

Arctic Oscillation and Polar Vortex Analysis and Forecasts

August 5, 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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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 negative the next two weeks as pressure/geopotential height anomalies are predicted to remain mixed to positive the next two weeks. The North Atlantic Oscillation (NAO) is currently negative with positive pressure/geopotential height anomalies across Greenland, and the NAO is predicted to remain negative the next week as pressure/geopotential height anomalies are predicted to remain mostly positive across Greenland the next week.
- The next two weeks ridging/positive geopotential height anomalies across Greenland will favor troughing/negative geopotential height anomalies across Northern Europe while ridging/positive geopotential height anomalies persist across Southern Europe. This pattern will favor normal to above normal temperatures across much of Europe including the United Kingdom (UK) and normal to below normal temperatures over Scandinavia and into the Baltic States.
- The predicted pattern across Asia the next two weeks is widespread ridging/positive geopotential height anomalies centered across Central Asia with troughing/negative geopotential height anomalies across Siberia and into Northeast Asia. This pattern favors mostly normal to above normal temperatures across Asia but especially Central Asia with normal to below normal temperatures across parts of Siberia and into Northeast Asia.

- Over the next two weeks the predicted atmospheric pattern across North America is ridging/positive geopotential height anomalies across Northern Canada and western North America forcing troughing/negative geopotential height anomalies across eastern and southern North America. This pattern will support this week widespread normal to above normal temperatures across western and northern Canada and the Western and Eastern United States (US) with normal to below normal temperatures in Central Canada and the Northern US Plains. Then next week the biggest the cooler temperatures will spread out of Central Canada into the Northeastern US.
- Summer is winding down but still plenty of heat. Some early thoughts on winter below.
- The next scheduled blog is probably the first week of August due to travel and personal holidays.

Plain Language Summary

With just a few weeks left for summer 2026, the summer can be summed up as heat domes across Western Europe, Western Siberia into Central Asia and Eastern Canada favoring some relatively cool temperatures at lower latitudes in parts of Eastern Europe, Northeast Asia, Southcentral Canada and the Central and even Eastern US (see **Figure**). The forecast features a continuation of more of the same with heat domes persisting across Southern Europe, Central Asia and Northern Canada but consolidating in western North America supporting relatively cool temperatures in Northern Europe, Northeastern Asia and Central Canada and into the Northeastern US (see **Figures 3, 6 and 9**).

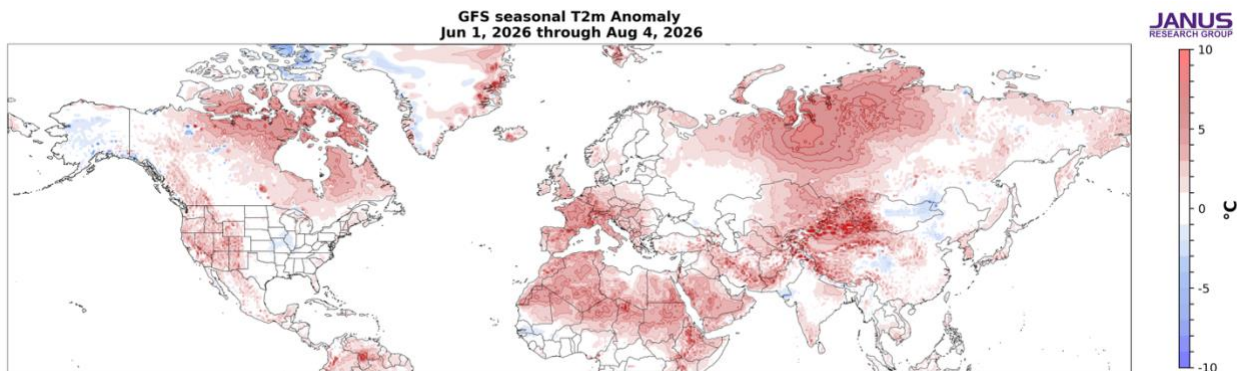


Figure. Estimate of the observed surface temperatures (°C; shading) from 01 Jun to 4 Aug 2026 based on GFS initializations and the GFS forecast from the 5 Aug 2026 run.

Impacts

This morning I had a cup of coffee with Jason Meshekow or @realwxforecast near my house. It was great to meet him in person, and our stimulating weather conversation was a good preparation for the blog today.

As usual I begin the discussion with a look at the two-week forecast of the mid-tropospheric circulation animation in **Figure 1**. 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. However, at the end of the forecast the GFS is predicting high pressure to push towards the North Pole. That is more of a winter phenomenon so will be interesting to see if the forecast verifies.

There is one clear dominant region of high-pressure ridging centered over the Canadian Arctic that includes Greenland. Eventually that high pressure center shifts into the Central Arctic centered mostly in the Beaufort Sea but is also related to ridging in Western Canada. Other regions of high pressure include Europe, the Laptev Sea and East Asia. These features strongly contribute to widespread warmth across the northern continents (see **Figures 3, 6 and 9**). Though these high-pressure centers are also helping to push south into the mid-latitudes relatively cool temperatures downstream into Northern Europe, Siberia into Northeast Asia and Eastern Canada and eventually the Northeastern US (see **Figures 3 and 6**).

Initialized 00Z 500 hPa HGT/HGTa 05-Aug-2026

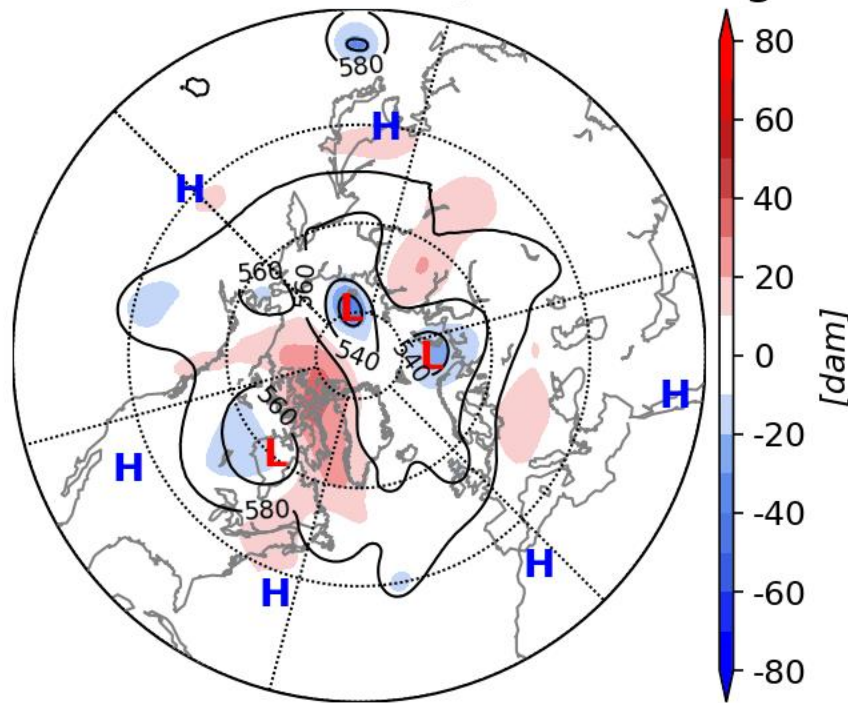


Figure i. Initialized 500 mb geopotential heights (dam; contours) and decameter anomalies (dam; shading) across the Northern Hemisphere for 5 Aug 2026 and forecasted from 6 Aug to 20 Aug 2026. The forecasts are from the 00Z 5 Aug 2026 GFS model.

