

Arctic Oscillation and Polar Vortex Analysis and Forecasts

August 17, 2026

Dr. Judah Cohen from Atmospheric and Environmental Research (AER) embarked on an experimental process of regular research, review, and analysis of the Arctic Oscillation (AO) and Polar Vortex (PV). This analysis is intended to provide researchers and practitioners real-time insights on one of North America's and Europe's leading drivers for extreme and persistent temperature patterns.

During the winter schedule the blog is updated once every week. Snow accumulation forecasts replace precipitation forecasts. Also, there is renewed emphasis on ice and snow boundary conditions and their influence on hemispheric weather. In late Spring, we transition to a spring/summer schedule, which is once every two weeks. Snow accumulation forecasts will be replaced by precipitation forecasts. Also, there will be less emphasis on ice and snow boundary conditions and their influence on hemispheric weather.

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The AO/PV blog is partially supported by NSF grant AGS: 1657748

Summary

- The Arctic Oscillation (AO) is currently neutral as pressure/geopotential height anomalies across the Arctic are currently mostly mixed and the AO is predicted to remain mostly mixed to slightly negative the next two weeks as pressure/geopotential height anomalies are predicted to remain mixed to slightly positive the next two weeks. The North Atlantic Oscillation (NAO) is currently near neutral with weakly positive pressure/geopotential height anomalies across Greenland, and the NAO is predicted to remain neutral to negative the next week as pressure/geopotential height anomalies are predicted to remain mostly positive across Greenland the next two weeks.
- The next two weeks ridging/positive geopotential height anomalies across Greenland will favor troughing/negative geopotential height anomalies across Western and Northern Europe while ridging/positive geopotential height anomalies will persist across Southern and Eastern Europe. This pattern will favor normal to below normal temperatures across Western and Northern Europe including the United Kingdom (UK) with normal to above normal temperatures across Southeastern Europe.
- The predicted pattern across Asia the next two weeks is ridging/positive geopotential height anomalies centered near the Laptev Sea supporting troughing/negative geopotential height anomalies across Central and Eastern Siberia and into Northeast Asia with more ridging across Southern Asia. This pattern favors widespread normal to above normal temperatures

across Asia but especially Western Siberia and Central Asia with normal to below normal temperatures across Central and Eastern Siberia and eventually into East Asia.

- Over the next two weeks the predicted atmospheric pattern across North America is ridging/positive geopotential height anomalies across much of Canada and the Western United States (US) forcing troughing/negative geopotential height anomalies across Southeastern Canada and the Northeastern US. This pattern will support widespread normal to above normal temperatures across Western, Central and Northern Canada and the Western and Southern US with normal to below normal temperatures in Southeastern Canada and the Northeastern US.
- Summer is winding down and so is the heat in some places but not others. I continue with more early thoughts on winter below.

Plain Language Summary

With just a couple of weeks left for summer 2026, the summer can be summed up as heat domes predominantly across Western Europe, Western Siberia into Central Asia, the Western US and Eastern Canada favoring some relatively cool temperatures at lower latitudes in parts of Eastern Europe into Western Russia, Northeast Asia, Southcentral Canada, the Central US and the Great Lakes (see **Figure**). The forecast features a continuation of more of the same with heat domes persisting across Western Siberia and Central Asia, Western and Northern Canada but relief from the record heat in Western Europe and more relatively cool temperatures in Northeastern Asia and Southeastern Canada and into the Northeastern US (see **Figures 3, 6 and 9**).

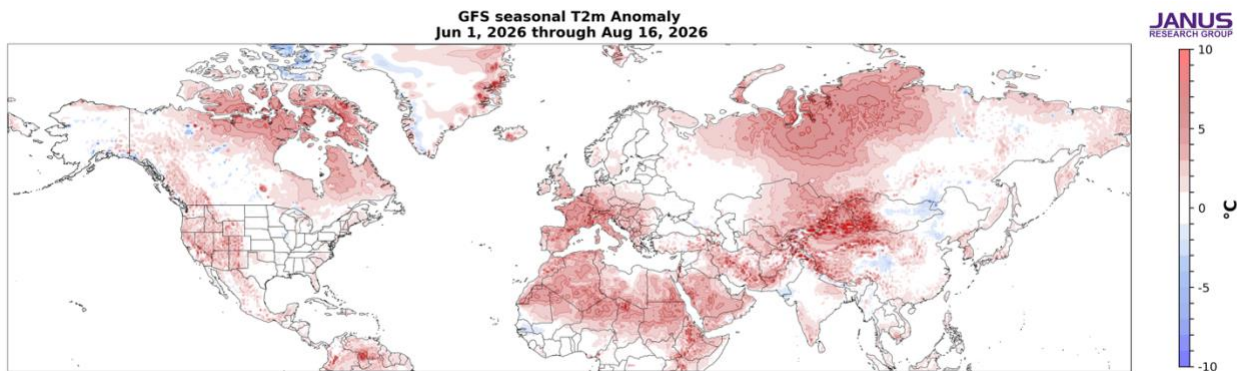


Figure. Estimate of the observed surface temperatures (°C; shading) from 01 Jun to 16 Aug 2026 based on GFS initializations and the GFS forecast from the 17 Aug 2026 run.

Impacts

Summer 2026 is pretty much in the books, with just two weeks left before the start of meteorological fall. I don't expect the warm temperatures to fade quickly as September is one of the months with the greatest warming trends and I have quipped often that September should lose its status as a fall month and instead be welcomed as a summer month. The heat and dry conditions in Europe have certainly been one of the weather headlines of this summer, and based on the forecast, Western Europe should experience some welcome relief with cooler and possibly wetter conditions, thanks in part to persistent high-pressure ridging in the region of Greenland. The Northeastern US is another region, though not as anomalously warm as Western Europe, where it looks like the back of summer has been broken. I do expect warm temperatures to return in September for both regions, but the heat just isn't the same.

I happened to be looking at the Northern Hemisphere surface temperature anomalies from last summer and was struck how similar the temperature pattern is to this summer, though that is not how I remember it. In **Figure i**, I present the surface temperature anomalies from summer 2025. Northern Canada had a hotter summer in 2026 relative to 2025, and Scandinavia had a hotter summer in 2025 relative to 2026 but to first order the pattern looks remarkably static. And I do believe that in summer the trend is clearly your friend, in contrast to winter where I think making a straight trend forecast is risky (though that is exactly what the dynamical models do with some ENSO thrown in for North America).

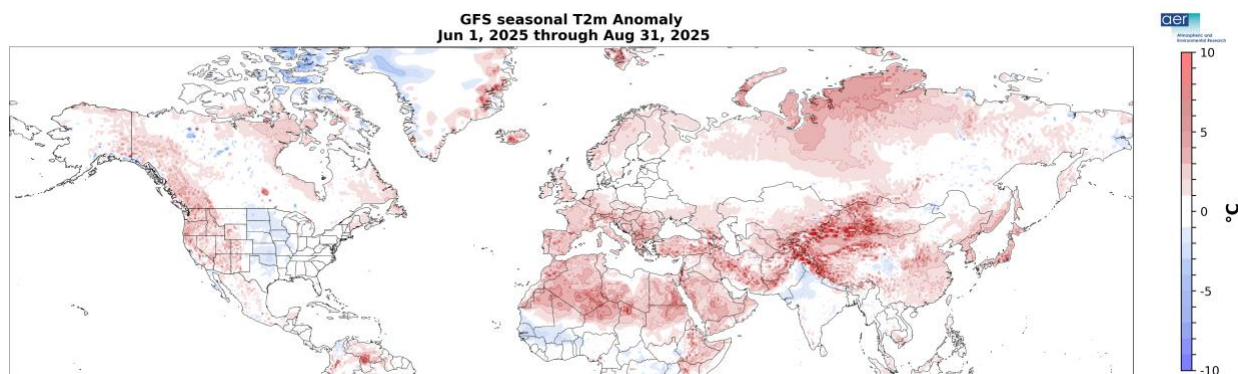


Figure i. Estimate of the observed surface temperatures (°C; shading) from 01 Jun to 31 Aug 2025 based on GFS initializations and the GFS forecast from the 1 Sep 2025 run.

