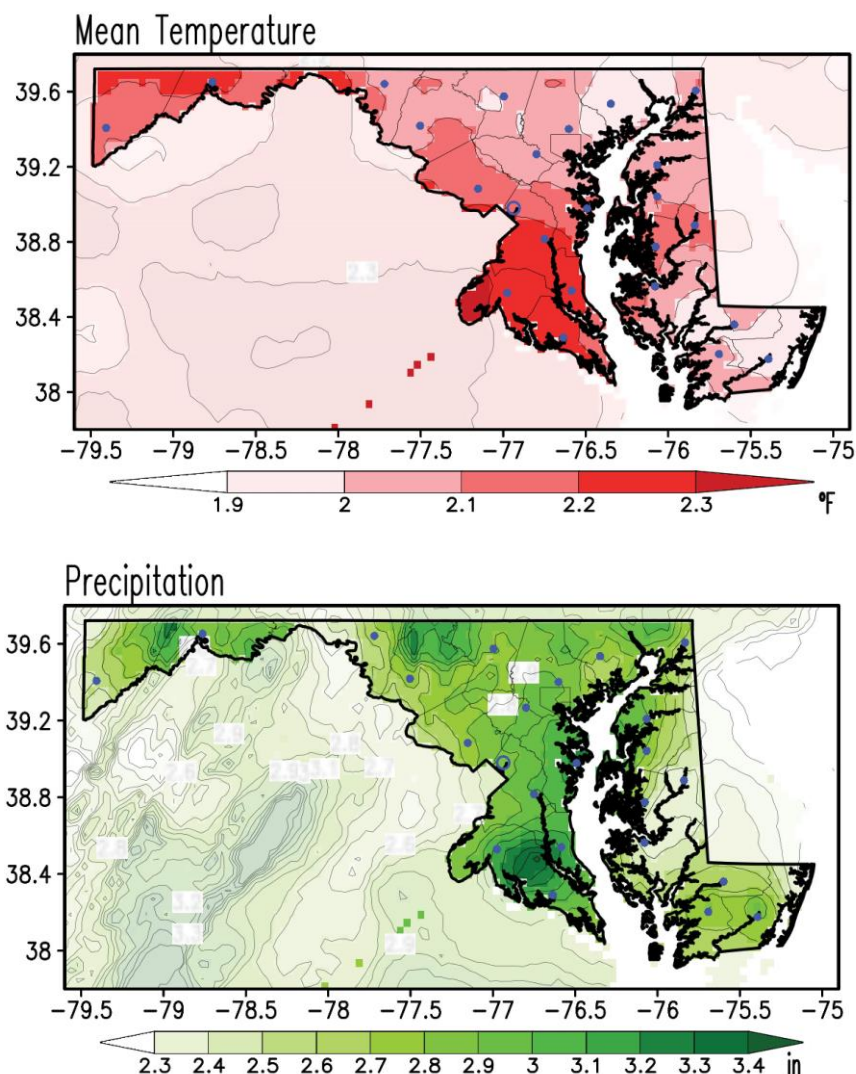


Figure B1. Standard deviation for September mean surface air temperature (upper) and total precipitation (bottom) for the 1991-2020 period. The standard deviations in temperatures are in °F, and those in precipitation are in inches according to the color bars. Note that shading outside the state has been washed out to facilitate focusing on Maryland. Filled blue circles mark the county seats. The maps were obtained from an archived in-house NOAA Monthly U.S. Climate Gridded Dataset (NClimGrid – Vose et al., 2014).

Appendix C. 2007-2020 Mean and Standard Deviation of Sea Surface Temperatures in September

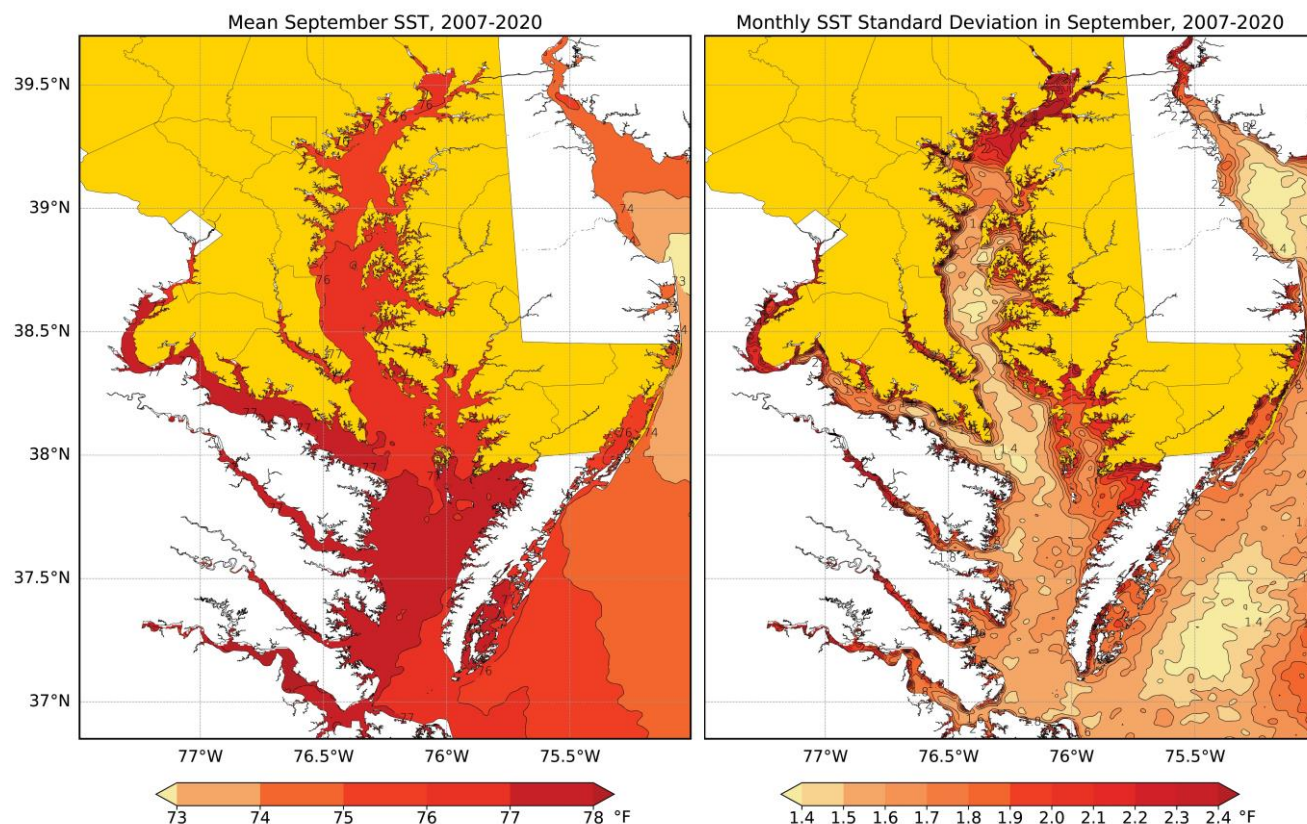


Figure C1. Mean (left panel) and standard deviation (right panel) of sea surface temperatures in the Chesapeake Bay and surrounding coastal areas in September for the period 2007-2020. The mean and standard deviation of the temperatures are in °F according to the color bars. The mean temperature map is the current mean against which the September 2025 conditions are compared to obtain the September 2025 anomalies (from Figure 4). For clarity, the temperature mean and standard deviation have been smoothed using a 9-point spatial smoother applied four times. Note that Maryland has been shaded yellow to facilitate focusing on the state waters.

References

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