With just a few weeks left to summer, looking once again at the NH temperature anomalies so far this summer (see above **Figure**), it does seem that the heat has been persistent in favored regions and has resulted in well above normal summer temperatures for Western Europe, Central Asia, the Western US and Northern Canada. The heat in many of these regions have resulted in a severe wildfire season including Western Europe, Northern Canada and the Western US. I really haven't heard much on the heat in Central Asia but clearly it is real. It has also been well above normal in Western Siberia, North Africa and parts of the Middle East. I haven't seen much news about these regions but once again the positive temperature anomalies look impressive in all these regions. I would think the wildfire season in parts of Siberia must have been active this summer.

As far as North Africa maybe when it is hot in the Sahara region that isn't newsworthy but a hot summer in North Africa probably exacerbated the heat waves in Europe this summer. I was in Europe for most of July. It was hot where I visited in the Berlin region and Southern France, but I experienced nothing extreme. The week before I arrived the heat was extreme in Leipzig and Berlin and in Leipzig the tram tracks became covered with melted tar rendering the trams in operatable. Certainly, seems to me the infrastructure in Europe is not designed for the hot

weather of recent summers. Meanwhile since I returned to the Northeastern US the weather is surprisingly pleasant for the heat or “dog days” of summer and for the most part that theme looks to continue for much of August based on the weather forecast maps below. So, while above normal temperatures are still likely for the Northeastern US especially in September, a prolonged stretch of uncomfortable heat and humidity may not return to the Northeastern US until next summer. But admittedly Septembers of late feel more like a summer than fall month these days. And therefore, I see no reason not to expect a relatively warm September. But in September tends to be drier and the nights can still cool off.

On Monday I tweeted or posted on social media how our AI subseasonal model is predicting that the core of the heat waves in Western Europe and the Western US will shift to the east in late August and into early September (<https://x.com/judah47/status/2084290284427395375>). No real signs of that in the temperature forecast posted below but is strongly suggested by the end of the two weeks ECMWF ensemble forecasts and in the ECMWF subseasonal forecasts. I will be watching to see if our AI model forecast verifies or does that heat linger in either region despite the forecasts.

Now that it is August, my attention turns to Arctic sea ice. We are about a month away from the Arctic sea ice minimum. Arctic sea ice is well below normal, that is a given especially given how low the sea ice was even at its maximum back in March. What is more uncertain is how close to a record low will the minimum be in September? It appears to me a new record low is not likely, and it could even be higher than the past two years.

But more important is where the low sea ice is focused 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. It is early still but in August and September the negative sea ice anomalies have tended to be focused in the North Pacific sector. So given how large the negative anomalies are already in the North Atlantic sector (see **Figure ii**), I expect that the sea ice anomalies in the late fall will be focused in the North Atlantic sector. This would favor a weaker polar vortex overall, but we have a long way to go, and this is mostly speculation on my part. The polar vortex still has not formed but early signs of it should become visible later this month.

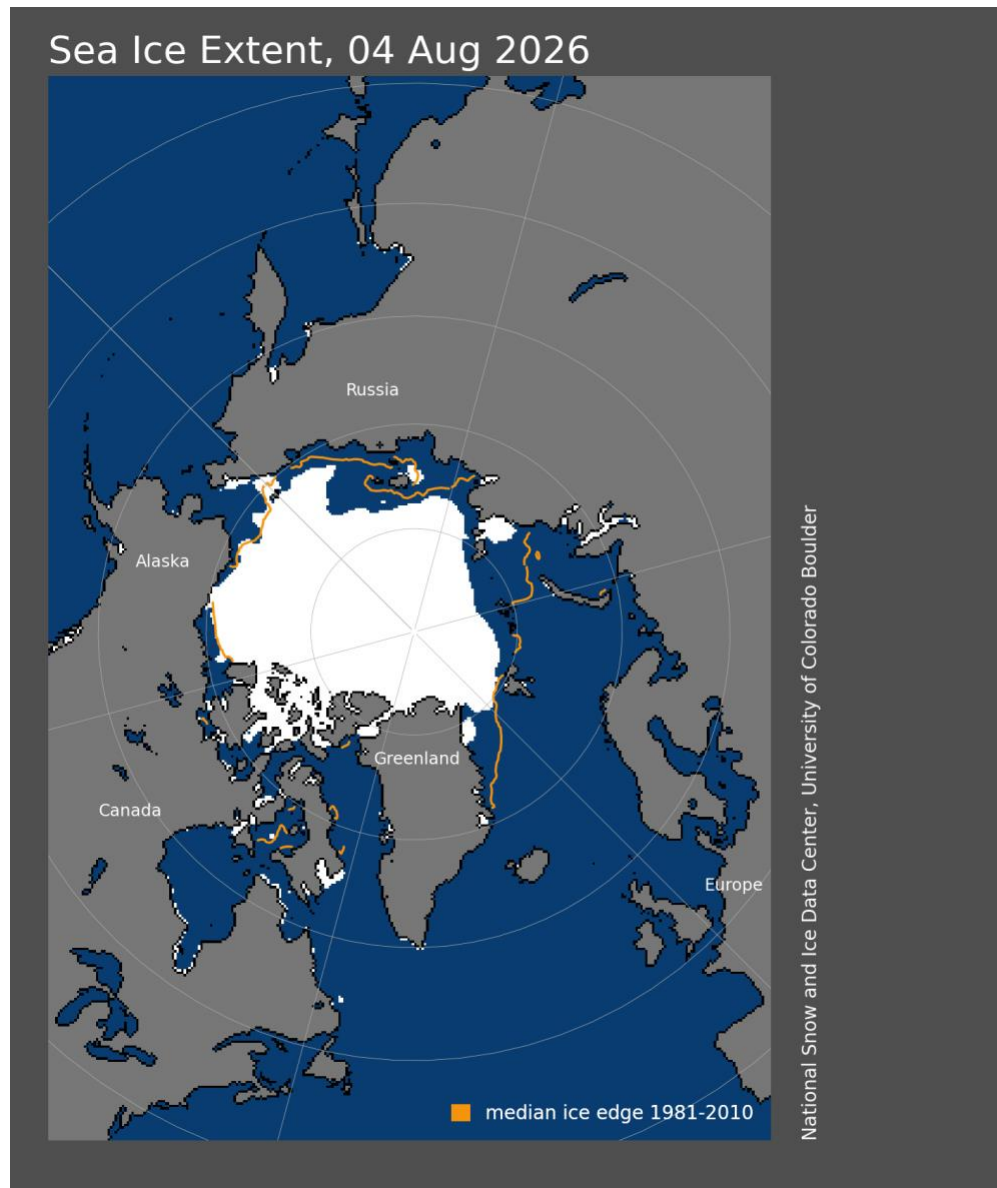


Figure ii. Arctic sea ice cover extent for 4 Aug 2026. White depicts ice covered areas and the orange contour the climatological extent of Arctic sea ice for the date. Plot taken from: <https://nsidc.org/sea-ice-today>

The polar cap geopotential height anomalies (PCHs) plot of **Figure 11** shows this strange band of well above normal PCHs in the mid- to low stratosphere. This should not persist once troposphere-stratosphere coupling becomes active, but it does suggest that the polar vortex will start off relatively weak upon its return next month.