In a sign that I am truly shifting my focus from summer to winter, I will start out this week's blog with the polar vortex (PV) animation in **Figure ii**. There is nothing remarkable about it other than you can clearly see the formation of the PV over the next two weeks. Low pressure forms over the North Pole the last few days of August. As far as I can tell, the formation of the PV is close to the climatological average. I thought maybe it might be early given how the cold/negative polar cap geopotential height anomalies (PCHs) plot of **Figure 11** descend from the upper to mid-stratosphere over the next two weeks, but I find no evidence of an early PV formation. The PCHs plot at the end of August does resemble that of last August so probably best not to read too much into it just yet, despite what I wrote in the previous blog.

Initialized 00Z 10 hPa HGT/HGTa 17-Aug-2026

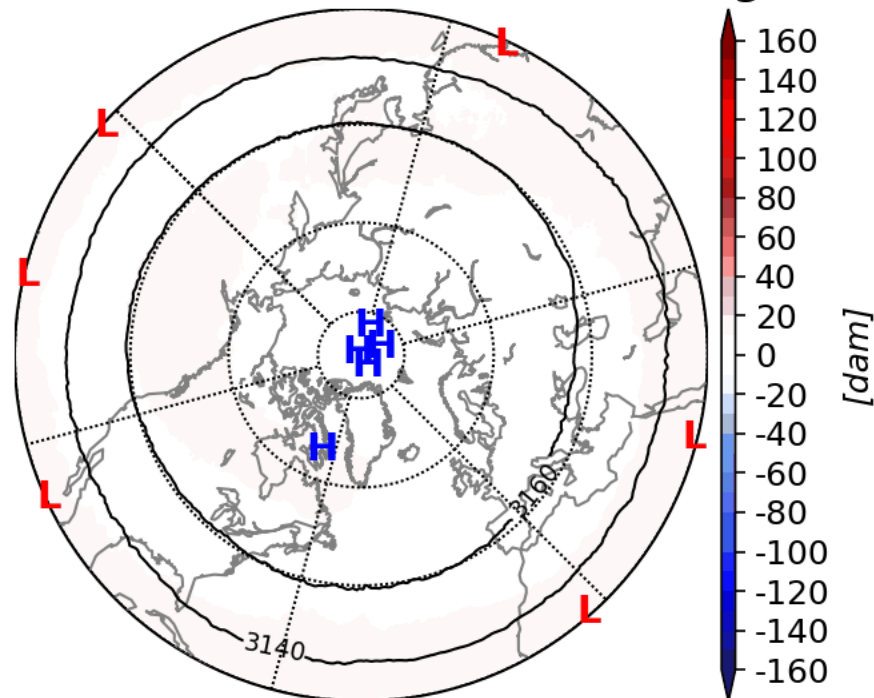


Figure ii. Initialized 10 mb geopotential heights (dam; contours) and decameter anomalies (dam; shading) across the Northern Hemisphere for 17 Aug 2026 and forecasted from 18 Aug to 01 Sep 2026. The forecasts are from the 00Z 17 Aug 2026 GFS model.

Now back to the regular summer programming with a look at the two-week forecast of the mid-tropospheric circulation animation in **Figure iii**. As is often the case (and in summer more than winter) we can easily discern a general pattern of low pressure in the Arctic centered right over the North Pole encircled or surrounded by bubbles of high-pressure ridging centered on either side of 60°N and could be described as heat domes.

Early on there is one clear dominant region of high-pressure ridging centered over the Laptev Sea. Eventually that high pressure center fades with time. Other regions of high pressure include Greenland, Northern and Western Canada and towards the end of the animation in the western North Pacific. These features strongly contribute to widespread warmth across the northern continents (see **Figures 3, 6 and 9**). Though notably absent is a high-pressure ridge over Europe. These high-pressure centers are also helping to push south into the mid-latitudes relatively cool temperatures downstream into Western Europe, Siberia into Northeast Asia and the Northeastern US (see **Figures 3 and 6**).

Initialized 00Z 500 hPa HGT/HGTa 17-Aug-2026

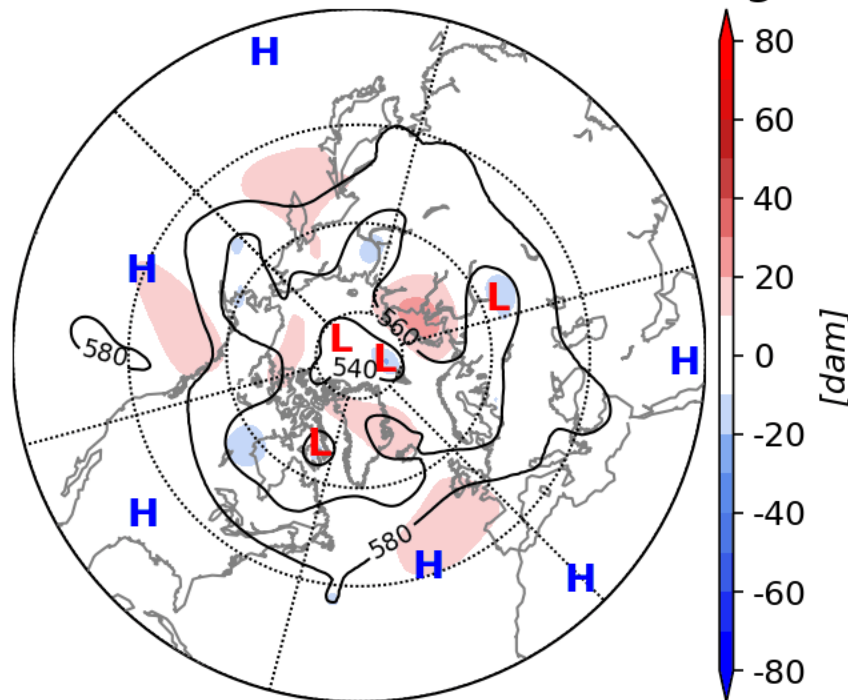


Figure iii. Initialized 500 mb geopotential heights (dam; contours) and decameter anomalies (dam; shading) across the Northern Hemisphere for 17 Aug 2026 and forecasted from 18 Aug to 01 Sep 2026. The forecasts are from the 00Z 17 Aug 2026 GFS model.

In early August I posted on social media how or AI subseasonal model is predicting that the core of the heat wave in Western Europe to the east in late August (<https://x.com/judah47/status/2084290284427395375>). That forecast looks to verify well. The model also showed the heat sliding east in the Western US. That did occur this past week however for the remainder of the August it looks like the heat will return to the Western US, so maybe the model was one for two on moderation of the two heat waves. The other region with major heat, Western Siberia and Central Asia, the model is looking accurate in predicting for the heat to persist. The model also did well in showing widespread relative warmth across much of Canada.

The Arctic sea ice minimum will occur next month. Arctic sea ice is well below normal, and the melting even accelerated since the last blog (see **Figure iv**). An impressive amount of ice disappeared in the North Pacific side of the Arctic. So even though I still think a new record low is not likely but now looking more in line with the past two years, in contrast to what I wrote in the previous blog.

But importantly it is where the low sea ice is focused whether in the North Atlantic or North Pacific sectors of the Arctic. It has been shown that less sea ice in the North Atlantic sector of the Arctic weakens the polar vortex while less sea ice in the North Pacific sector strengthens the polar vortex. I will hold off on conjecturing about where the sea ice anomalies will be focused in the fall given how dynamic the situation remains.

