

Arctic Oscillation and Polar Vortex Analysis and Forecasts

September 14, 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 positive as pressure/geopotential height anomalies across the Arctic are currently mostly negative and the AO is predicted to slowly trend towards neutral the next two weeks as pressure/geopotential height anomalies are predicted to become increasingly mixed the next two weeks. The North Atlantic Oscillation (NAO) is currently positive with mostly negative pressure/geopotential height anomalies across Greenland, and the NAO is predicted to slowly trend towards neutral the next two weeks as pressure/geopotential height anomalies are predicted to become mostly mixed across Greenland the next two weeks.
- In the previous blog the theme across the Northern Hemisphere was mild due to a mostly zonal flow, well the flow is more amplified, but the theme is still mild with continental ridging including Europe. The next two weeks the general predicted pattern across Europe is ridging/positive geopotential height anomalies across much of Europe with the brief exception of troughing/negative geopotential height anomalies across Northern Europe this week. This pattern will favor normal to above normal temperatures across most of Europe including the United Kingdom (UK).
- The predicted pattern across Asia this week is ridging/positive geopotential height anomalies centered across the Urals but slowly sliding into Western Siberia supporting troughing/negative geopotential height anomalies across Central and eventually Eastern

Siberia. This pattern favors widespread normal to above normal temperatures across Asia the next two weeks except for normal to below normal temperatures across Central and Eastern Siberia and into Northeast Asia.

- This week the predicted atmospheric pattern across North America is ridging/positive geopotential height anomalies in the Gulf of Alaska forcing troughing/negative geopotential height anomalies across Eastern Canada with more ridging in the Eastern United States (US). However, next week the ridging in the Gulf of Alaska and the Eastern US will consolidate over Central Canada and the Central US. This pattern will support widespread normal to above normal temperatures across much of North America the next two weeks except for normal to below normal temperatures across Eastern Canada and into the Northeastern US this week and into early next week.
- September is truly doing its best to make me look good as the pattern has flipped from the first half of the month to the second half of the month with the same result - relatively warm temperatures still reign supreme for the foreseeable future. I also present verification of the summer forecast.

Plain Language Summary

It looks like someone forgot to tell the summer heat domes that summer is over. With September 2026 just about half over it is shaping up as an incredibly warm month relative to normal (see **Figure**) with heat domes high pressure ridging still dominant across Europe, Western Asia, the Western US and Canada favoring widespread relatively warm temperatures for Europe, most of Asia, and much of Canada and the US (see **Figures 3, 6 and 9**). This is not too surprising given the recent strong warming trends observed in the month of September, still the lack of true fall weather across the Northern Hemisphere is impressive.

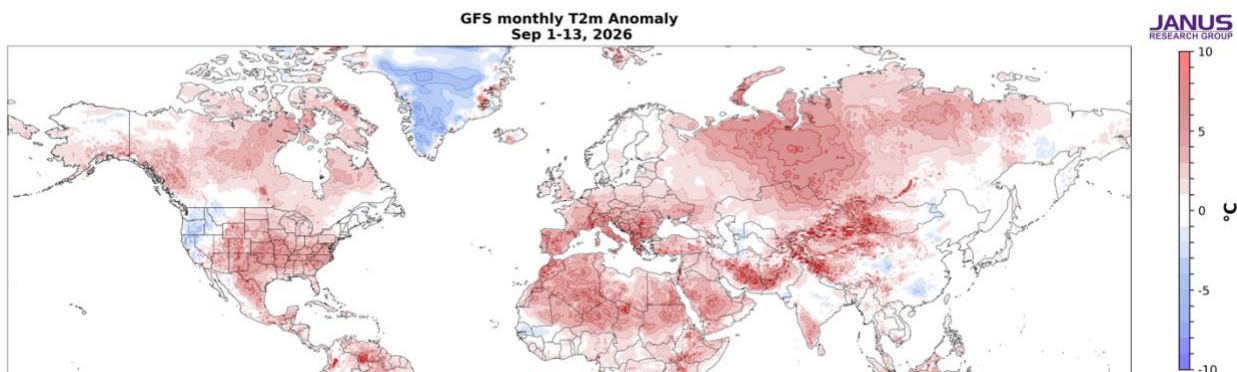


Figure. Estimate of the observed surface temperatures (°C; shading) from 01 Sep to 13 Sep 2026 based on GFS initializations and the GFS forecast from the 14 Sep 2026 run.

Impacts

Last winter I posted on social media about high pressure ridging bringing about the trifecta of cold to North America, Europe and Asia. Well for the next two weeks we have ridging bringing the trifecta of warmth for the same three continents. The forecast from today's weather models is yet again warmth, warmth and more warmth (see **Figures 3, 6 and 9**). I know that I sound like a broken record, but it seems to me that for the foreseeable future, warm temperatures will reign supreme. The breadth and depth of warm temperatures this September is breath taking.

Once again, I will start with the animation of the Northern Hemisphere (NH) mid troposphere and then move on to the polar vortex (PV) animation since once again as far as I can tell, stratosphere-troposphere coupling has not begun.

Initialized 00Z 500 hPa HGT/HGTa 14-Sep-2026

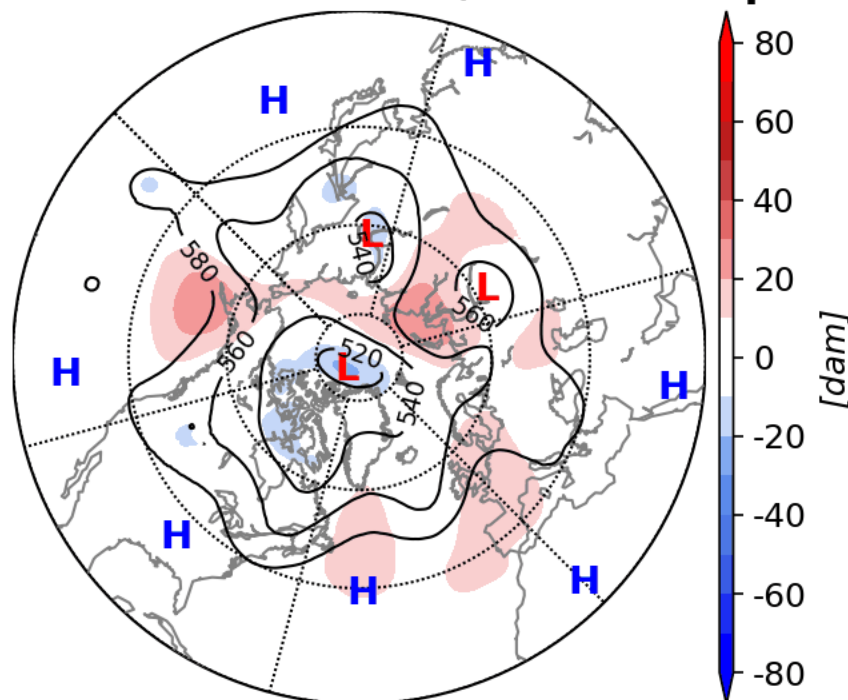


Figure i. Initialized 500 mb geopotential heights (dam; contours) and decameter anomalies (dam; shading) across the Northern Hemisphere for 14 Sep 2026 and forecasted from 15 Sep to 29 Sep 2026. The forecasts are from the 00Z 14 Sep 2026 GFS model.

The look ahead at the two-week forecast of the mid-tropospheric circulation animation in **Figure i** shows a familiar pattern of low pressure in the Arctic mostly 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, a term that I am using longer than expected. For the next two weeks the atmospheric circulation projects strongly on to positive Northern Annular Mode NAM or AO.

I am not the biggest fan of the term annular mode to describe the NH circulation but for the forecast the term seems appropriate. In the previous blog I described the flow as a “poster child” for strong zonal flow, a positive AO or NAM. I would no longer describe the flow as zonal, seems more amplified but still have the positive AO/NAM and the associated warmth may be even greater relative to normal in the coming two weeks.