Near-Term

This week

The AO is predicted to be neutral to 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 negative this week.

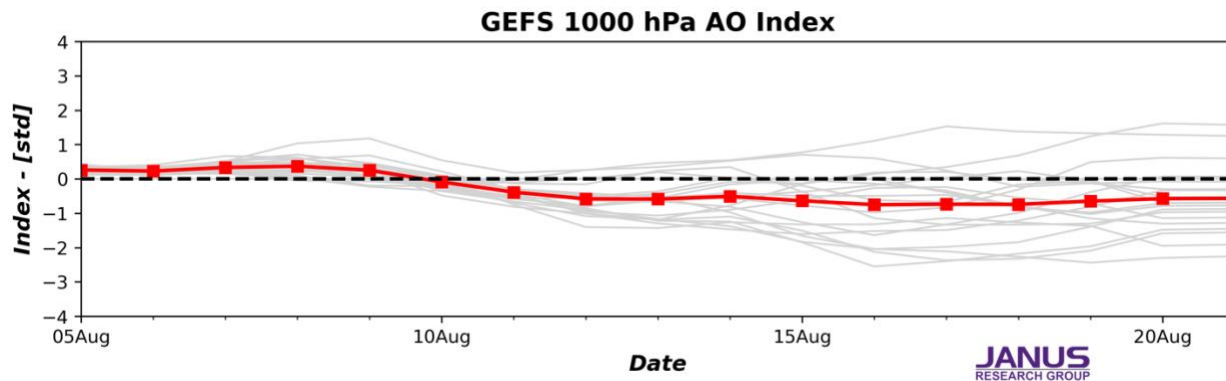


Figure 1. The predicted daily-mean AO at 1000 hPa from the 00Z 5 Aug 2026 GFS ensemble. Gray lines indicate the AO index from each individual ensemble member, with the ensemble mean AO index given by the red line with squares.

Ridging/positive geopotential height anomalies across Greenland will support \troughing/negative geopotential height anomalies across Northern Europe with ridging/positive geopotential height anomalies across Southern Europe this week (**Figure 2**). This pattern will support normal to above normal temperatures widespread across Europe including the UK with normal to below normal temperatures across Scandinavia this week (**Figure 3**). This week the general pattern across Asia is ridging/positive geopotential height anomalies across Southern and Central Asia with troughing/negative geopotential height anomalies across Northwestern and Northeastern Asia this week (**Figure 2**). This pattern favors widespread normal to above normal temperatures across much of Southern and especially Central Asia with normal to below normal temperatures across Northwestern and Northeastern Asia including Eastern Siberia this week (**Figure 3**).

GEFS 1-5 Day Forecast 500 hPa Anomaly
INIT: 00Z 08/05/2026 FCST: 08/06/2026 to 08/10/2026

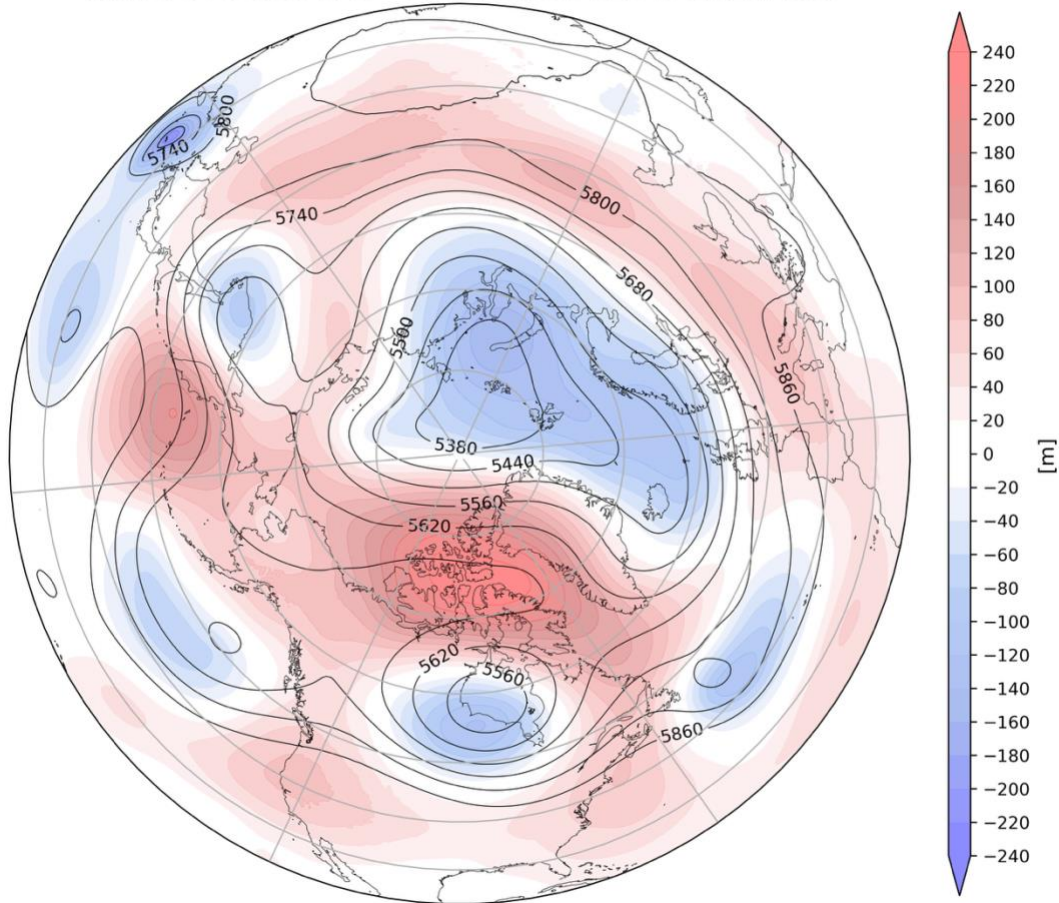


Figure 2. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 6 Aug 2026 to 10 Aug 2026. The forecasts are from the 00Z 5 Aug 2026 GFS ensemble.

