

Arctic Oscillation and Polar Vortex Analysis and Forecasts

October 13, 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 positive as pressure/geopotential height anomalies across the Arctic are currently mostly negative and the AO is predicted to trend negative the next two weeks as pressure/geopotential height anomalies are predicted to become increasingly positive the next two weeks. The North Atlantic Oscillation (NAO) is currently positive with mostly negative pressure/geopotential height anomalies across the mid-latitudes of the North Atlantic, and the NAO is predicted to trend negative the next two weeks as pressure/geopotential height anomalies are predicted to become mostly positive across Greenland the next two weeks.
- This week predicted troughing/negative geopotential height anomalies across Greenland will favor ridging/positive geopotential height anomalies across much of Europe centered near the United Kingdom (UK) except for troughing/negative geopotential height anomalies across Southeastern Europe. Then next week increasing ridging across Greenland will favor troughing across Northern Europe and expanding southward. This pattern will favor normal to above normal temperatures across most of Europe except for normal to below normal temperatures in the Balkan States and Turkey this week. However next week temperatures will become increasingly normal to below normal across much of Europe.
- This week ridging/positive geopotential height anomalies centered across the Urals will support expanding troughing/negative geopotential height anomalies centered on Central

Asia. However next week, deepening European troughing will favor strengthening ridging across East Asia. This pattern favors widespread normal to above normal temperatures across Asia the next two weeks except for normal to below normal temperatures across Central Asia this week and then Western Russia next week.

- Looking like rapid transitions across Northern America the coming weeks. This week the predicted atmospheric pattern across North America is ridging/positive geopotential height anomalies across Western Canada forcing troughing/negative geopotential height anomalies to the east across Eastern Canada and to the south across the Western across the United States (US). Then next week, the western North America troughing will deepen while eastern North America ridging strengthens. However, it is looking increasingly likely the pattern will quickly flip again by early November. This pattern will support widespread normal to above normal temperatures across much of the US and Canada with normal to below normal temperatures limited to Eastern Canada and the Western US this week and then next week normal to below normal temperatures will filter into the Northeastern US and spread up and down the west coasts of Canada and the US.
- I still find the early polar vortex behavior this season to be interesting. I made some predictions based on the upcoming Canadian Warming. How is the prediction going and what follows. Also another Siberian snow cover extent update.

Plain Language Summary

With half of fall over, it has featured widespread warmth across the Northern Hemisphere (see **Figure**). However, an ongoing stretched polar vortex (PV) brought cooler temperatures to East Asia and will this week to Eastern Canada and the Northeastern US (see **Figure 3**). However, a Canadian Warming will bring a temperature seesaw to the North Atlantic sector with warming in Canada and cooling in Europe and Western Russia (see **Figures 6 and 9**). Looking like a stretched PV will follow next in early November.

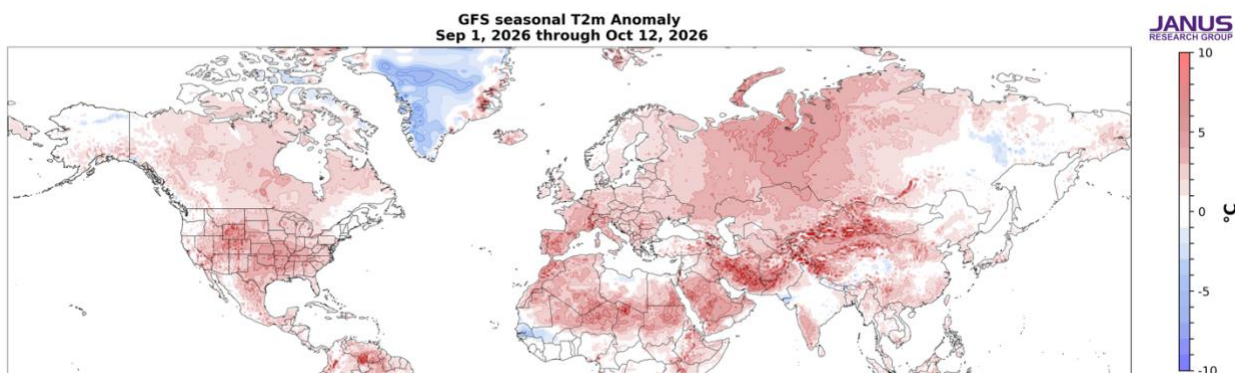


Figure. Estimate of the observed surface temperatures ($^{\circ}\text{C}$; shading) from 01 Sep to 12 Oct 2026 based on GFS initializations and the GFS forecast from the 13 Oct 2026 run.

Impacts

In a couple of social media posts during the first week of October ([1 Oct 2026](#) and [6 Oct 2026](#)), I tried to show how a long-range forecast can be derived from the likelihood of an upcoming Canadian Warming. I postulated that a milder temperature pattern for North America and Greenland blocking was a likely outcome and for this event, it was then almost certainly to be followed by a stretched polar vortex (PV). Support for both (or even three) forecasts did not exist in the dynamical model forecasts at the time of my own prognostication. The milder pattern across North America, especially Canada is now being predicted by all the models (see **Figure 9**).