Early on there are three dominant regions of high-pressure ridging centered over the Gulf of Alaska, Europe and the Urals. With time though the main high-pressure ridging centers are focused over the interior of North America, still over Europe and Western Siberia. These were favored regions during the summer months, and though we have transitioned to fall either the atmosphere didn’t get the memo or habits are hard to break. Not sure if this is possibly positive feedback in play here where the months of heat and/or dry weather are keeping high-pressure ridging anchored in these same regions. Also not sure how long these features can persist but if they go much longer into the late fall and early winter, it is going to be a very different winter from last winter.

It is my impression that often the CFS forecast for the month ahead is often just a persistence forecast, so I was pretty surprised by the October forecast posted below in **Figures 12 and 13**, as the October forecast is a complete flip from the September pattern with a negative AO and widespread continental cooling. Not sure what the CFS is seeing but for all winter weather enthusiasts, let’s hope the saying “even a broken clock is correct twice a day” can be applied to this latest CFS forecast.

I posted last week on social media that the PV was transitioning to a stretched PV this week. I still believe that but admittedly it is difficult to see in **Figure ii**. It is still September and very early for these events, I don’t think that I have even discussed one before in September. But putting that aside not much going on with the PV in the early going. Overall, the PV is circular in shape and consistent with the lack of troughing over the mid-latitude continents, though once again I see no strong signs of stratosphere-troposphere coupling.

Initialized 00Z 10 hPa HGT/HGTa 14-Sep-2026

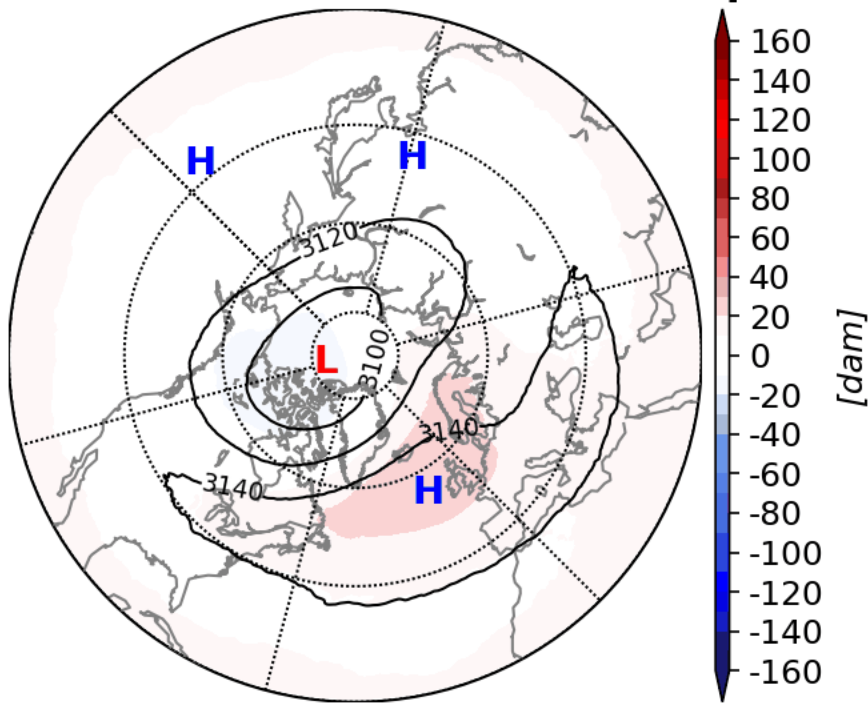


Figure ii. Initialized 10 mb geopotential heights (dam; contours) and decameter anomalies (dam; shading) across the Northern Hemisphere for 14 Sep 2026 and forecasted from 15 Sep to 29 Sep 2026. The forecasts are from the 00Z 14 Sep 2026 GFS model.

As I mentioned in the previous blog, a strong positive AO is conducive to Arctic sea ice preservation. It seems to me that so far in September the sea ice melt has been relatively slow, and I would expect that the end of the sea ice melt season is imminent. Sea ice extent shown in **Figure iii**, looks very similar to the Arctic sea ice minimum to last year, not only in total extent but in shape or areas covered in ice. Sea ice is well below normal both in the North Pacific side of the Arctic and North Atlantic sector 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. Sea ice should grow much faster in the North Pacific sector of the Arctic in the coming weeks and months, but again probably best not to make too many conjectures at this time. I will just note that last fall sea ice grew much faster on the North Pacific side of the Arctic and in late fall and during the winter anomalies were strongly focused in the North Atlantic and I believe that sea ice anomalies in the Barents-Kara Seas were record low.

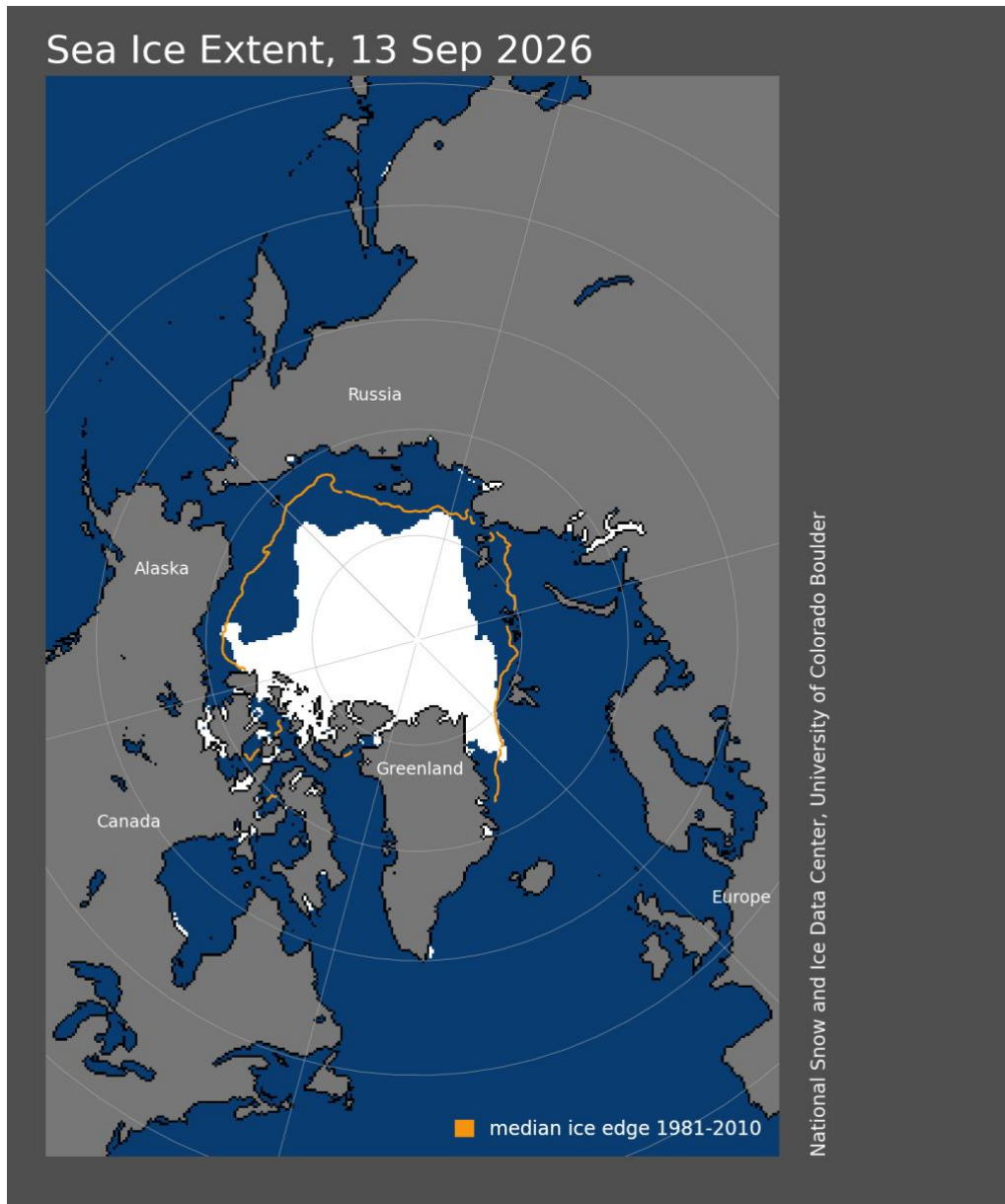


Figure iii. Arctic sea ice cover extent for 13 Sep 2026. White depicts ice covered areas and the orange contour the climatological extent of Arctic sea ice for the date. Plot taken from: <https://nsidc.org/sea-ice-today>