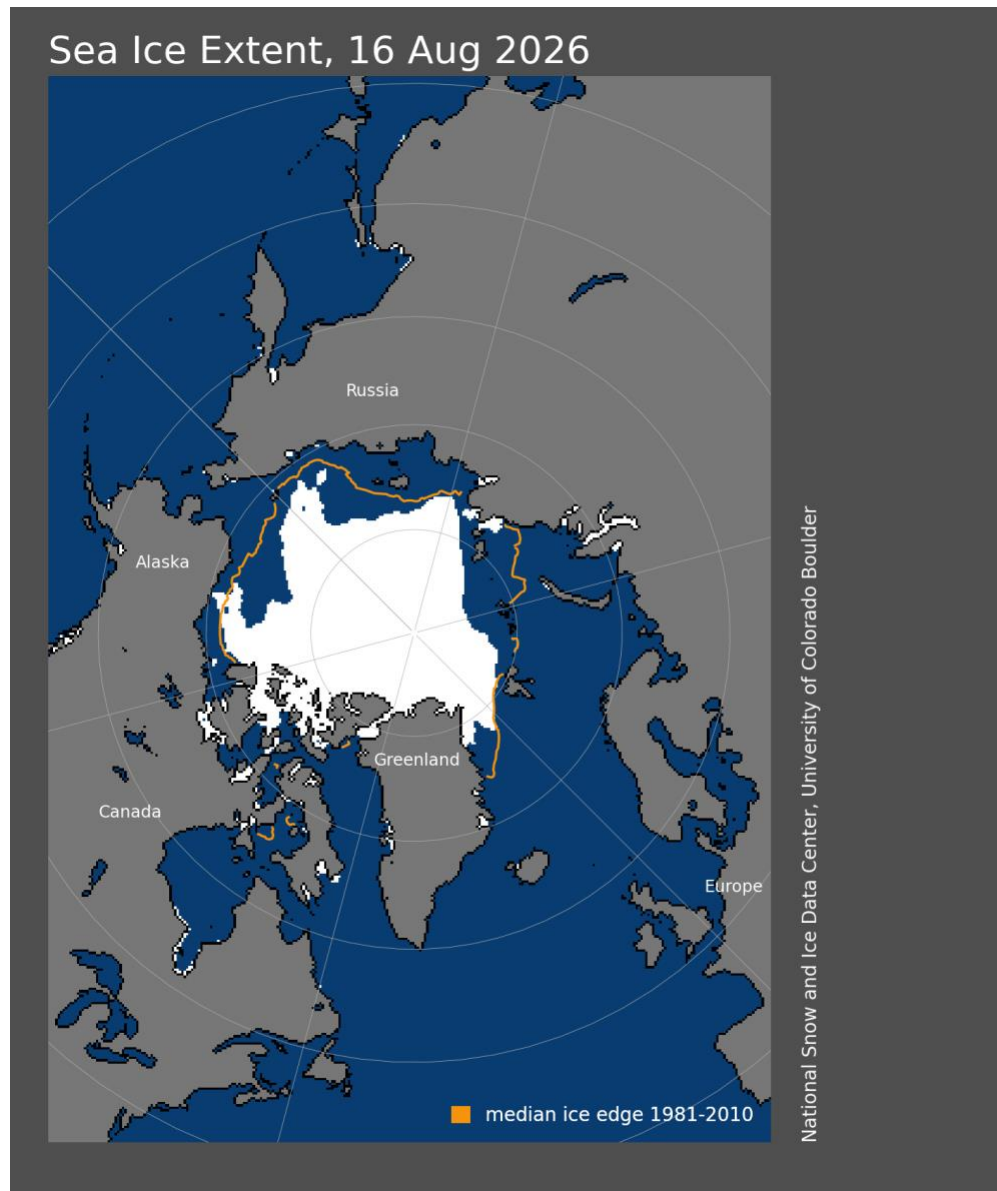


Figure iv. Arctic sea ice cover extent for 16 Aug 2026. White depicts ice covered areas and the orange contour the climatological extent of Arctic sea ice for the date. Plot taken from: <https://nsidc.org/sea-ice-today>

I was struck how large the warm anomalies are for the sea surface temperatures (SSTs) across the Northern Hemisphere shown in **Figure 14**. One striking feature is the strip of warm ocean temperatures across the equatorial Pacific associated with the strong El Niño. But other striking

features are the very warm ocean temperatures in the North Atlantic, especially near Europe and the central North Pacific. Tropical SSTs are thought to have a greater impact than extratropical SSTs, though I feel that extratropical SSTs are important as well. Therefore, how these three regions will all interact to shape the atmospheric circulation is highly uncertain. I was checking out the North America global climate model winter forecasts are overall surprisingly cold for the US given the super El Niño (see https://www.cpc.ncep.noaa.gov/products/NMME/current/ustmp2m_Seas4.html). The CFS is leading the way, a model that has not shown very good accuracy, but other models are exhibiting similar forecasts. It will be interesting to see how closely the European model forecasts are to the American models when they become available.

Near-Term

This week

The AO is predicted to be neutral to slightly negative this week (**Figure 1**) with mostly mixed to positive geopotential height anomalies currently across the Arctic and mixed geopotential height anomalies across the mid-latitudes of the NH (**Figure 2**). With predicted positive geopotential height anomalies across Greenland (**Figure 2**), the NAO is predicted to be mostly negative this week.

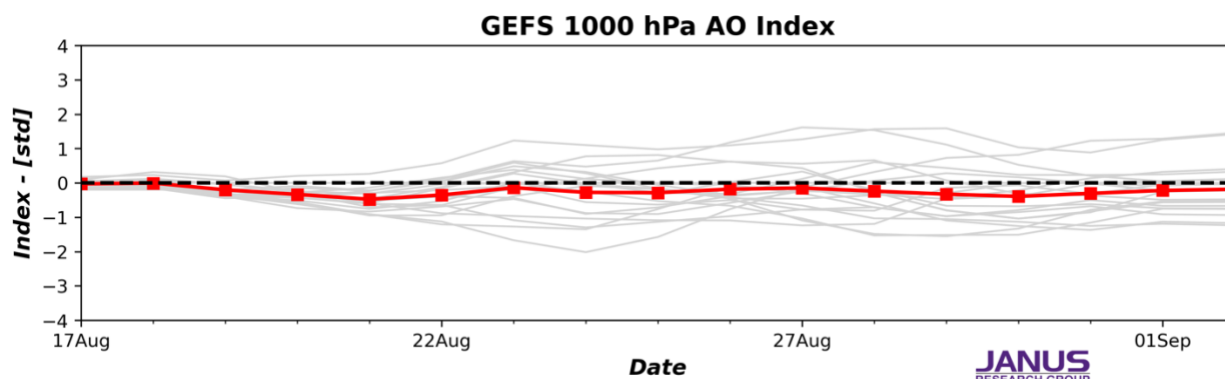


Figure 1. The predicted daily-mean AO at 1000 hPa from the 00Z 17 Aug 2026 GFS ensemble. Gray lines indicate the AO index from each individual ensemble member, with the ensemble mean AO index given by the red line with squares.

Ridging/positive geopotential height anomalies across Greenland will support troughing/negative geopotential height anomalies across Western and Northern Europe with ridging/positive geopotential height anomalies across Southern and Eastern Europe this week (**Figure 2**). This pattern will support normal to below normal temperatures across Western and Northern Europe including the UK with normal to below normal temperatures across Southern and Eastern this week (**Figure 3**). This week the general pattern across Asia is ridging/positive geopotential height anomalies centered in the Laptev Sea and extending into Western Siberia supporting troughing/negative geopotential height anomalies across Central Siberia with more

ridging across Southern Siberia this week (**Figure 2**). This pattern favors widespread normal to above normal temperatures across much of Southern and Northwestern Asia with normal to below normal temperatures across Central and Eastern Siberia this week (**Figure 3**).