In addition, all the models are now on board with high-pressure ridging across Greenland. Where the high-pressure ridging or blocking will be centered is still being debated by the models, but you can see that at the end of the animation of the Northern Hemisphere (NH) mid troposphere circulation, the blocking ends up squarely over Greenland (see **Figure i**). But regardless of the exact location of the high pressure center the implication for European weather is agreed among all the model forecasts, a turn to colder weather across the continent. This will be a noticeable departure from the weather across Europe, where for a long time now well above normal temperatures has been the rule. Now I don't expect this turn to colder weather to be of long duration. I don't believe this to be like a long-lived negative NAO period that can follow a sudden stratospheric warming. But is the atmosphere foreshadowing a key feature of the upcoming winter? I certainly don't know but I have seen lots of chatter on social media about how many of the dynamical models are predicting Greenland blocking and an overall negative NAO winter as a key feature of the winter months. Something to ponder.

Initialized 00Z 500 hPa HGT/HGTa 13-Oct-2026

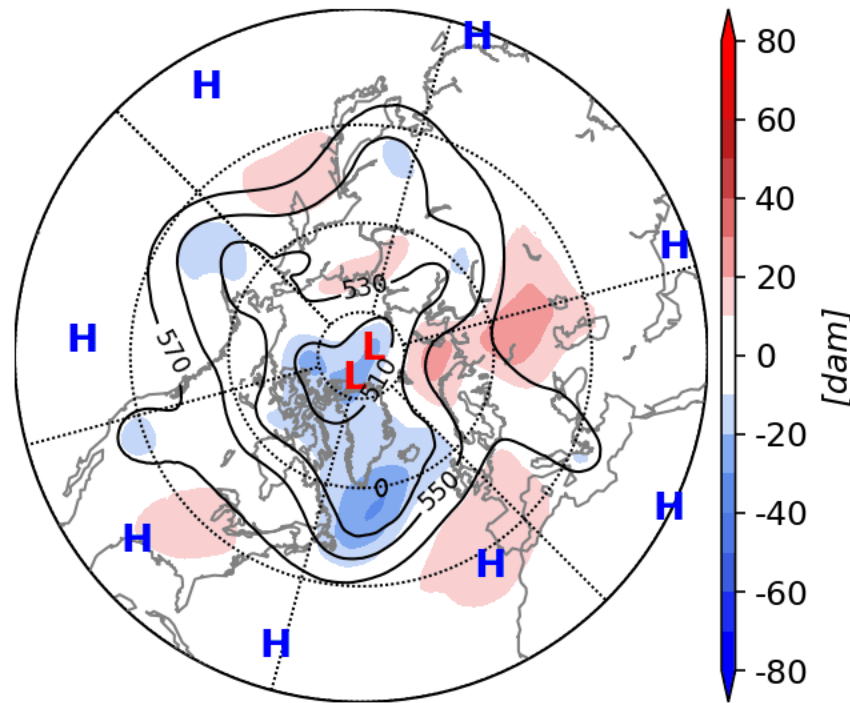


Figure i. Initialized 500 mb geopotential heights (dam; contours) and decameter anomalies (dam; shading) across the Northern Hemisphere for 13 Oct 2026 and forecasted from 14 Oct to 28 Oct 2026. The forecasts are from the 00Z 13 Oct 2026 GFS model.

What about the veracity of the last of my predictions – a stretched PV? No firm evidence of this yet in the weather model forecasts. At the end of the animation in **Figure i**, there is strong high-pressure ridging in the Gulf of Alaska and the west coast of Canada with troughing downstream over Eastern Canada. This strongly suggests a developing stretched PV at the end of the period. Though admittedly I don't see much evidence of it in the latest PV animation (see in **Figure ii**).

Initialized 00Z 10 hPa HGT/HGTa 13-Oct-2026

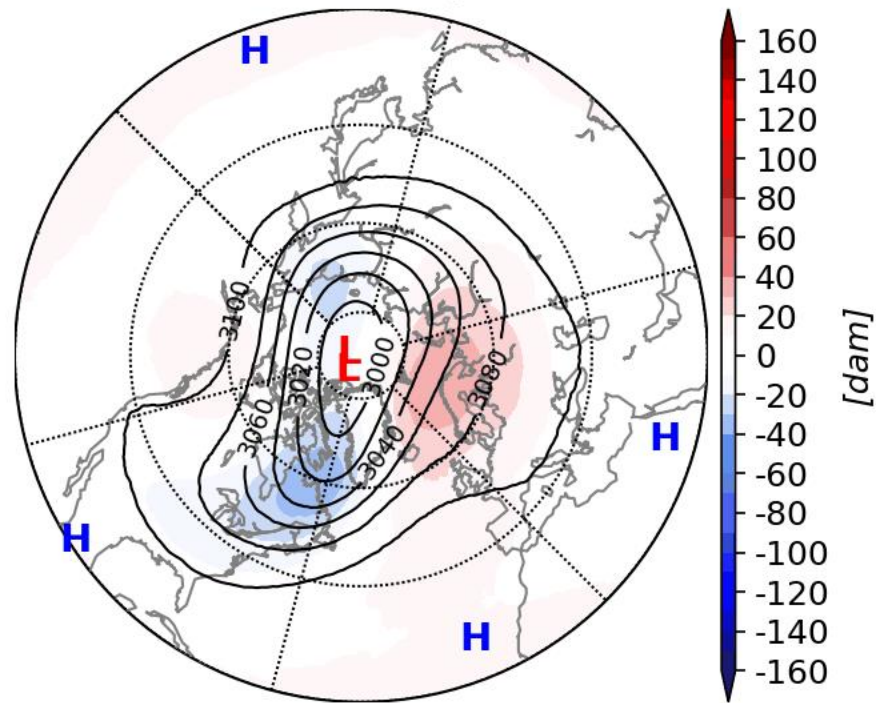


Figure ii. Initialized 10 mb geopotential heights (dam; contours) and decameter anomalies (dam; shading) across the Northern Hemisphere for 13 Oct 2026 and forecasted from 14 Oct to 28 Oct 2026. The forecasts are from the 00Z 13 Oct 2026 GFS model.