Now that summer ended two weeks ago, I include the Janus Research summer surface temperature anomaly forecast, the observed surface temperature anomaly based on ERA5 and the C3S all for June, July and August 2026 in **Figure iv**. You could look at the forecasts and the observed temperatures and say, all you had to do to produce a successful forecast was predict warm everywhere (which is basically the C3S forecast). And there is a good amount of truth to that statement. With that being said, I feel that the Janus summer forecast did very well correctly predicting the widespread relative warmth and for the most part correctly predicting the temperature pattern or notable features such as the amplified warmth in the Western US, Western Europe, North Africa and Western Siberia but did miss the amplified warmth in Northern

Canada. The C3S missed in addition to the amplified warmth in Northern Canada also missed the amplified warmth in Western Europe and Western Siberia. The Janus forecast also did predict some regional relative cool temperatures that were in the general area of observed cool temperatures. The C3S did not forecast any relatively cool temperatures. Both the Janus and C3S forecast were included in the [26 May 2026](#) blog.

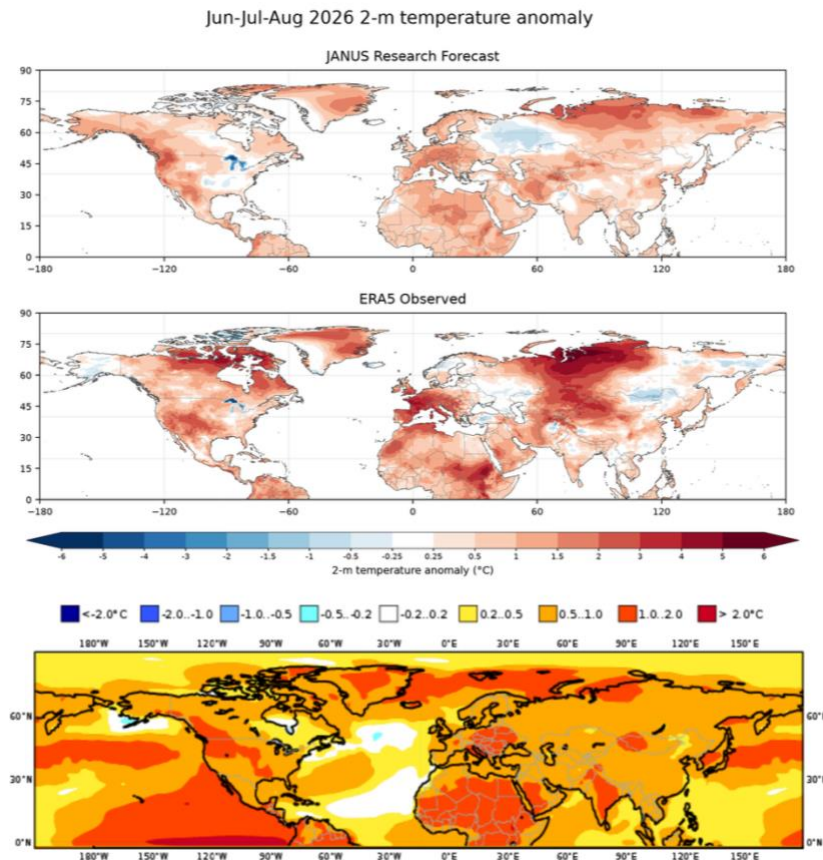


Figure iv. a) Predicted surface temperature anomalies (°C; shading) across the Northern Hemisphere for June, July and August 2026 from the Janus Research model, b) observed surface temperature anomalies (°C; shading) across the Northern Hemisphere for June, July and August 2026 from ERA5, c) the forecast from the C3S suite of models for June, July and August 2026. The C3S forecast was downloaded from: https://climate.copernicus.eu/charts/packages/c3s_seasonal/

Near-Term

This week

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

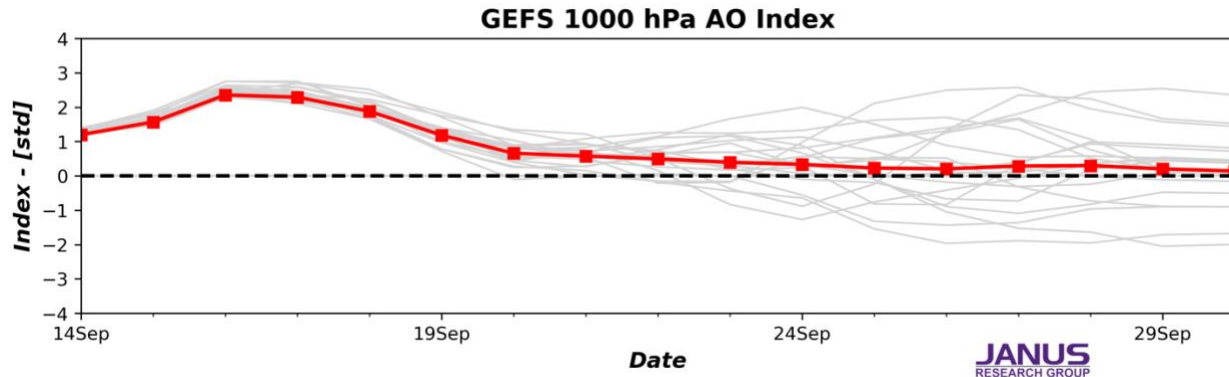


Figure 1. The predicted daily-mean AO at 1000 hPa from the 00Z 14 Sep 2026 GFS ensemble. Gray lines indicate the AO index from each individual ensemble member, with the ensemble mean AO index given by the red line with squares.

A zonal flow pattern is predicted for Europe for this week with ridging/positive geopotential height anomalies across Southern Europe with troughing/negative geopotential height anomalies across Northern Europe this week (**Figure 2**). This pattern will support widespread normal to above normal temperatures across much of Europe including the UK this week (**Figure 3**). This week the general pattern across Asia is ridging/positive geopotential height anomalies centered across the Urals forcing troughing/negative geopotential height anomalies centered on Central Siberia this week (**Figure 2**). This pattern favors widespread normal to above normal temperatures across much of Asia with normal to below normal temperatures across Central Siberia this week (**Figure 3**).