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

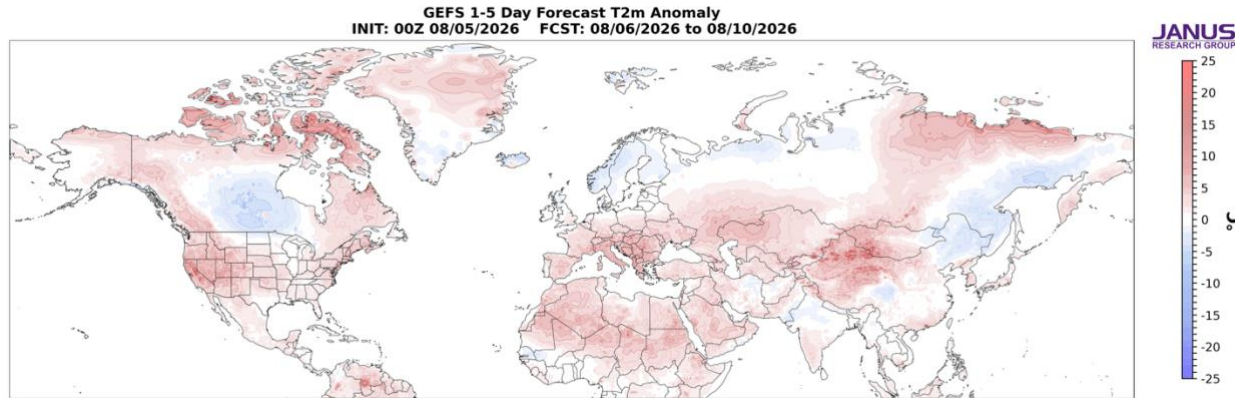


Figure 3. Forecasted surface temperature anomalies ($^{\circ}\text{C}$; shading) from 6 Aug 2026 to 10 Jul 2026. The forecasts are from the 00Z 5 Aug 2026 GFS ensemble.

Troughing will support new rainfall across eastern Scandinavia, Western Siberia and the Tibetan Plateau with mostly dry conditions across much of Europe and Asia (**Figure 4**). Troughing will support new rainfall across western Alaska, Quebec and the Northeastern US this week (**Figure 4**).

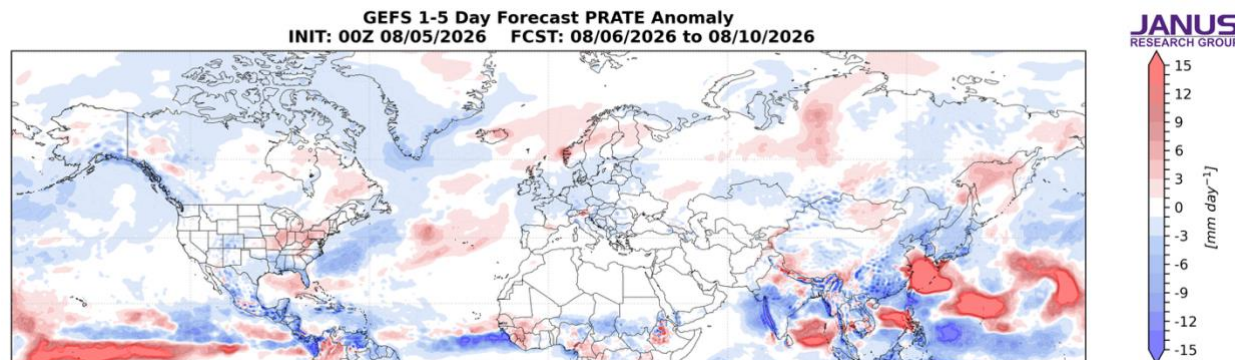


Figure 4. Forecasted precipitation (mm/day; shading) from 6 Aug 2026 to 10 Jul 2026. The forecasts are from the 00Z 5 Aug 2026 GFS ensemble.

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 negative to neutral this period (**Figure 1**). With mostly positive pressure/geopotential height anomalies across Greenland (**Figure 5**), the NAO will likely be negative this period.

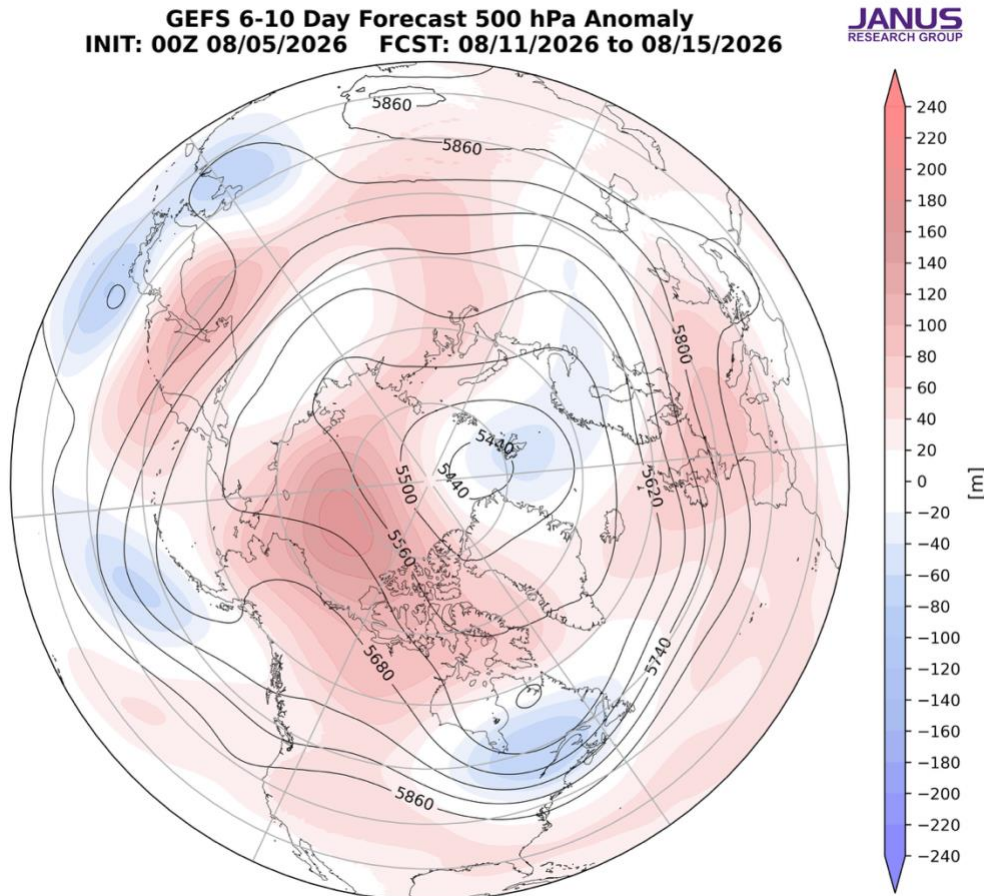


Figure 5. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 11 Aug 2026 to 15 Aug 2026. The forecasts are from the 00Z 5 Aug 2026 GFS ensemble.