The PV animation starts with a stretched PV but then quickly transitions to a Canadian Warming, which takes us all the way through until the end of the PV animation. It seems to me that the model that is most bullish in transitioning from the Canadian Warming to a stretched PV is the European model. Though looking at the latest GFS and GPS ensembles, it does appear to me these models are trying hard to get there as well.

If my forecast of the stretched PV verifies, it seems highly likely that a western ridge/eastern trough pattern will once again establish itself in early November, and possibly even the very end of October. One stretched PV is unlikely to be enough to force the November monthly means, but two would probably do it. This is of course all highly speculative on my part but if we do somehow get two stretched PVs in November that sets up a very interesting juxtaposition of what November is suggesting for the winter and the inevitability of the super El Niño imprint on the upcoming North American winter. At least here in Boston the TV mets love to say as goes November so goes the winter. That will setup a very intriguing conundrum for these same TV mets – tow the party line and go with a mild winter guaranteed by the super El Niño or go with this popular rule of thumb? Maybe more wishcasting on my part but if by some chance it materializes,

grab the popcorn! I have a lot more I would like to share on the El Niño forecasts and their sense of inevitability, but I am running out of time, so it will have to wait for another day.

The Arctic sea ice melt growth season got off to a fast start helped by the consistently positive AO since the end of the melt season. Arctic sea ice has grown since the sea ice minimum of a month ago (see **Figure iii**). Sea ice in the North Pacific sector is actually very close to normal for this time of year and the deficit is really concentrated along the North Slope of Asia. As I thought, it is looking to me as highly likely that once again this late fall and early winter the negative sea ice anomalies will be focused in the North Atlantic rather than the North Pacific 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. Nothing is sure in life but death and taxes, so not claiming a fait accompli just yet.