GEFS 1-5 Day Forecast 500 hPa Anomaly
INIT: 00Z 09/14/2026 FCST: 09/15/2026 to 09/19/2026

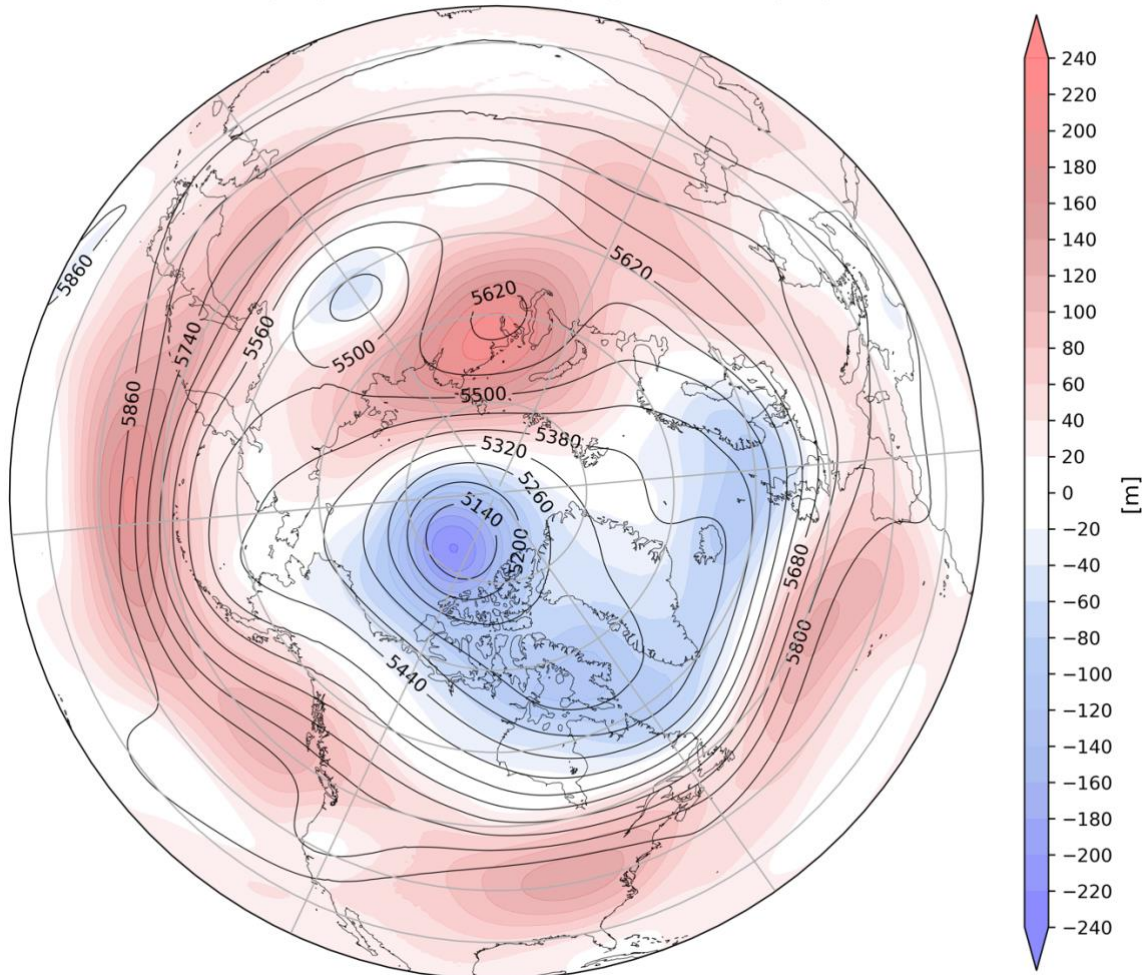


Figure 2. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 15 Sep 2026 to 19 Sep 2026. The forecasts are from the 00Z 14 Sep 2026 GFS ensemble.

The predicted pattern across North America this week is ridging/positive geopotential height anomalies centered forcing troughing/negative geopotential height anomalies across Eastern Canada with more ridging/positive geopotential height anomalies centered over the Eastern US this week (**Figure 2**). This pattern will favor normal to above normal temperatures across Alaska, Western Canada and the US but focused on the Eastern US with normal to below normal temperatures across Eastern Canada this week (**Figure 3**).

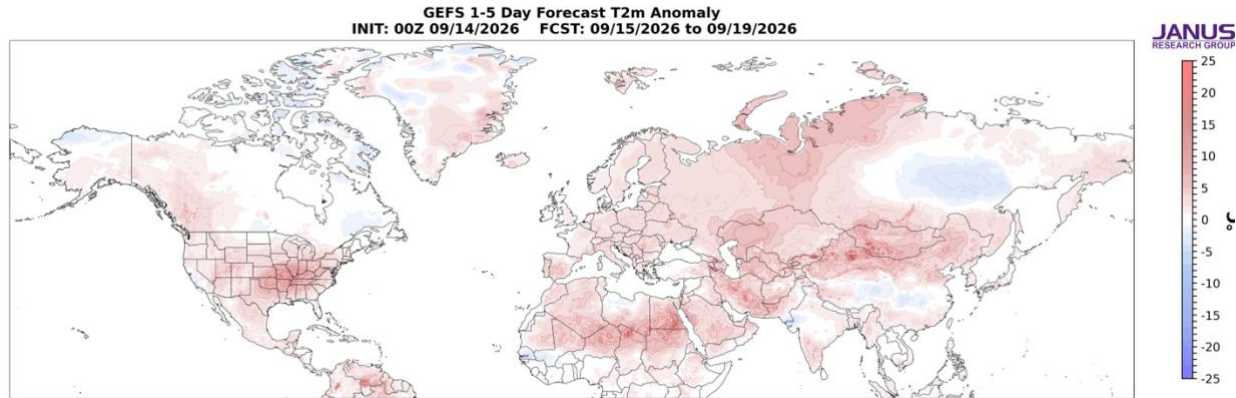


Figure 3. Forecasted surface temperature anomalies ($^{\circ}\text{C}$; shading) from 15 Sep 2026 to 19 Sep 2026. The forecasts are from the 00Z 14 Sep 2026 GFS ensemble.

Troughing will support new rainfall across Northern Europe, Southern Siberia and the Tibetan Plateau with mostly dry conditions across much of Europe and Asia (**Figure 4**). Troughing will support new rainfall across Alaska and the from the Southwestern US into the Upper Midwest this week (**Figure 4**).

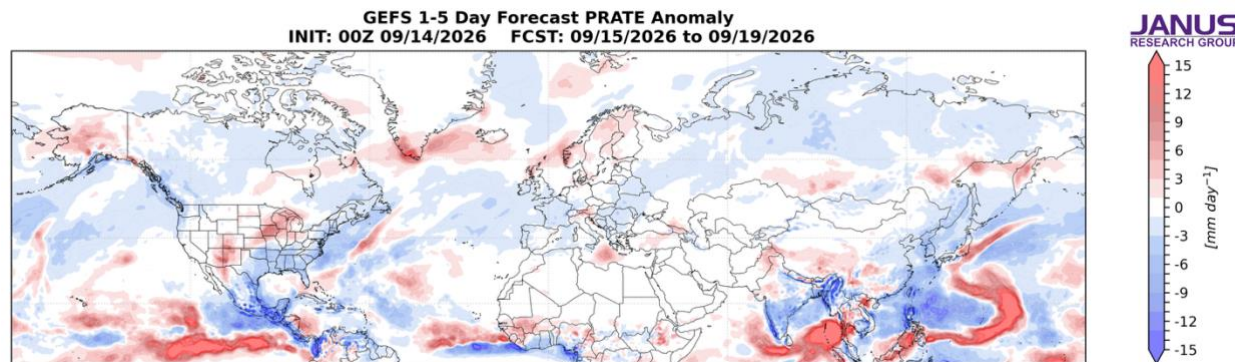


Figure 4. Forecasted precipitation (mm/day; shading) from 15 Sep 2026 to 19 Sep 2026. The forecasts are from the 00Z 14 Sep 2026 GFS ensemble.

Near-Mid Term

Next week

With geopotential height anomalies becoming increasingly mixed across the Arctic and with mixed geopotential height anomalies across the mid-latitudes this period (**Figure 5**), the AO will likely be positive but trending towards neutral this period (**Figure 1**). With mixed and weak pressure/geopotential height anomalies across Greenland (**Figure 5**), the NAO will likely be neutral this period.