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

this period (**Figure 5**). This pattern favors widespread normal to above normal temperatures widespread across Asia but especially Central Asia with normal to below normal temperatures across Western Russia and parts of Siberia and Northeast Asia this period (**Figure 6**).

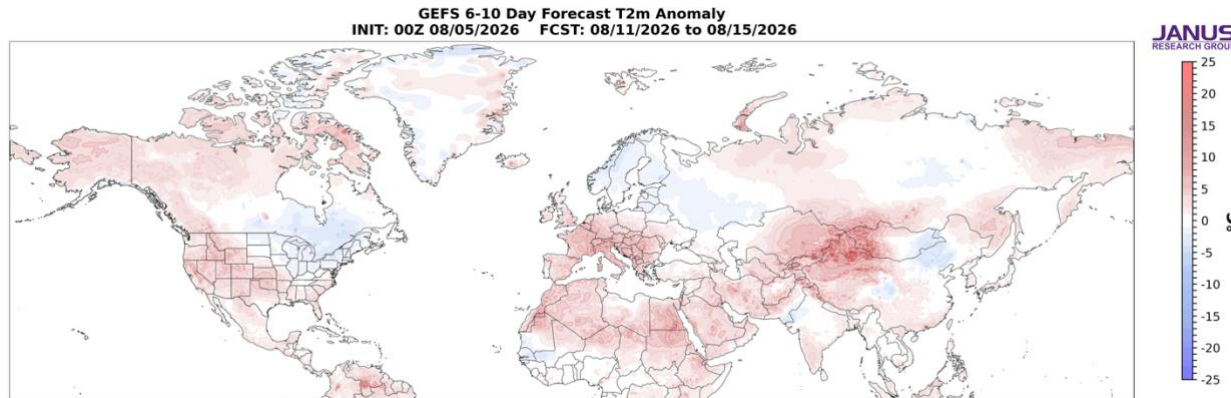


Figure 6. Forecasted surface temperature anomalies ($^{\circ}\text{C}$; shading) from 11 Aug 2026 to 15 Aug 2026. The forecasts are from the 00Z 5 Aug 2026 GFS ensemble.

Across North America ridging/positive geopotential height anomalies will continue to strengthen across western North America supporting troughing/negative geopotential height anomalies across Eastern Canada and the Northeastern US this period (**Figure 5**). 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 Southern and Eastern Canada and the Northeastern US this period (**Figure 6**).

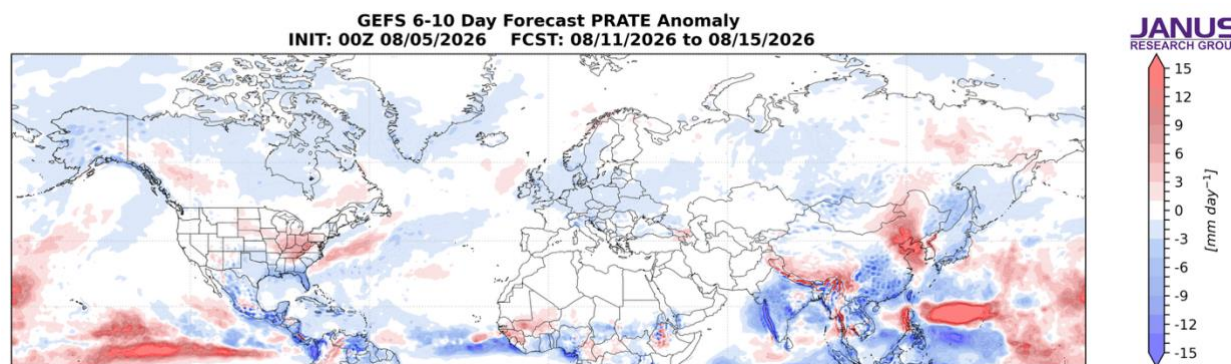


Figure 7. Forecasted rainfall rate (mm/day ; shading) from 11 Aug 2026 to 15 Aug 2026. The forecasts are from the 00Z 5 Aug 2026 GFS ensemble.

Troughing will support new rainfall across 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 Western Canada, southern Quebec, the US Northern Plains 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.