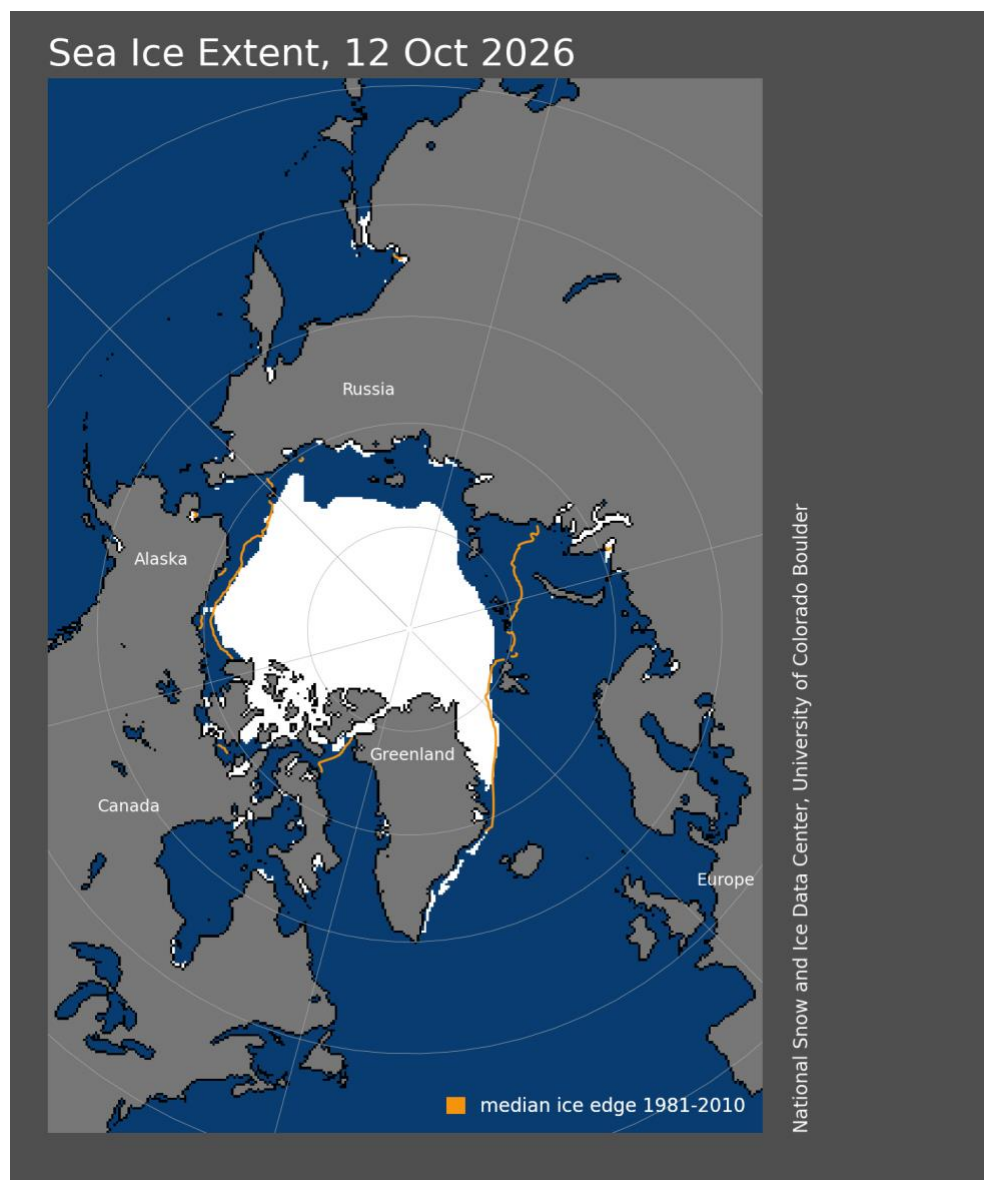


Figure iii. Arctic sea ice cover extent for 12 Oct 2026. White depicts ice covered areas and the orange contour the climatological extent of Arctic sea ice for the date. Plot taken from: <https://nsidc.org/sea-ice-today>

Since we are in the middle of October, my attention has turned to Siberian snow fall but to be honest not as much as I normally do at this time of year. Not because I am no longer interested but because of some unfortunate computer issues, I have been plagued with. But here is the latest update in **Figure iv**. I must thank my Janus colleagues John Galantowicz and Karl Pfeiffer, without whose assistance this plot would not be possible!

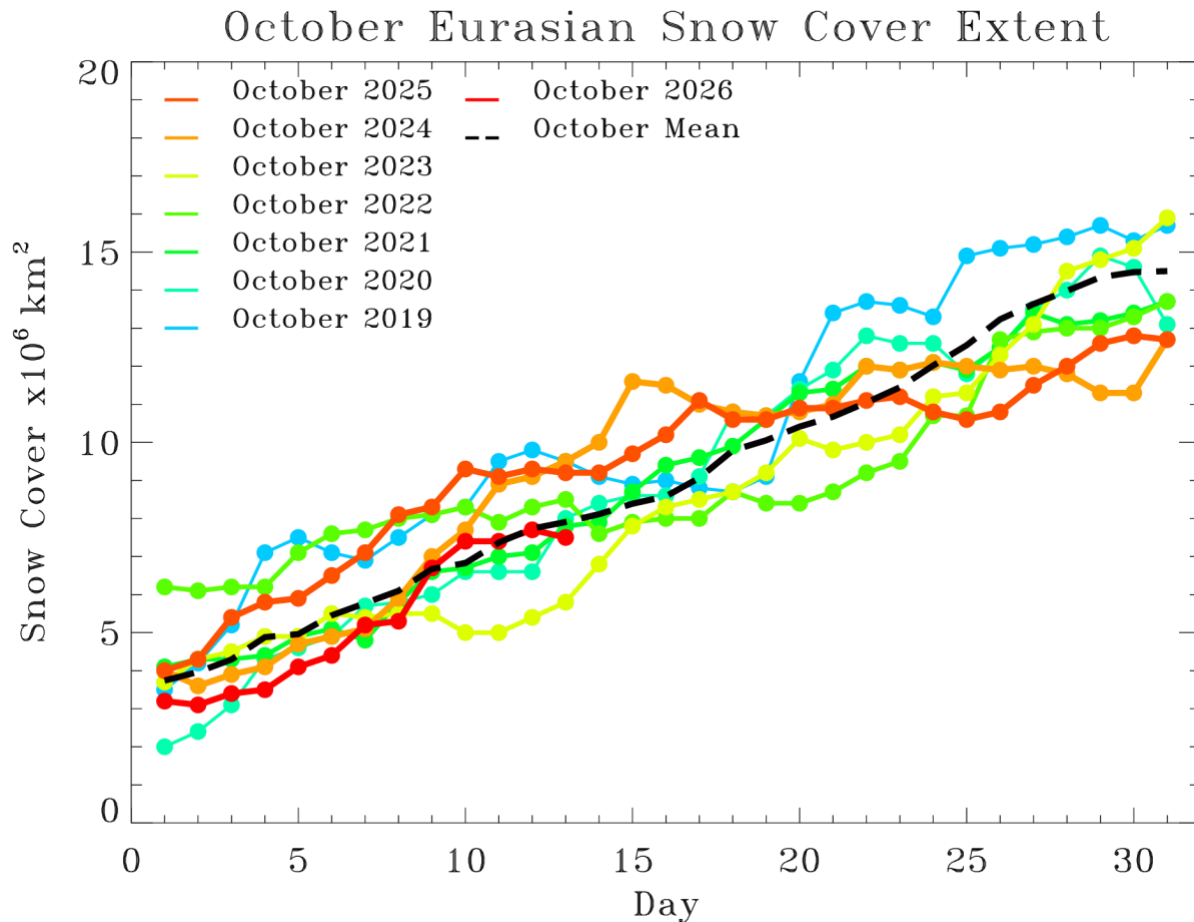


Figure iv. Daily Eurasian snow cover extent from 2019 through 2026. October 2026 shown in red. The long-term mean shown as a black dashed line.