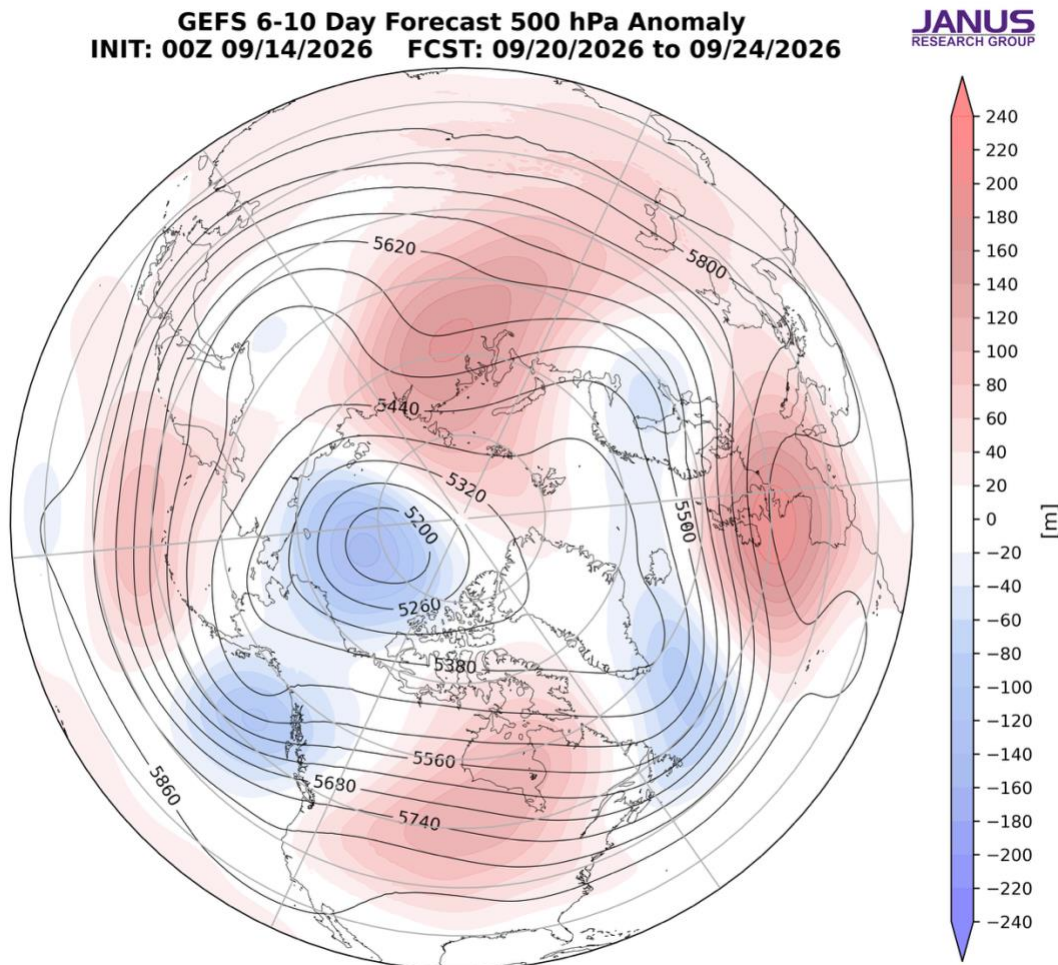


Figure 5. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 20 Sep 2026 to 24 Sep 2026. The forecasts are from the 00Z 14 Sep 2026 GFS ensemble.

The mostly zonal flow across Europe is predicted to finally end with ridging/positive geopotential height anomalies dominating much of Europe but centered on Western Europe this period (**Figure 5**). The pattern will support widespread normal to above normal temperatures across Europe including the UK this period (**Figure 6**). The ridging/positive geopotential height anomalies centered across the Urals is predicted to slowly drift east

with into Western Siberia while continuing to support troughing/negative geopotential height anomalies across and Central and Eastern 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 limited to Central and Eastern Siberia and into Northeast Asia this period (**Figure 6**).

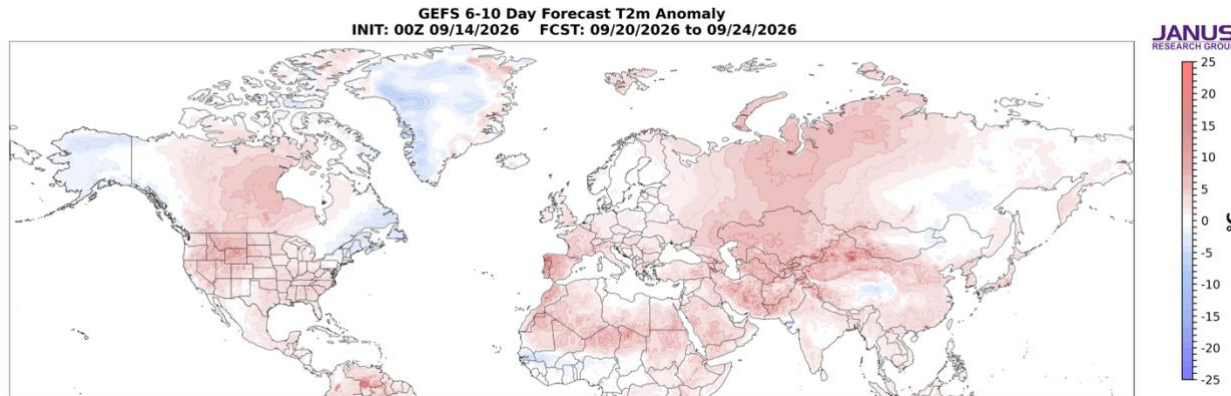


Figure 6. Forecasted surface temperature anomalies ($^{\circ}\text{C}$; shading) from 20 Sep 2026 to 24 Sep 2026. The forecasts are from the 00Z 14 Sep 2026 GFS ensemble.

Across North America previous ridging/positive geopotential height anomalies in the Gulf of Alaska and the Eastern US will consolidate across Central Canada and the Central US with troughing/negative geopotential height anomalies across Alaska, the Gulf of Alaska and the Canadian Maritimes this period (**Figure 5**). This pattern will favor normal to above normal temperatures widespread across Canada and the US except for normal to below normal temperatures mostly limited to Alaska, the Canadian West Coast, the Canadian Maritimes and the New England this period (**Figure 6**).

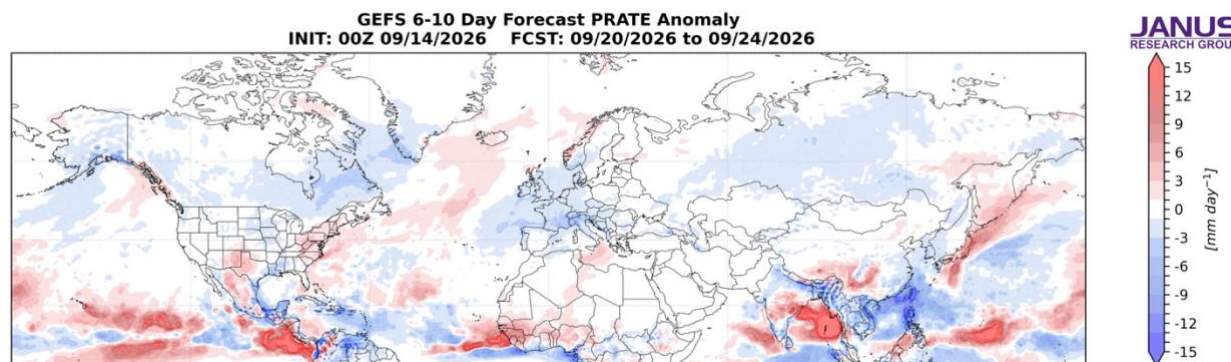


Figure 7. Forecasted rainfall rate (mm/day; shading) from 20 Sep 2026 to 24 Sep 2026. The forecasts are from the 00Z 14 Sep 2026 GFS ensemble.