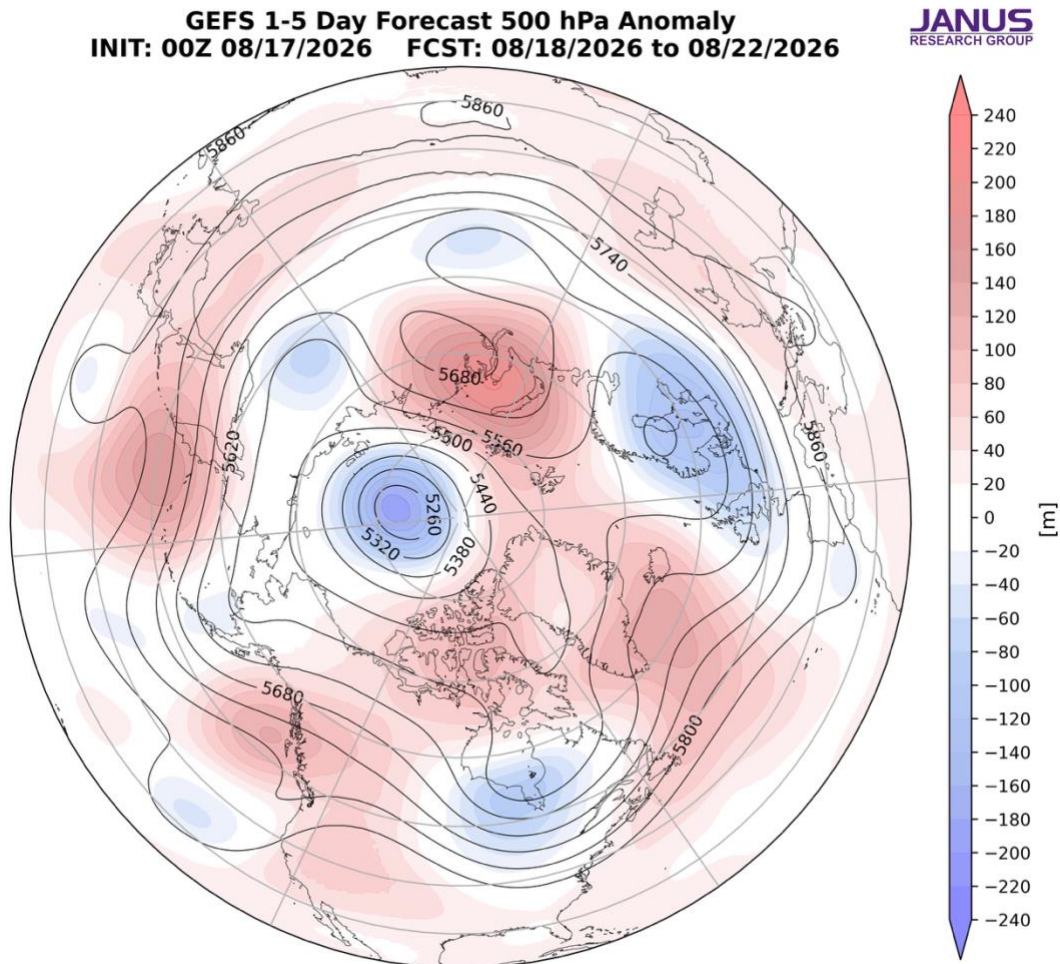


Figure 2. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 18 Aug 2026 to 22 Aug 2026. The forecasts are from the 00Z 17 Aug 2026 GFS ensemble.

The predicted pattern across North America this week is ridging/positive geopotential height anomalies centered over the Canadian Arctic archipelagos and Western Canada with troughing/negative geopotential height anomalies over southern Hudson Bay and into the Great Lakes this week (**Figure 2**). This pattern will favor normal to above normal temperatures across Alaska, Western and Northern Canada and the Western and Southern US with normal to below normal temperatures across Central Canada and the US Great Lakes this week (**Figure 3**).

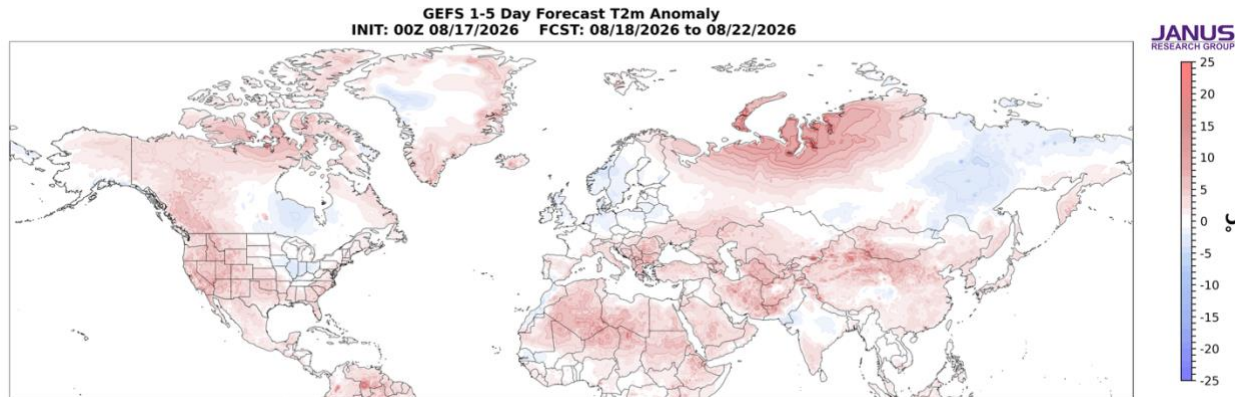


Figure 3. Forecasted surface temperature anomalies ($^{\circ}\text{C}$; shading) from 18 Aug 2026 to 22 Aug 2026. The forecasts are from the 00Z 17 Aug 2026 GFS ensemble.

Troughing will support new rainfall across Southern and Eastern Europe and into Scandinavia, Southern Siberia into Northeast Asia and the Tibetan Plateau with mostly dry conditions across much of Europe and Asia (**Figure 4**). Troughing will support new rainfall across Alaska, Quebec and the US Mid-Atlantic this week (**Figure 4**).

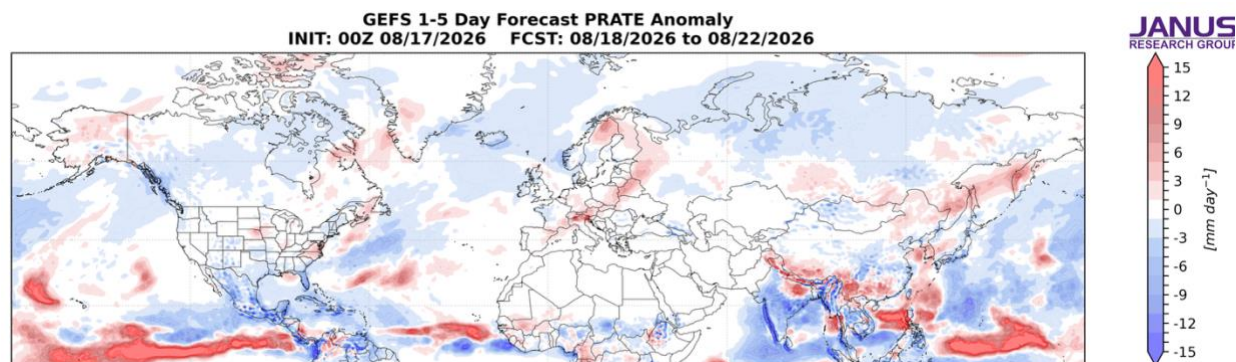


Figure 4. Forecasted precipitation (mm/day; shading) from 18 Aug 2026 to 22 Jul 2026. The forecasts are from the 00Z 17 Aug 2026 GFS ensemble.

Near-Mid Term

Next week

With geopotential height anomalies remaining mostly mixed to positive across the Arctic and with mixed geopotential height anomalies across the mid-latitudes this period (**Figure 5**), the AO will likely be slightly negative to neutral this period (**Figure 1**). With mostly positive but weak pressure/geopotential height anomalies across Greenland (**Figure 5**), the NAO will likely be negative to neutral this period.