Currently the snow cover advance has been mostly lackluster. It started slow but now is at a typical pace. It does seem that the atmospheric circulation is conducive for a more rapid advance but has yet to materialize. The models showing a much warmer pattern for Siberia for the end of October, but I am somewhat skeptical. If the forecasts for a more negative AO and Greenland blocking materialize that should support a more rapid advance of snow cover and not a slowdown. But as I have seen year after year the models struggle notoriously with predicting Siberian snow cover advance.

Relevant both to Eurasian snow cover advance and a stretched PV late October into early November, is the consensus forecast from all the weather models of expansive ridging coupled with relatively mild temperatures across the North American Arctic. That is often associated with a tripole pattern of temperatures across the mid-to high latitudes of cold across northern Eurasia including Siberia, warm Alaska, Northern Canada and Greenland and then cold again Southern Canada and the Northern US. Hey the CFS agrees with me (see **Figure 13**)! So, what possibly could go wrong. But on a more serious note, something to watch.

Maybe I am overly sensitive, but it seems that Eurasian or Siberian snow cover extent is the one winter predictor everyone loves to hate. I feel that the surface boundary forcing has received a bad reputation over the past decade and that continues until today. I continue to believe that it is a valuable tool in winter prediction and its predictive power has stayed impressively consistent ever since its introduction three decades ago now. But I readily admit how to measure the index to optimize its contribution to a winter forecast has evolved. I readily admit the relationship between snow cover extent and the AO has dropped off to the point that it is probably no longer useful or barely useful in making a winter AO or NAO forecast. This has probably been true since the mid 2010's. But in a continuation of what I wrote in the previous blog, I don't even think that the AO has the same winter predictive power it had before 2013.

I believe there has been a climate disrupter that has shuffled up the atmospheric building blocks. One obvious candidate for me is the large disappearance of Arctic sea ice especially in the Barents-Kara Seas. The once perennial sea ice cover in the Barents-Kara Seas suddenly transitioning to perennial open water could easily have a large influence on Eurasian snow cover and troposphere-stratosphere coupling. All of this is admittedly my own musings and nothing more. It would be great to do a thorough analysis of all that I have postulated but once again will have to wait for another day.

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.

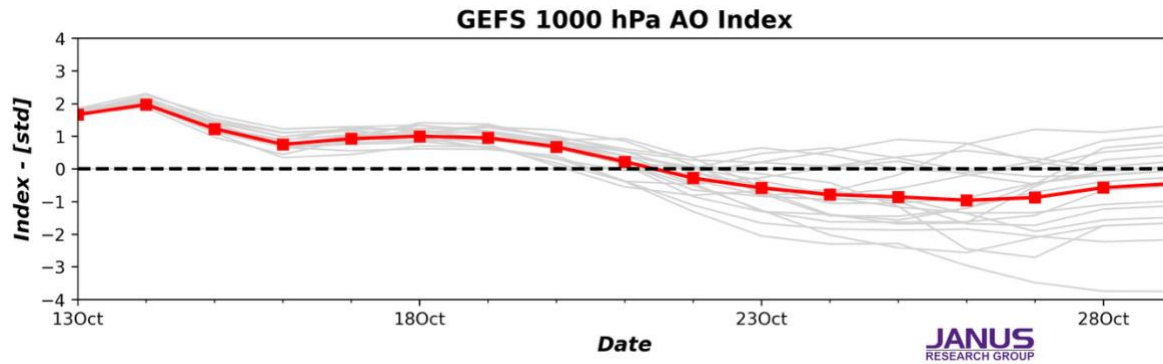


Figure 1. The predicted daily-mean AO at 1000 hPa from the 00Z 13 Oct 2026 GFS ensemble. Gray lines indicate the AO index from each individual ensemble member, with the ensemble mean AO index given by the red line with squares.

Predicted troughing/negative geopotential height anomalies across Greenland is predicted to support ridging/positive geopotential height anomalies across much of Europe centered near the UK with troughing to the southeast across the Eastern Mediterranean this week (**Figure 2**). This pattern will support widespread normal to above normal temperatures across much of Europe including the UK except for normal to below normal temperatures across the Balkans and Turkey 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 in Central Asia and Eastern 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 Asia and Eastern Siberia this week (**Figure 3**).

GEFS 1-5 Day Forecast 500 hPa Anomaly
INIT: 00Z 10/13/2026 FCST: 10/14/2026 to 10/18/2026