Troughing will support new rainfall across Norway, Eastern Siberia, Southwestern China and the Tibetan Plateau with mostly dry conditions across much of Europe and Asia (**Figure 7**). Troughing will support new rainfall across the Canadian West Coast, the US Southern Plains and the Eastern US with mostly dry conditions across much of North America this week (**Figure 7**).

Mid Term

Week Two

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

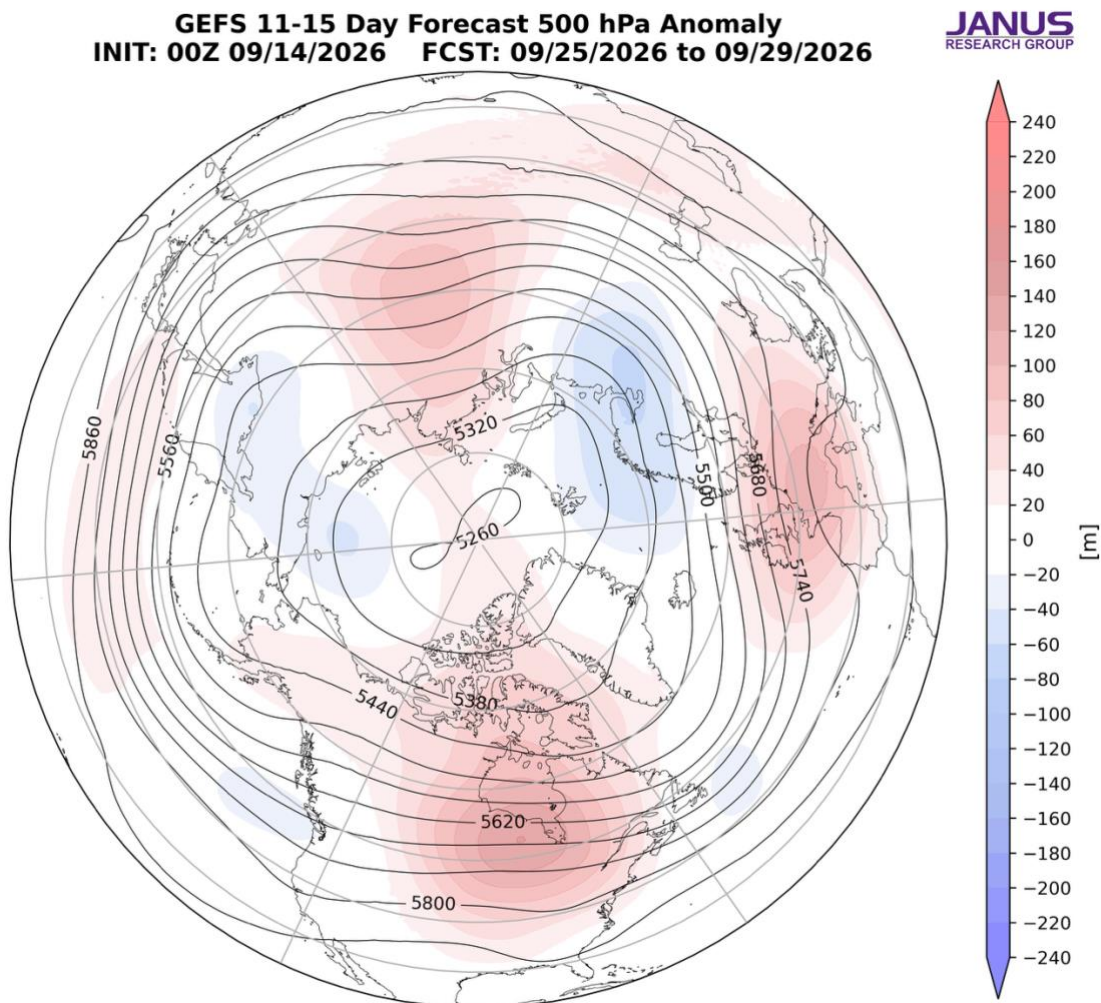


Figure 8. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 25 Sep to 29 Sep 2026. The forecasts are from the 00Z 14 Sep 2026 GFS ensemble.

Yet again ridging/positive geopotential height anomalies are predicted to dominate Europe this period (**Figure 8**). This pattern will favor widespread normal to above normal temperatures

across much of Europe including the UK this period (**Figures 9**). The omega pattern from earlier this month is predicted to return to Asia with expansive ridging/positive geopotential height anomalies centered across Western Siberia bookended by troughing/negative geopotential height anomalies across in Western Russia and Eastern Siberia this period (**Figure 8**). This pattern favors widespread normal to above normal temperatures across most of Asia especially Western Siberia and Central Asia with normal to below normal temperatures limited to Western Russia, Eastern Siberia, central China and northern India this period (**Figure 9**).

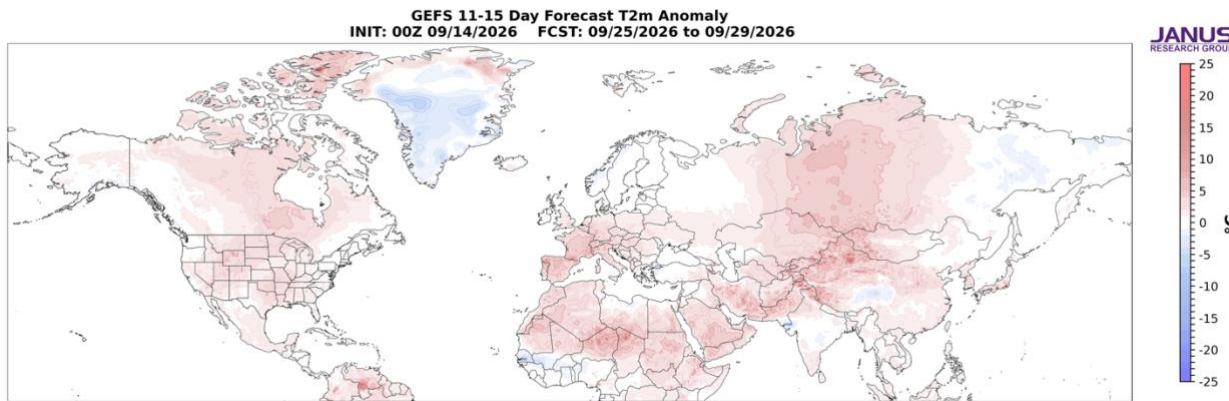


Figure 9. Forecasted surface temperature anomalies ($^{\circ}\text{C}$; shading) from 25 Sep to 29 Sep 2026. The forecasts are from the 00Z 14 Sep 2026 GFS ensemble.

Not to be left out, ridging/positive geopotential height anomalies are predicted to dominate North America as well centered on lower Hudson Bay with troughing/negative geopotential height anomalies limited to the west coasts of Canada and the US this period (**Figure 8**). This pattern supports widespread normal to above normal temperatures across Alaska, much of Canada and the US with the limited exception of regional normal to below normal temperatures across the Canadian and US west coasts this period (**Figure 9**).

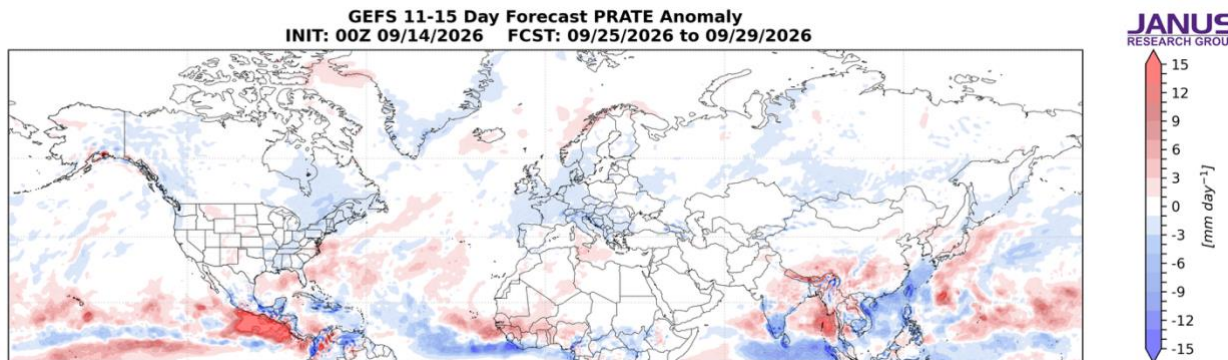


Figure 10. Forecasted rainfall (mm/day; shading) from 25 Sep to 29 Sep 2026. The forecasts are from the 00Z 14 Sep 2026 GFS ensemble.