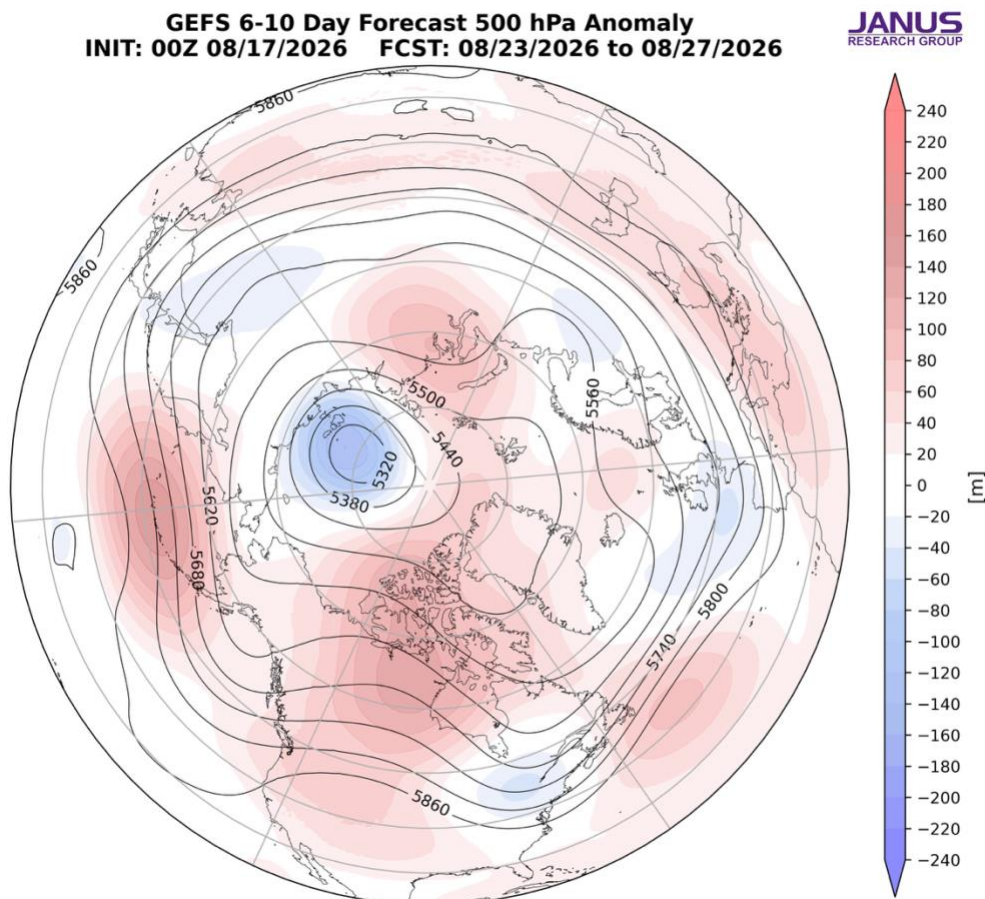


Figure 5. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 23 Aug 2026 to 27 Aug 2026. The forecasts are from the 00Z 17 Aug 2026 GFS ensemble.

Ridging/positive geopotential height anomalies across Greenland will continue to support troughing/negative geopotential height anomalies across Western and Northern Europe with ridging/positive geopotential height anomalies persisting across Southern and Eastern Europe this period (**Figure 5**). The pattern will support normal to below normal temperatures across Western and Northern Europe including the UK with normal to above temperatures across Southern and Eastern Europe this period (**Figure 6**). Ridging/positive geopotential height anomalies are predicted to persist in the Laptev Sea and into Western Siberia

supporting troughing/negative geopotential height anomalies across Central Siberia and into Northeastern Asia with more ridging across Southern Asia this period (**Figure 5**). This pattern favors widespread normal to above normal temperatures widespread across Asia but especially Western Siberia and Central Asia with normal to below normal temperatures across Central and Eastern Siberia and Northeast Asia this period (**Figure 6**).

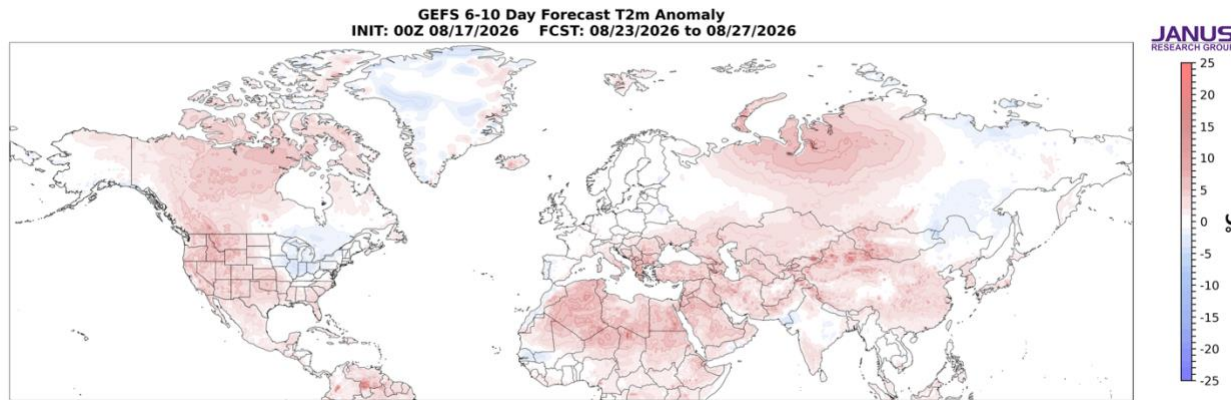


Figure 6. Forecasted surface temperature anomalies ($^{\circ}\text{C}$; shading) from 23 Aug 2026 to 27 Aug 2026. The forecasts are from the 00Z 17 Aug 2026 GFS ensemble.

Across North America troughing/negative geopotential height anomalies in the Gulf of Alaska will support ridging/positive geopotential height anomalies across much of Canada with more troughing/negative geopotential height anomalies across the Northeastern US this period (**Figure 5**). This pattern will favor normal to above normal temperatures widespread across Alaska, Canada and the Western and Southern US with normal to below normal temperatures mostly limited to the Northeastern US this period (**Figure 6**).

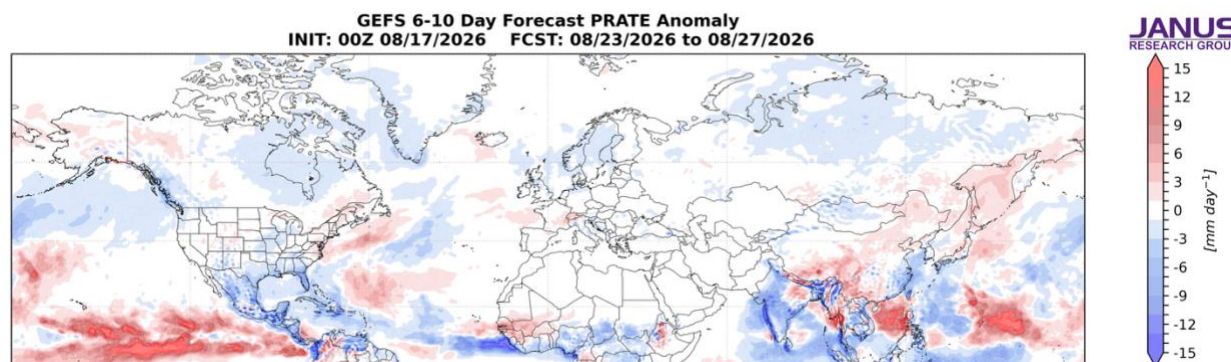


Figure 7. Forecasted rainfall rate (mm/day ; shading) from 23 Aug 2026 to 27 Aug 2026. The forecasts are from the 00Z 17 Aug 2026 GFS ensemble.

Troughing will support new rainfall across France, Eastern Siberia, Northeastern China, Southwestern China and the Tibetan Plateau with mostly dry conditions across much of Europe and Asia (**Figure 7**). Troughing will support new rainfall across Alaska, Western Canada, southern Quebec and the Northeastern US with mostly dry conditions across much of North America this week (**Figure 7**).

Mid Term

Week Two

With predicted mostly mixed to positive geopotential height anomalies across the Arctic and mixed geopotential height anomalies across the mid-latitudes this period (**Figure 8**), the AO will likely remain neutral to negative his period (**Figure 1**). With predicted weak but positive pressure/geopotential height anomalies across Greenland (**Figure 8**), the NAO will likely remain negative to neutral this period.