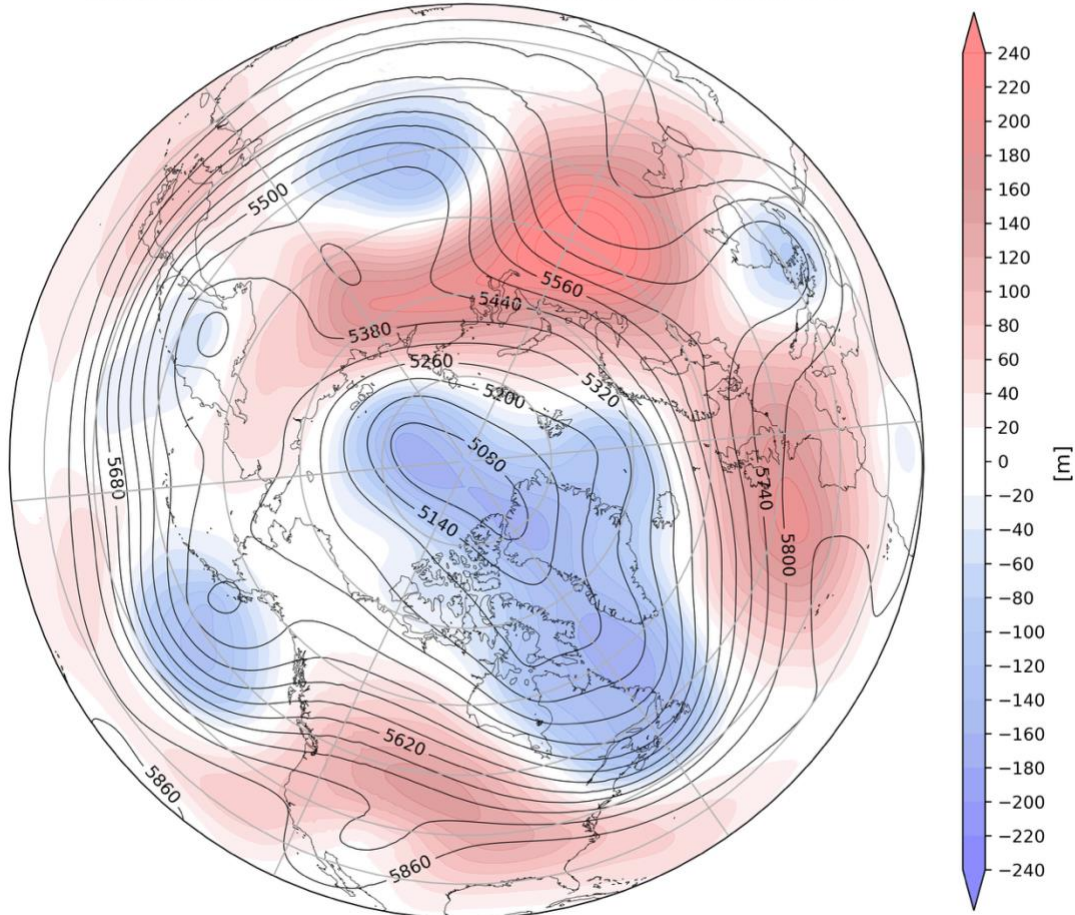


Figure 2. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 14 Oct to 18 Oct 2026. The forecasts are from the 00Z 13 Oct 2026 GFS ensemble.

The predicted pattern across North America this week is ridging/positive geopotential height anomalies centered across Western Canada forcing troughing/negative geopotential height anomalies across Eastern Canada forcing to the east and the Western US to the south this week (**Figure 2**). This pattern will favor normal to above normal temperatures across Alaska, Western Canada, the US West Coast and the Eastern US with normal to below normal temperatures across Eastern Canada, which will filter into New England and Four Corners region of the US this week (**Figure 3**).

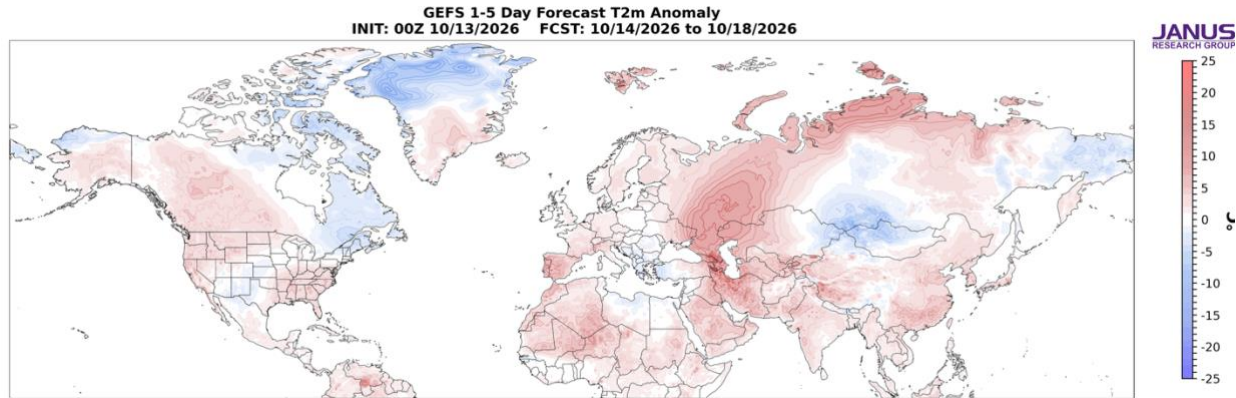


Figure 3. Forecasted surface temperature anomalies ($^{\circ}\text{C}$; shading) from 14 Oct to 18 Oct 2026. The forecasts are from the 00Z 13 Oct 2026 GFS ensemble.

Troughing and/or cold temperatures will support new snowfall across Northern Norway, Southern Siberia and the Tibetan Plateau this week (**Figure 4**). Troughing and/or cold temperatures will support new snowfall across eastern Alaska and Northern and Eastern Canada this week (**Figure 4**).