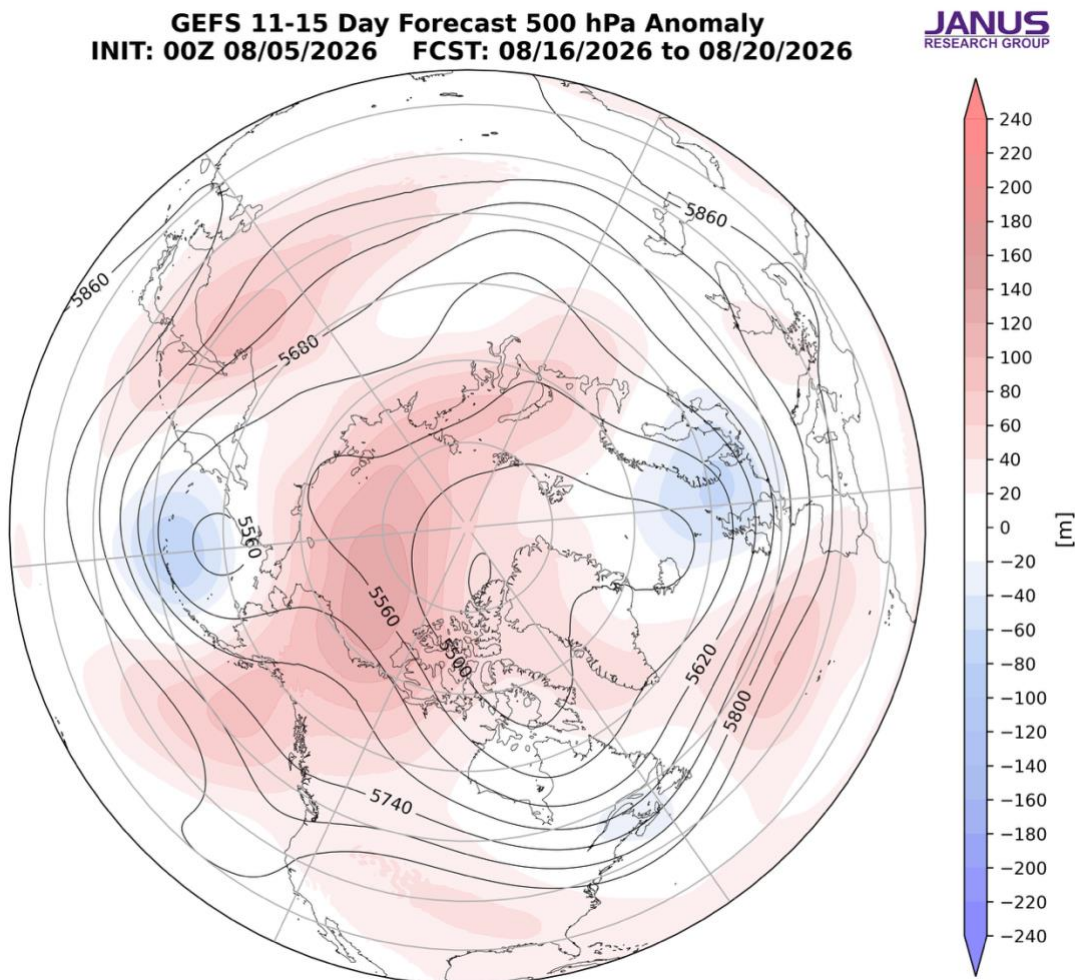


Figure 8. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 16 Aug to 20 Aug 2026. The forecasts are from the 00Z 5 Aug 2026 GFS ensemble.

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

except for normal to below normal temperatures limited to Scandinavia and the Baltic States this period (**Figures 9**). Ridging/positive geopotential height anomalies are predicted to dominate Asia with one center over the Laptev Sea and another center over Eastern China with regional troughing/negative geopotential height anomalies in Central Asia and in Eastern Siberia this period (**Figure 8**). This pattern favors widespread normal to above normal temperatures across most of Asia especially Western China and into Mongolia with normal to below normal temperatures limited to Eastern Siberia, Kazakhstan, Pakistan and into Northern India this period (**Figure 9**).

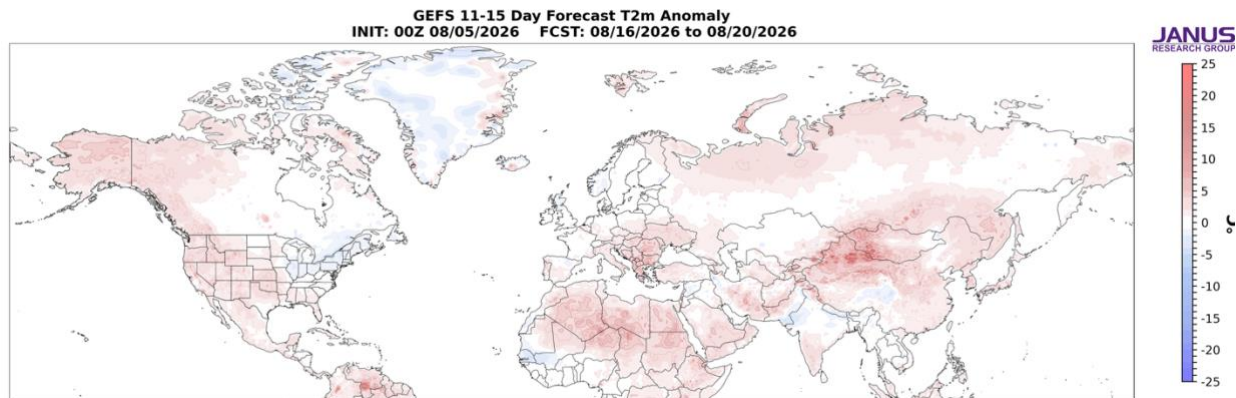


Figure 9. Forecasted surface temperature anomalies ($^{\circ}\text{C}$; shading) from 16 Aug to 20 Aug 2026. The forecasts are from the 00Z 5 Aug 2026 GFS ensemble

Ridging/positive geopotential height anomalies are predicted to persist over western North America supporting the continuation of troughing/negative geopotential height anomalies across Eastern Canada and the Northeastern US this period (**Figure 8**). This pattern supports normal to above normal temperatures across Alaska, Western and Northern Canada and the Western and Southern US with normal to below normal temperatures across Southern and Eastern Canada and the Northeastern US this period (**Figure 9**).

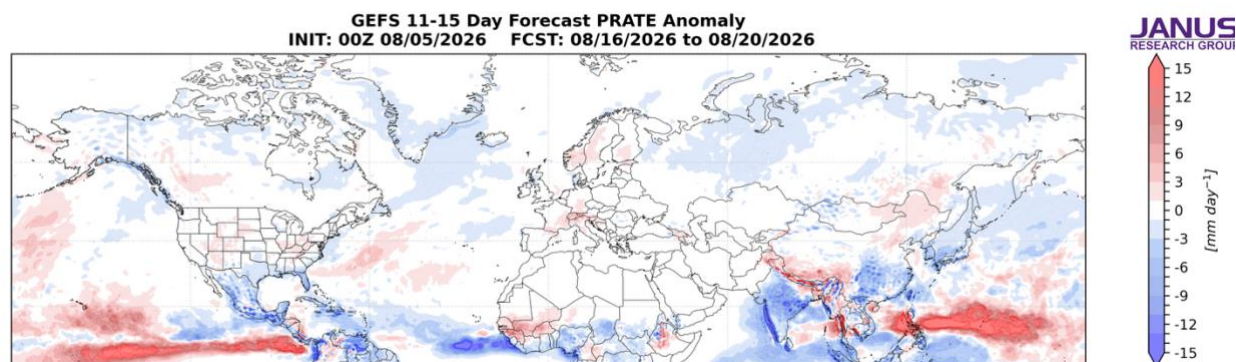


Figure 10. Forecasted rainfall (mm/day; shading) from 16 Aug to 20 Aug 2026. The forecasts are from the 00Z 5 Aug 2026 GFS ensemble

Troughing will support new rainfall across Scandinavia, the Alps, 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 western Alaska, Western Canada, the Southwestern US and the southern Great Lakes 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 and the lower troposphere with warm/positive PCHs in the lower stratosphere and the mid to upper troposphere (**Figure 11**). However early next week, the warm/positive PCHs extend downward into the lower troposphere.