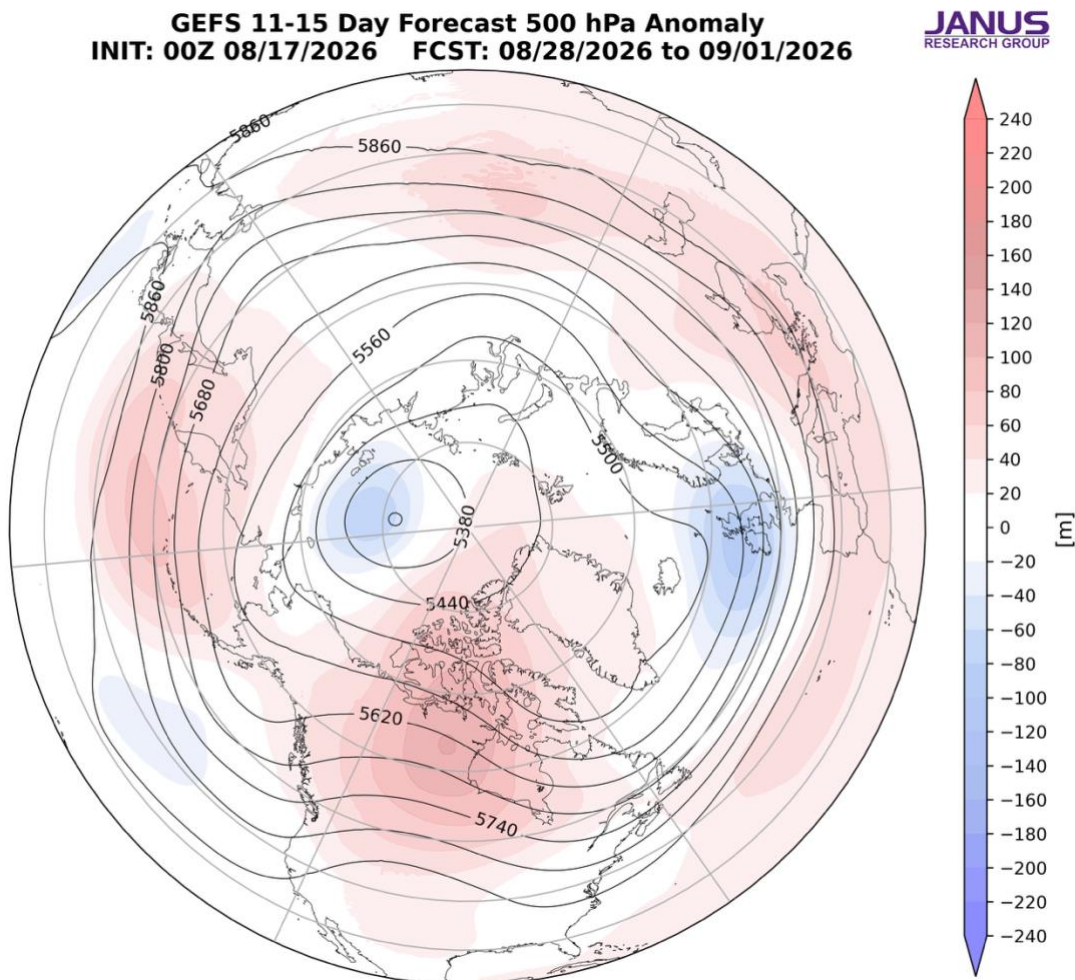


Figure 8. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 28 Aug to 01 Sep 2026. The forecasts are from the 00Z 17 Aug 2026 GFS ensemble.

Persistent ridging/positive geopotential height anomalies is predicted across Greenland will continue to support troughing/negative geopotential height anomalies persisting across Northern and especially Western Europe with ridging across Southern and Eastern Europe this period (**Figure 8**). This pattern will favor widespread normal to above normal temperatures

across much of Europe except for normal to below normal temperatures across Western Europe including the UK this period (**Figures 9**). Ridging/positive geopotential height anomalies are predicted to dominate Asia with one center over Central Asia and another center over the Western North Pacific with regional troughing/negative geopotential height anomalies in Northwest Russia and in East Asia this period (**Figure 8**). This pattern favors widespread normal to above normal temperatures across most of Asia especially Western China and into western Mongolia with normal to below normal temperatures limited to southeastern Siberia, and into eastern Mongolia and Northeastern China this period (**Figure 9**).

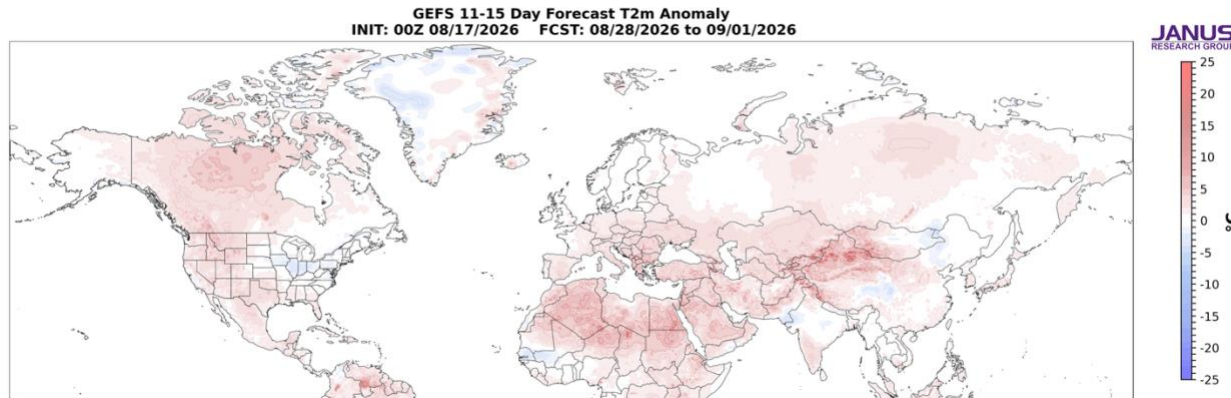


Figure 9. Forecasted surface temperature anomalies ($^{\circ}\text{C}$; shading) from 28 Aug to 01 Sep 2026. The forecasts are from the 00Z 17 Aug 2026 GFS ensemble

Ridging/positive geopotential height anomalies are predicted to dominate much of North America except for troughing/negative geopotential height anomalies across Southeastern Canada and the Northeastern US this period (**Figure 8**). This pattern supports widespread normal to above normal temperatures across Alaska, much of Canada and the Western and Southern US with normal to below normal temperatures across Southeastern Canada and the Northeastern US this period (**Figure 9**).

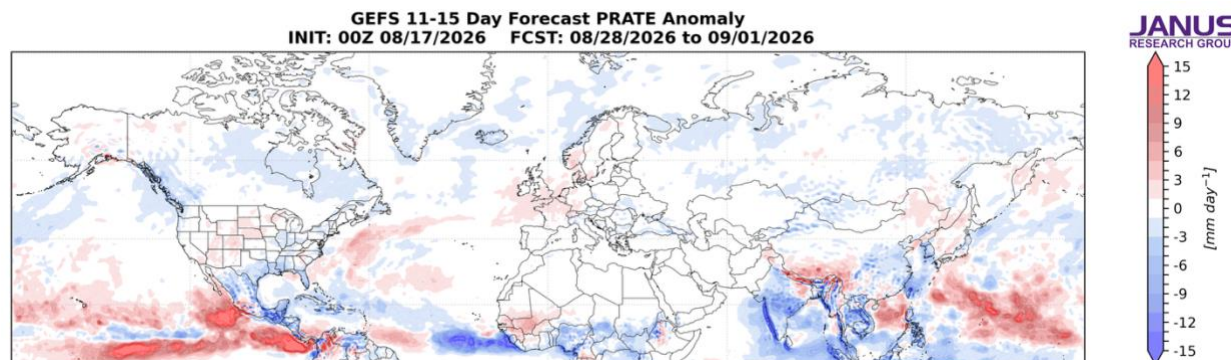


Figure 10. Forecasted rainfall (mm/day; shading) from 28 Aug to 01 Sep 2026. The forecasts are from the 00Z 17 Aug 2026 GFS ensemble

Troughing will support new rainfall across Northwestern Europe, northeastern China, the Tibetan Plateau and into southwest China with mostly dry conditions across much of Europe and Asia (**Figure 10**). Troughing will support new rainfall across the Southwestern US and into the Central Plains with mostly dry conditions across much of North America this week (**Figure 10**).

Longer Term

30-day

Today's polar cap geopotential height anomalies (PCHs) plot currently shows cold/negative PCHs in the upper stratosphere with warm/positive PCHs in the lower stratosphere and the troposphere (**Figure 11**). However next week, the cold/negative PCHs in the upper stratosphere will descend into the mid-stratosphere.