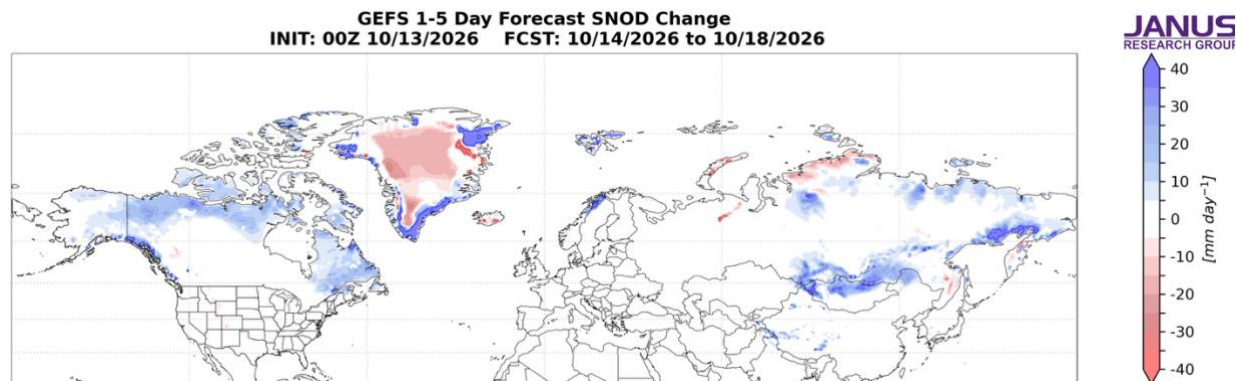


Figure 4. Forecasted snowfall (mm/day; shading) from 14 Oct to 18 Oct 2026. The forecasts are from the 00Z 13 Sep 2026 GFS ensemble.

Near-Mid Term

Next week

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

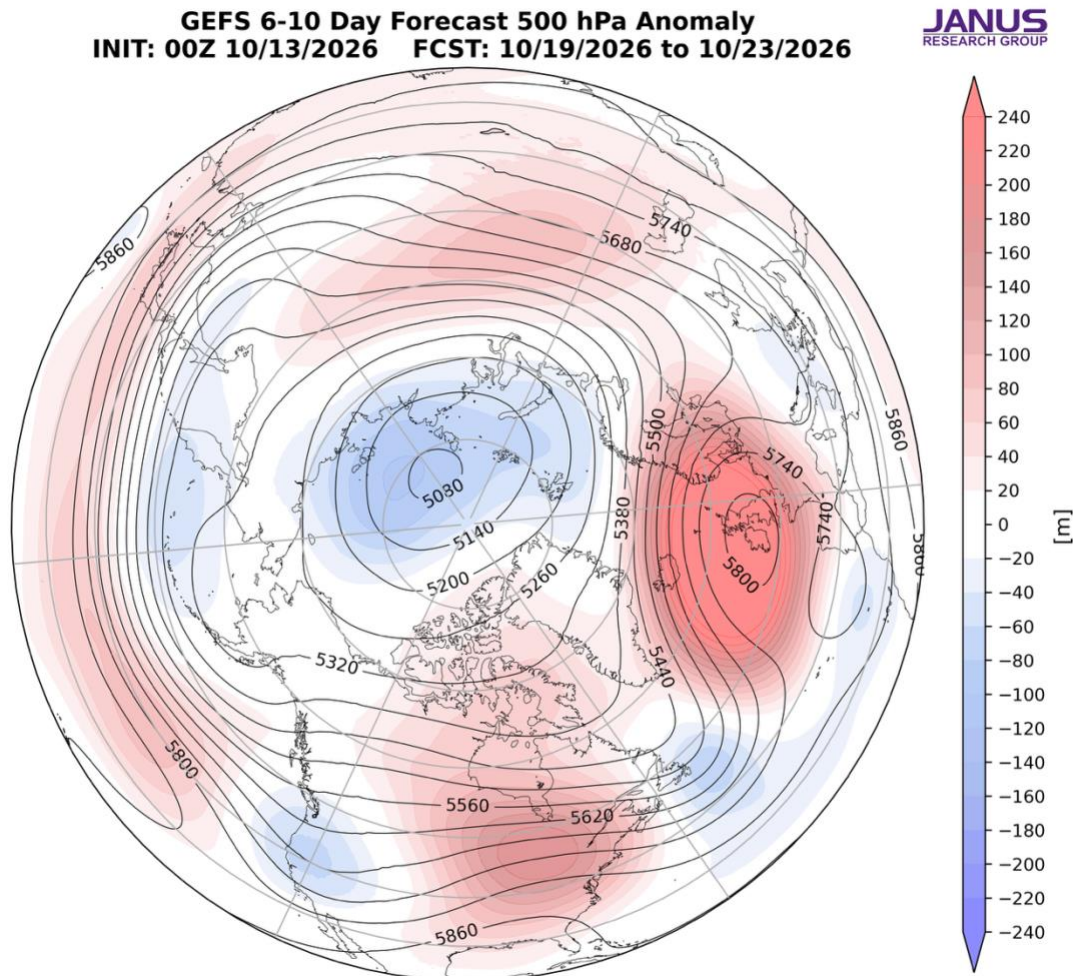


Figure 5. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 19 Oct to 23 Oct 2026. The forecasts are from the 00Z 13 Oct 2026 GFS ensemble.