Troughing will support new rainfall across Norway, southern China, the Tibetan Plateau and into northern India with mostly dry conditions across much of Europe and Asia (**Figure 10**). Troughing will support new rainfall across the Alaska, the Canadian and US 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 and lower troposphere with warm/positive PCHs in the lower stratosphere and the upper troposphere (**Figure 11**). However next week, the warm/positive PCHs in the lower stratosphere and troposphere weaken and even flips cold/negative in the upper troposphere.

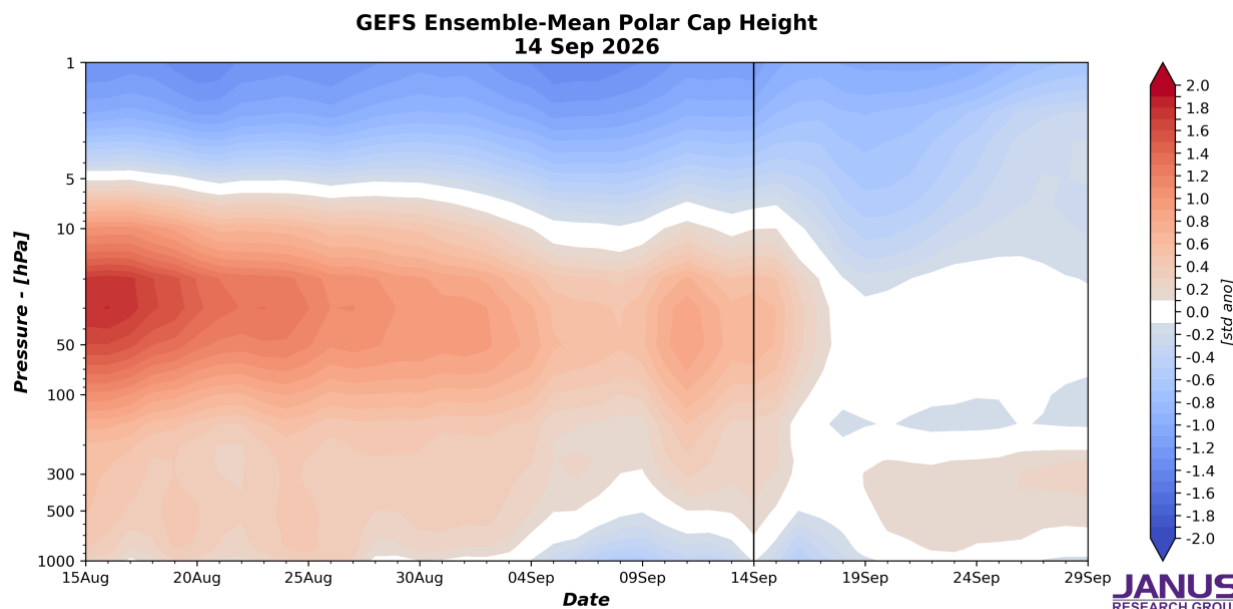


Figure 11. Observed and predicted daily polar cap height (i.e., area-averaged geopotential heights poleward of 60°N) standardized anomalies. The forecast is from the 00Z 14 Sep 2026 GFS ensemble.

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

CFS 500 hPa Forecast Anomaly Oct 2026
Valid as of 14 Sep 2026

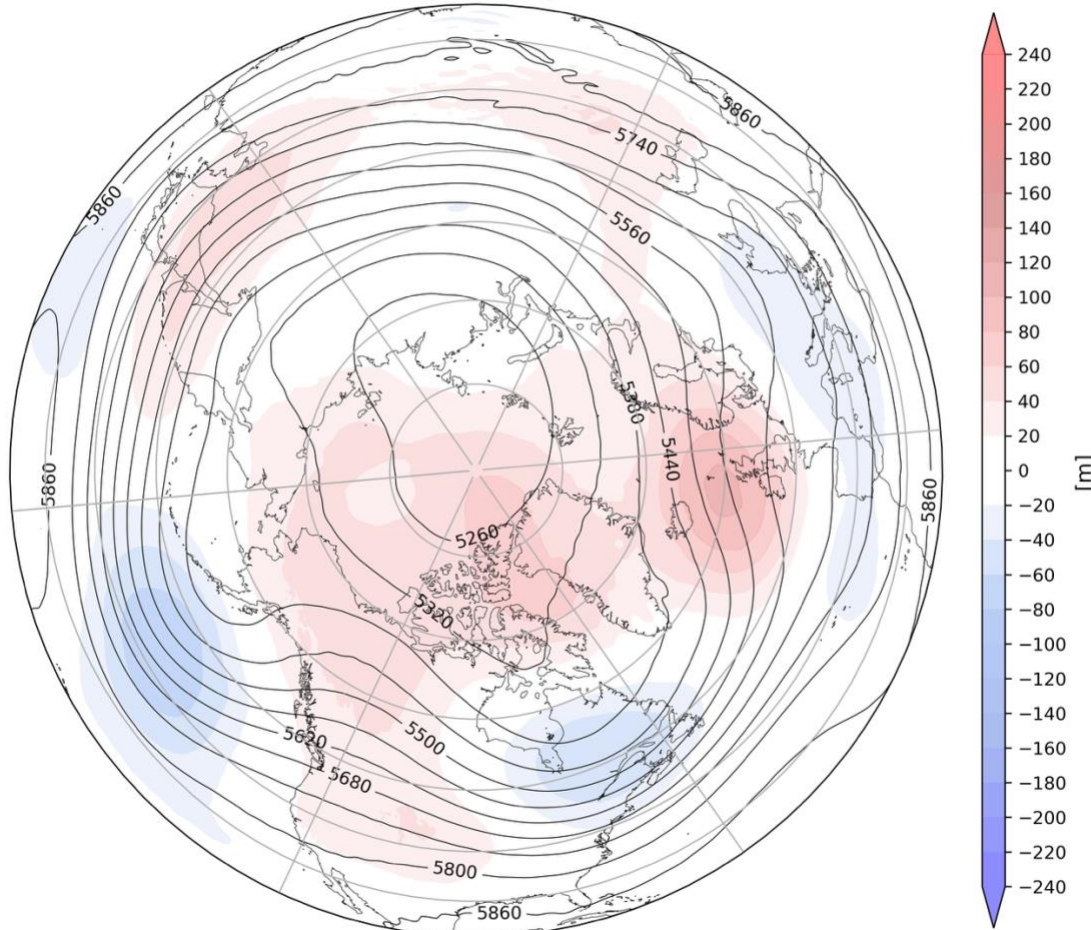


Figure 12. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere for Oct 2026. The forecasts are from the 00Z 14 Sep 2025 CFS.

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 centered between Iceland and the UK, East Asia, Western Canada and the Central Arctic with troughing across Southern Europe, Northern Asia, the Aleutians, Eastern Canada and the Eastern US (**Figure 12**). This pattern favors seasonable to relatively warm temperatures across Northern Europe, much of Central and Southern Asia including the Middle East, the Tibetan Plateau, Pakistan and Afghanistan, Northeastern Siberia, Alaska, Western Canada and the Western US with seasonable to relatively cool temperatures across Eastern Europe, Western Russia, much of Siberia and into Northeast Asia, Eastern Canada and the Eastern US (**Figure 13**).