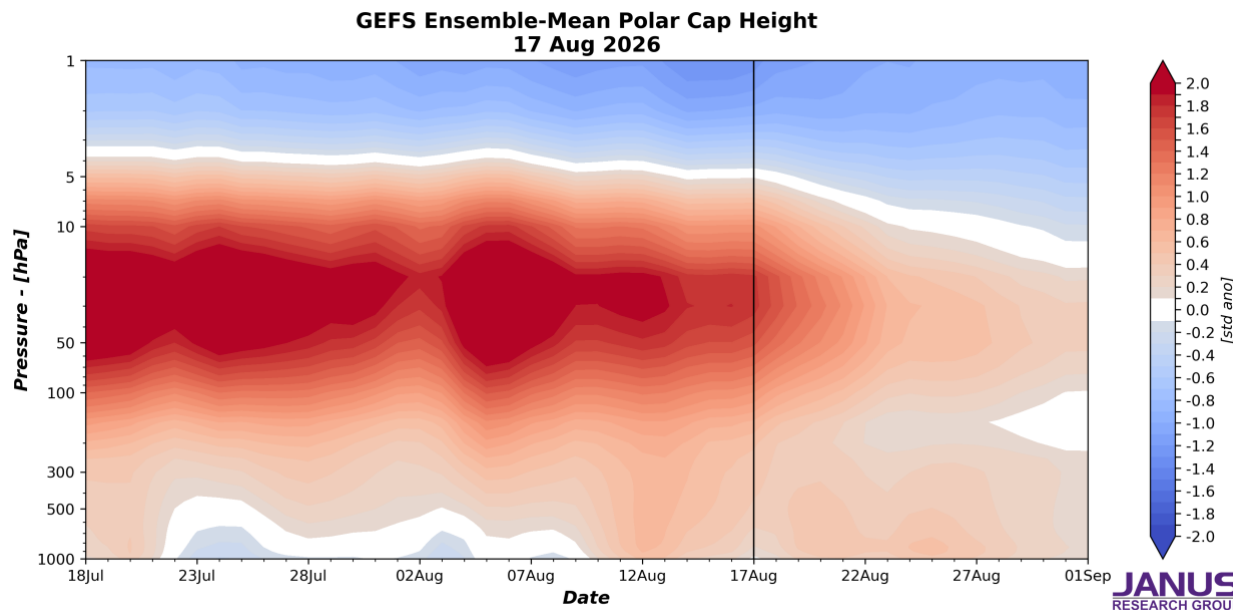


Figure 11. Observed and predicted daily polar cap height (i.e., area-averaged geopotential heights poleward of 60°N) standardized anomalies. The forecast is from the 00Z 17 Aug 2026 GFS ensemble.

The next two weeks the predicted weak to warm/positive PCHs in the lower troposphere (**Figure 11**) are consistent with the predicted neutral to negative surface AO (**Figure 1**).

CFS 500 hPa Forecast Anomaly Sep 2026
Valid as of 17 Aug 2026

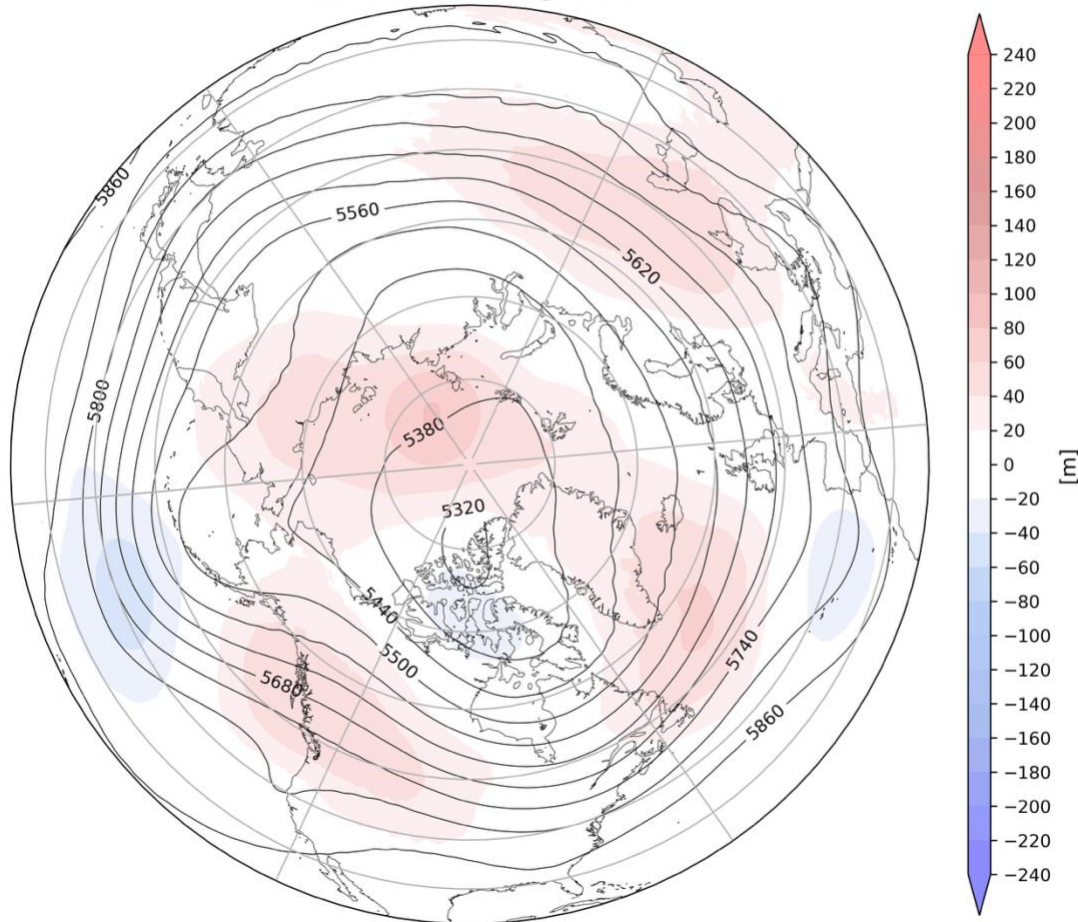


Figure 12. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere for Sep 2026. The forecasts are from the 00Z 17 Aug 2025 CFS.

I include in this week's blog the monthly 500 hPa geopotential heights (**Figure 12**) and surface temperatures for September (**Figure 13**) from the Climate Forecast System (CFS; the plots represent yesterday's four ensemble members). I do want to emphasize unless I say otherwise, I find the CFS forecasts of low confidence and most often don't match my own thinking. The forecast for the troposphere is ridging south of Greenland, Western Asia, the Siberian Arctic into Eastern Siberia, the Gulf of Alaska and into Western Canada with troughing across Western Europe, Siberia into East Asia, the Aleutians, Eastern Canada and the Northeastern US (**Figure 12**). This pattern favors seasonable to relatively warm temperatures across Southern Europe, Western and Southern Asia including the Middle East, the Tibetan Plateau and Afghanistan, Eastern Siberia, Alaska, Western and Northern Canada and the Western US with seasonable to relatively cool temperatures across Western Europe, Central Siberia and into Northeast Asia, Southeastern Canada and the Eastern US (**Figure 13**).

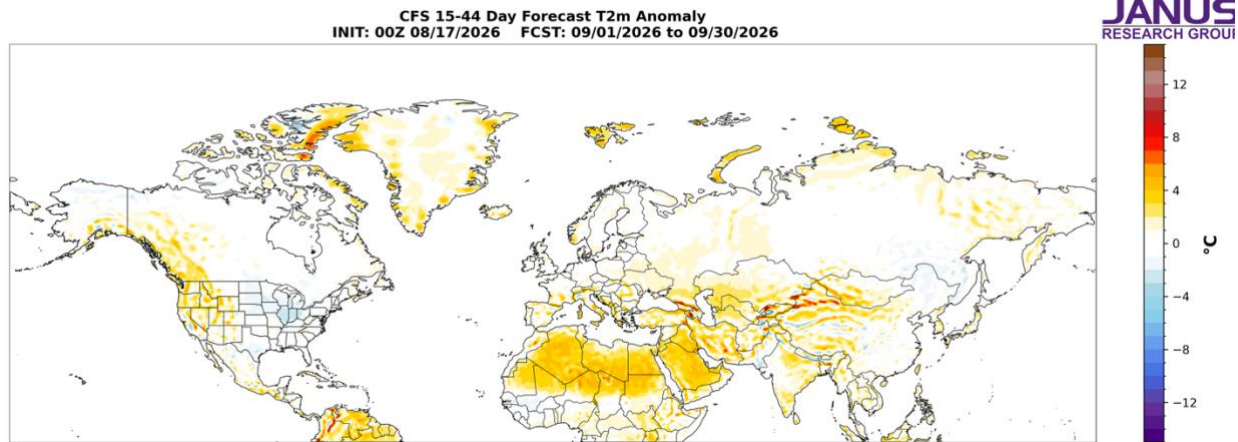


Figure 13. Forecasted average surface temperature anomalies ($^{\circ}\text{C}$; shading) across the Northern Hemisphere for Sep 2026. The forecasts are from the 00Z 17 Aug 2026 CFS.