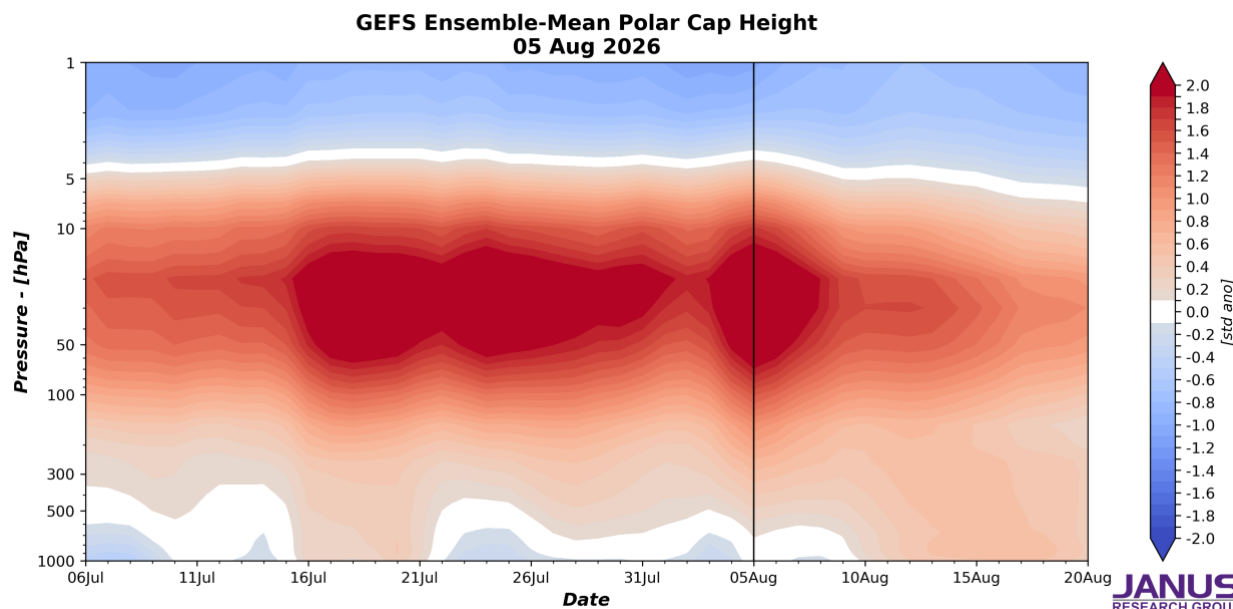


Figure 11. Observed and predicted daily polar cap height (i.e., area-averaged geopotential heights poleward of 60°N) standardized anomalies. The forecast is from the 00Z 5 Aug 2026 GFS ensemble.

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 05 Aug 2026

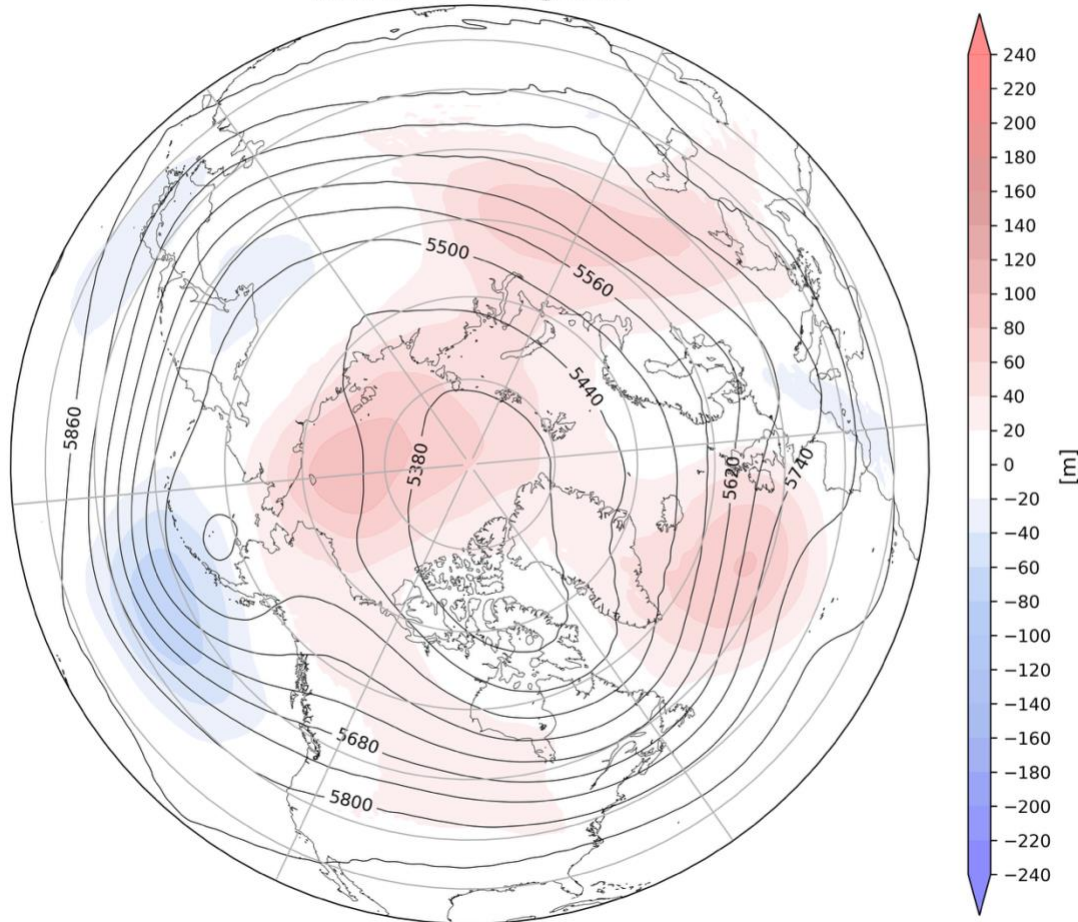


Figure 12. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere for Sep 2026. The forecasts are from the 00Z 5 Aug 2025 CFS.

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 Iceland, the Urals, the Beaufort Sea, Alaska and Western Canada with troughing across the 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 Eastern Europe, Western and Southern Asia including the Middle East, the Tibetan Plateau and Afghanistan, Alaska, Western and Northern Canada and the Western US with seasonable to relatively cool temperatures across Western Europe, Siberia and into Northeast Asia, Pakistan, Eastern Canada and the Eastern US (**Figure 13**).

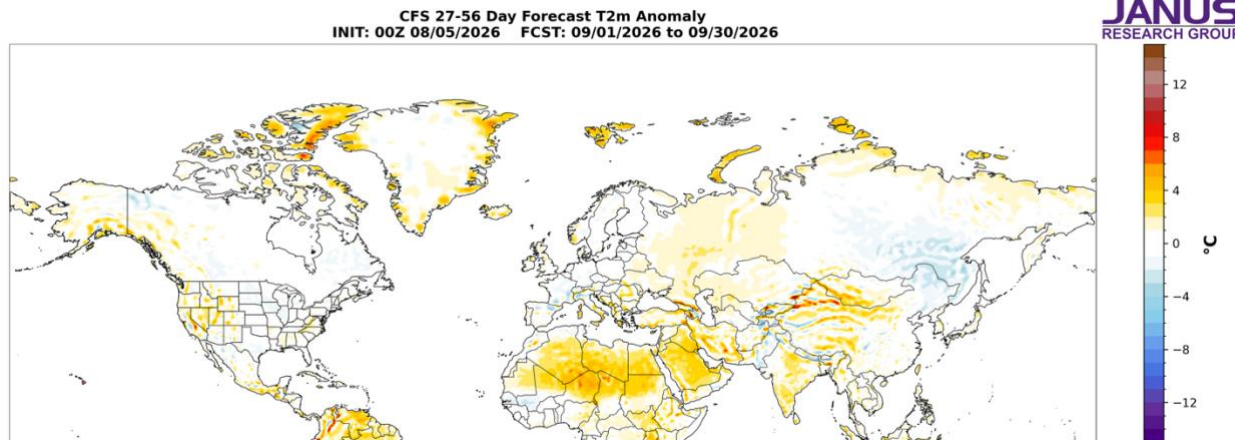


Figure 13. Forecasted average surface temperature anomalies ($^{\circ}\text{C}$; shading) across the Northern Hemisphere for Sep 2026. The forecasts are from the 00Z 5 Aug 2026 CFS.