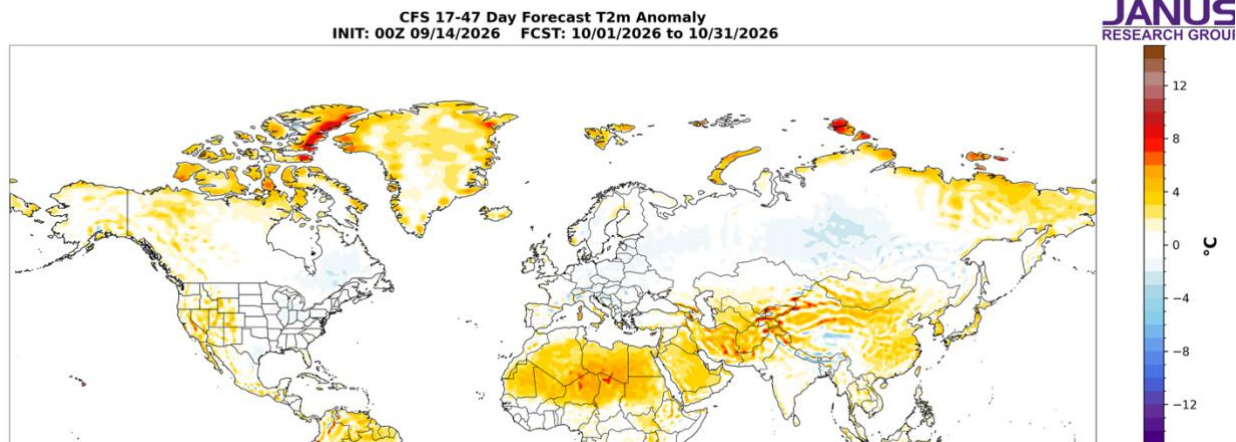


Figure 13. Forecasted average surface temperature anomalies ($^{\circ}\text{C}$; shading) across the Northern Hemisphere for Oct 2026. The forecasts are from the 00Z 14 Sep 2026 CFS.

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 remain impressive.

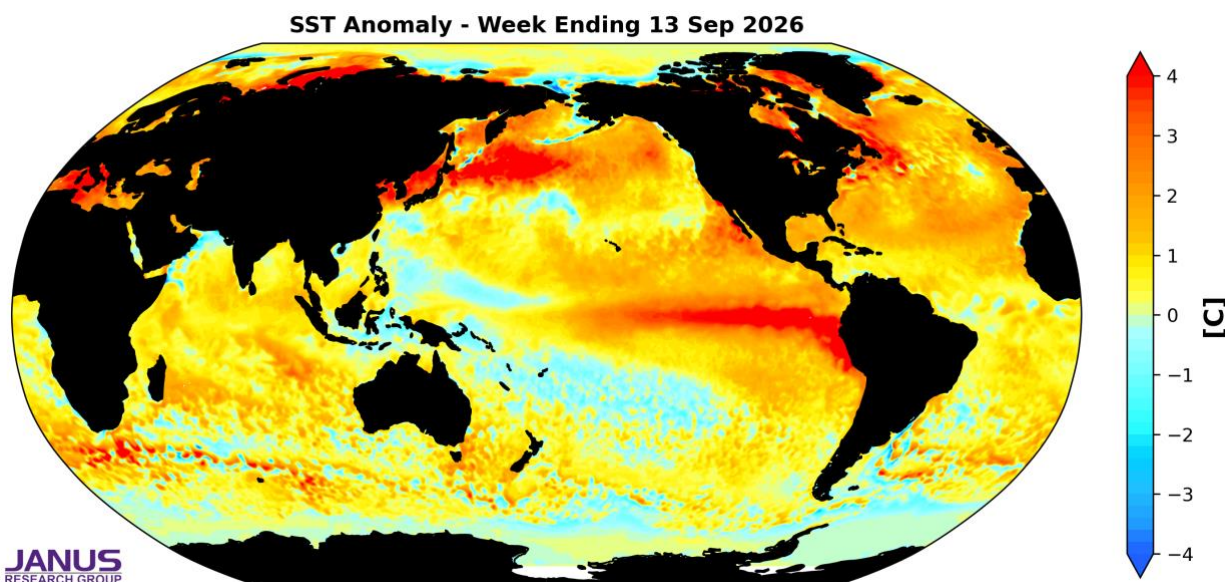


Figure 14. The latest daily-mean global SST anomalies for week ending 14 Sep 2026.

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 remain weak where mostly no phase is favored but may briefly pop into phase eight the next two weeks (**Figure 15**). Phase eight favors ridging over eastern North America; therefore, it seems that the MJO may be having some influence on North American weather next week. But admittedly this is outside of my expertise.

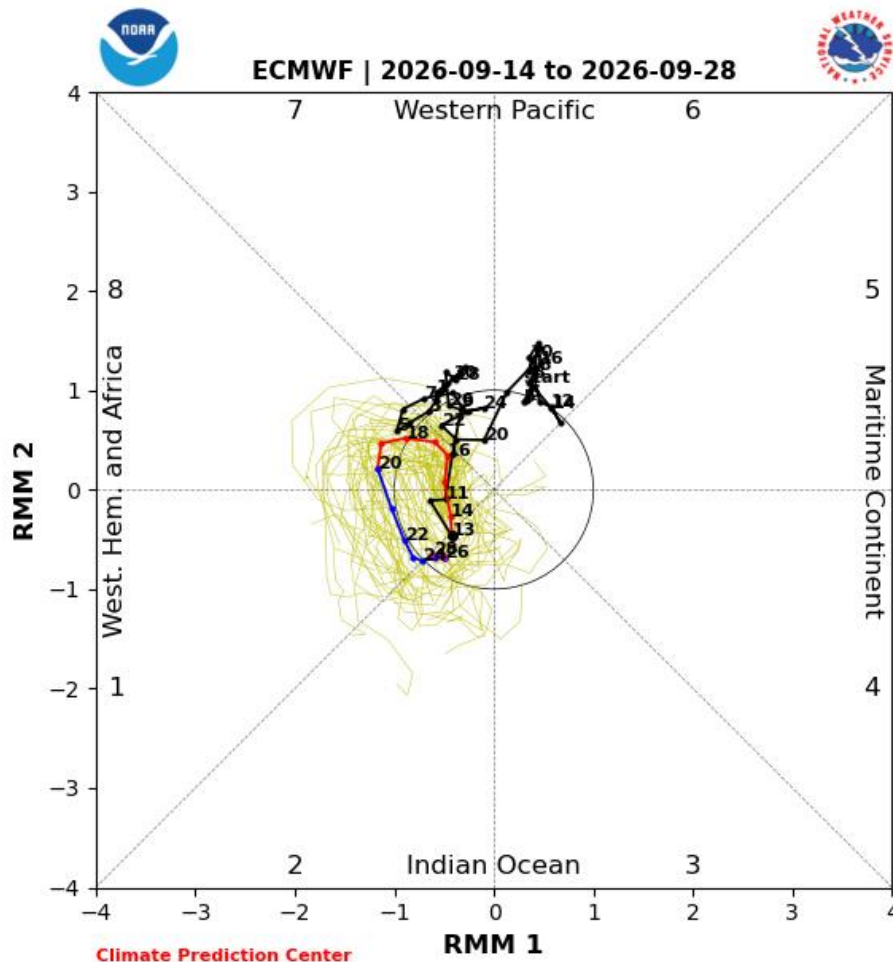


Figure 15. Past and forecast values of the MJO index. Forecast values from the 00Z 14 Sep 2026 ECMWF model. Yellow lines indicate individual ensemble-member forecasts, with the green line showing the ensemble-mean. A measure of the model 'spread' is denoted by the gray shading. Sector numbers indicate 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>

Get Detailed Seasonal Weather Intelligence with [sCast](#)

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!