Boundary Forcings

SSTs/El Niño/Southern Oscillation

Equatorial Central Pacific sea surface temperatures (SSTs) anomalies are well above normal, with the warming focused along the South American coast and out to the Dateline (see **Figure 14**), clear signs of El Niño conditions. In fact, a possible “super” El Niño is increasingly likely this fall and winter has been receiving much attention in the media. Observed SSTs across the NH remain well above normal especially in the North Pacific and much of the North Atlantic especially near Europe, though below normal SSTs exist regionally especially in the Southern Ocean. The widespread above normal SSTs are quite impressive!

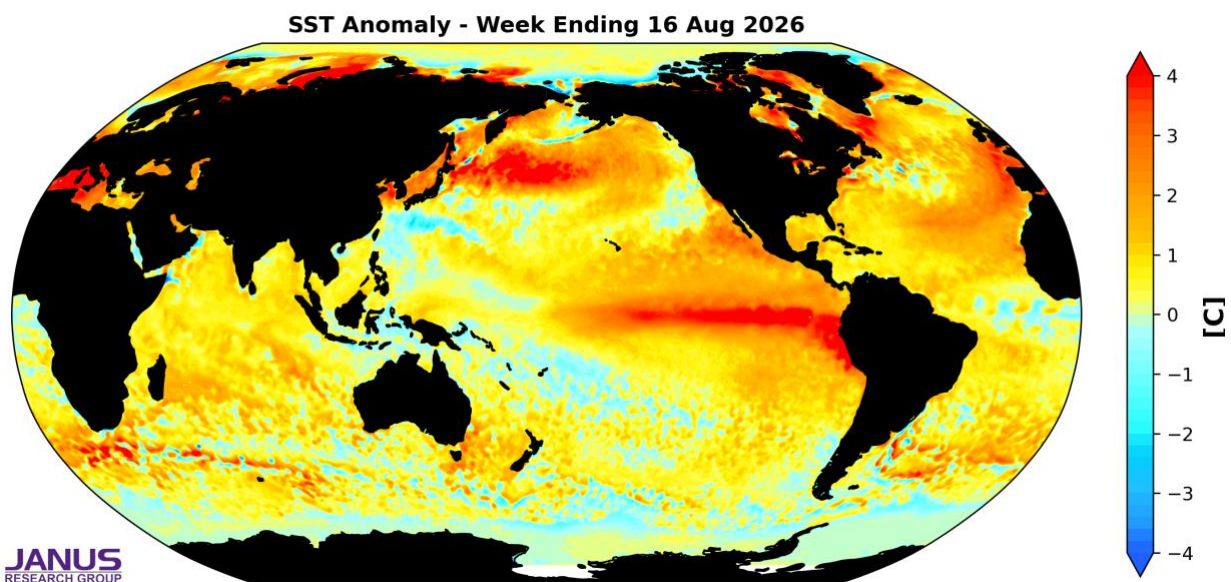


Figure 14. The latest daily-mean global SST anomalies for week ending 16 Aug 2026.

Madden Julian Oscillation

Currently the Madden Julian Oscillation (MJO) is in phase six (**Figure 15**), and the forecasts are for the MJO to weaken where no phase is favored the next two weeks (**Figure 15**). Phase six favors ridging across Western Canada with troughing across the Eastern US. Therefore, it seems that the MJO could be having some influence on North American weather next week. But admittedly this is outside of my expertise.

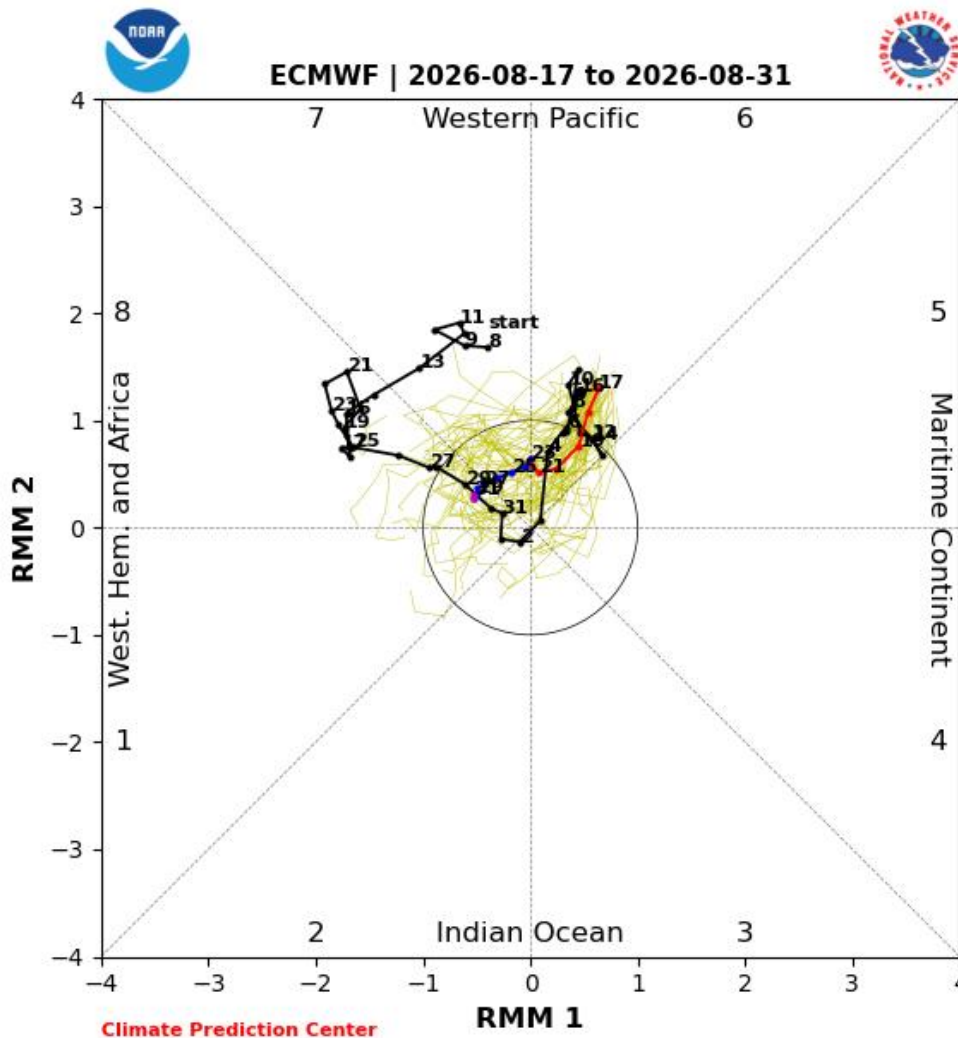


Figure 15. Past and forecast values of the MJO index. Forecast values from the 00Z 17 Aug 2026 ECMWF model. Yellow lines indicate individual ensemble-member forecasts, with the green line showing the ensemble-mean. A measure of the model 'spread' is denoted by the gray shading. Sector numbers indicate the phase of the MJO, with geographical labels

indicating where anomalous convection occurs during that phase. Image source
<https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CLIVAR/ecmf.shtml>

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We appreciate your taking the time to read the public Arctic Oscillation blog from Dr. Judah Cohen and the AER Seasonal Forecasting team.

Dr. Cohen's detailed monthly seasonal forecast, sCast, is also available. [sCast](#) provides a monthly 30-60-90-180-day outlook into temperature and precipitation, solar flux and wind anomalies across the globe, and regional population weighted cooling and heating degree forecasts for the US.

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