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.

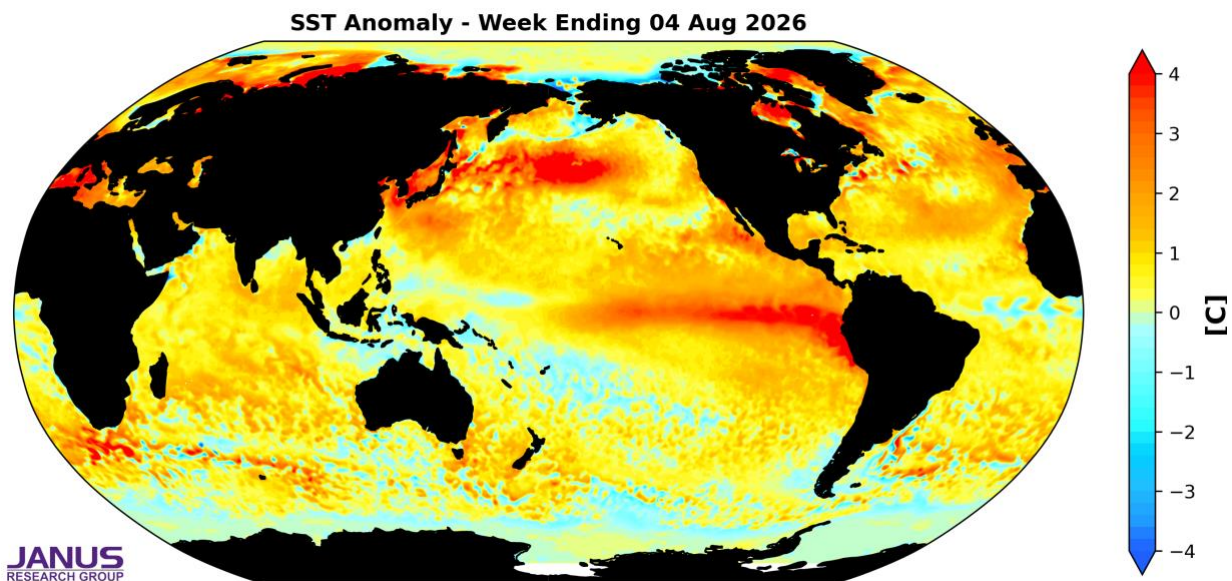


Figure 14. The latest daily-mean global SST anomalies for week ending 4 Aug 2026.

Madden Julian Oscillation

Currently the Madden Julian Oscillation (MJO) is weak where no phase is favored (**Figure 15**), and the forecasts are for the MJO to move into phase six 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.

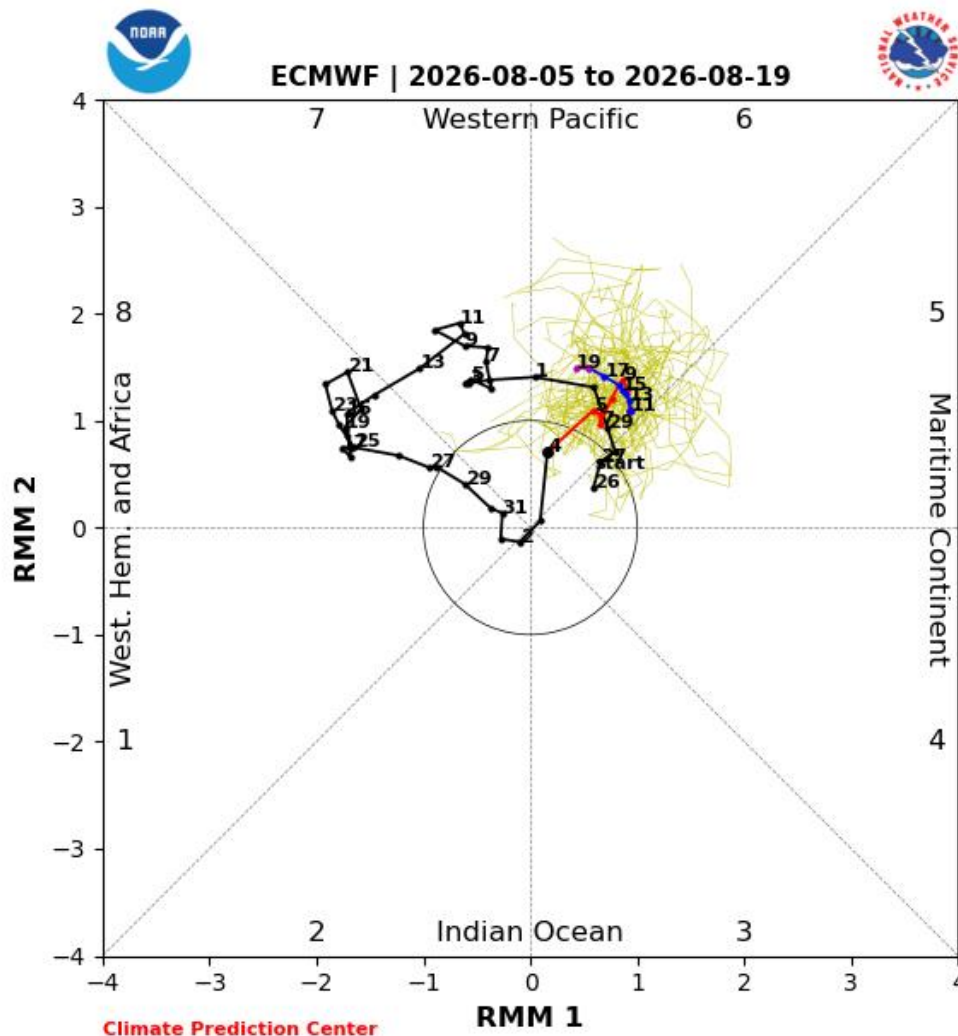


Figure 15. Past and forecast values of the MJO index. Forecast values from the 00Z 5 Aug 2026 ECMWF model. Yellow lines indicate individual ensemble-member forecasts, with the green line showing the ensemble-mean. A measure of the model 'spread' is denoted by the gray shading. Sector numbers indicate 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.

Our sCast principal engineer, [Karl Pfeiffer](#), can help you use sCast and other AER seasonal forecast products to deliver important, long-lead time weather intelligence to your business. Please reach out to Karl today!