Persistent and strengthening ridging/positive geopotential height anomalies centered near the UK will continue to support troughing/negative geopotential height anomalies across the Mediterranean this period (**Figure 5**). The pattern will support widespread normal to above normal temperatures across Europe including the UK except for normal to below normal temperatures across many of the Mediterranean countries this period (**Figure 6**). Ridging/positive geopotential height anomalies centered across Central Asia will support

troughing/negative geopotential height anomalies across Northeast 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 Northeast Asia but focused across Mongolia this period (**Figure 6**).

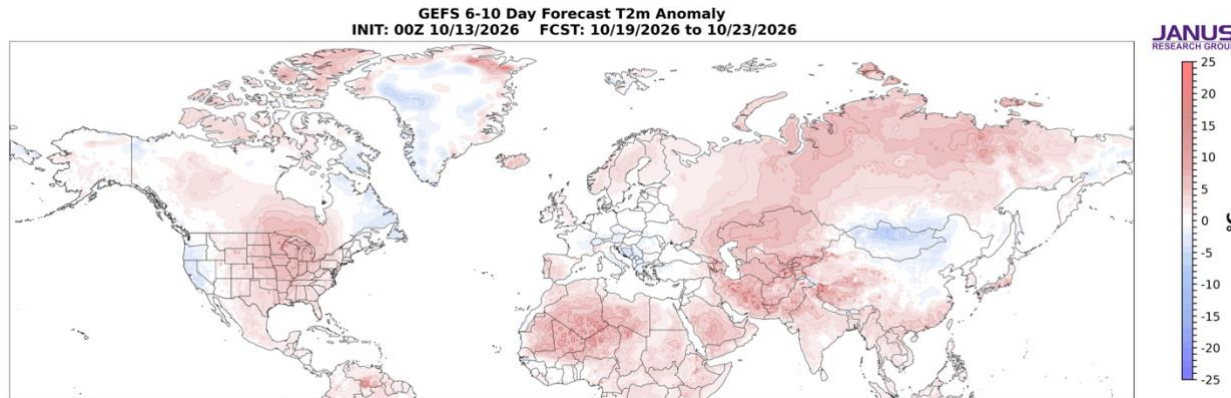


Figure 6. Forecasted surface temperature anomalies ($^{\circ}\text{C}$; shading) from 19 Oct to 23 Oct 2026. The forecasts are from the 00Z 13 Oct 2026 GFS ensemble.

In response to a Canadian Warming, ridging/positive geopotential height anomalies will dominate most of North America with troughing/negative geopotential height anomalies limited to the west coasts of Canada and the US this period (**Figure 5**). This pattern will favor widespread normal to above normal temperatures widespread across Alaska, much of Canada and the US with normal to below normal temperatures across the west coasts of Canada and the US and with some residual cool temperatures in the Canadian Maritimes and New England this period (**Figure 6**).

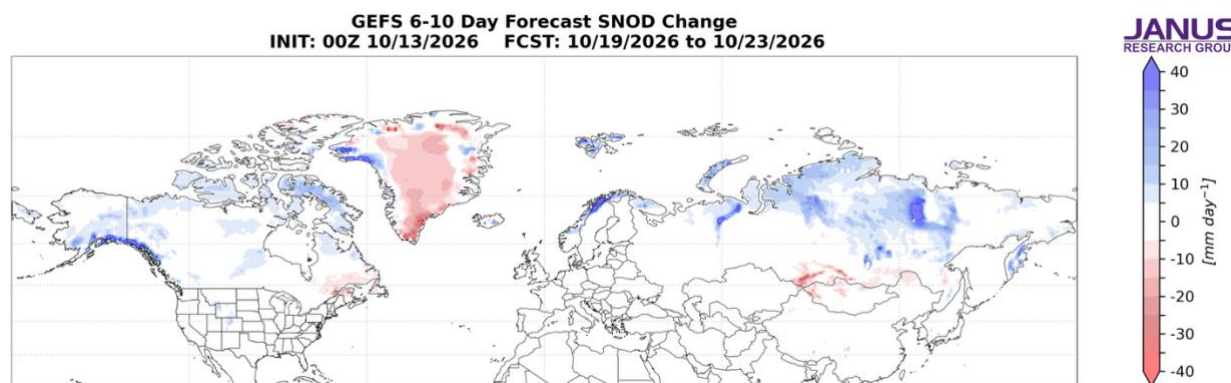


Figure 7. Forecasted snowfall rate (mm/day; shading) from 19 Oct 2026 to 23 Oct 2026. The forecasts are from the 00Z 13 Oct 2026 GFS ensemble.

Troughing and/or cold temperatures will support new snowfall across Northern Norway, Northern and Central Siberia while warm temperatures will cause snowmelt in Central Asia this period (**Figure 7**). Troughing and/or cold temperatures will support new snowfall across southern and eastern Alaska and Northern and Eastern Canada while warm temperatures will cause snowmelt in southern Quebec this period (**Figure 7**).

Mid Term

Week Two

With predicted mostly positive geopotential height anomalies across the Arctic and mixed geopotential height anomalies across the mid-latitudes this period (**Figure 8**), the AO will likely turn negative this period (**Figure 1**). With predicted positive pressure/geopotential height anomalies across Greenland (**Figure 8**), the NAO will likely turn negative this period as well.

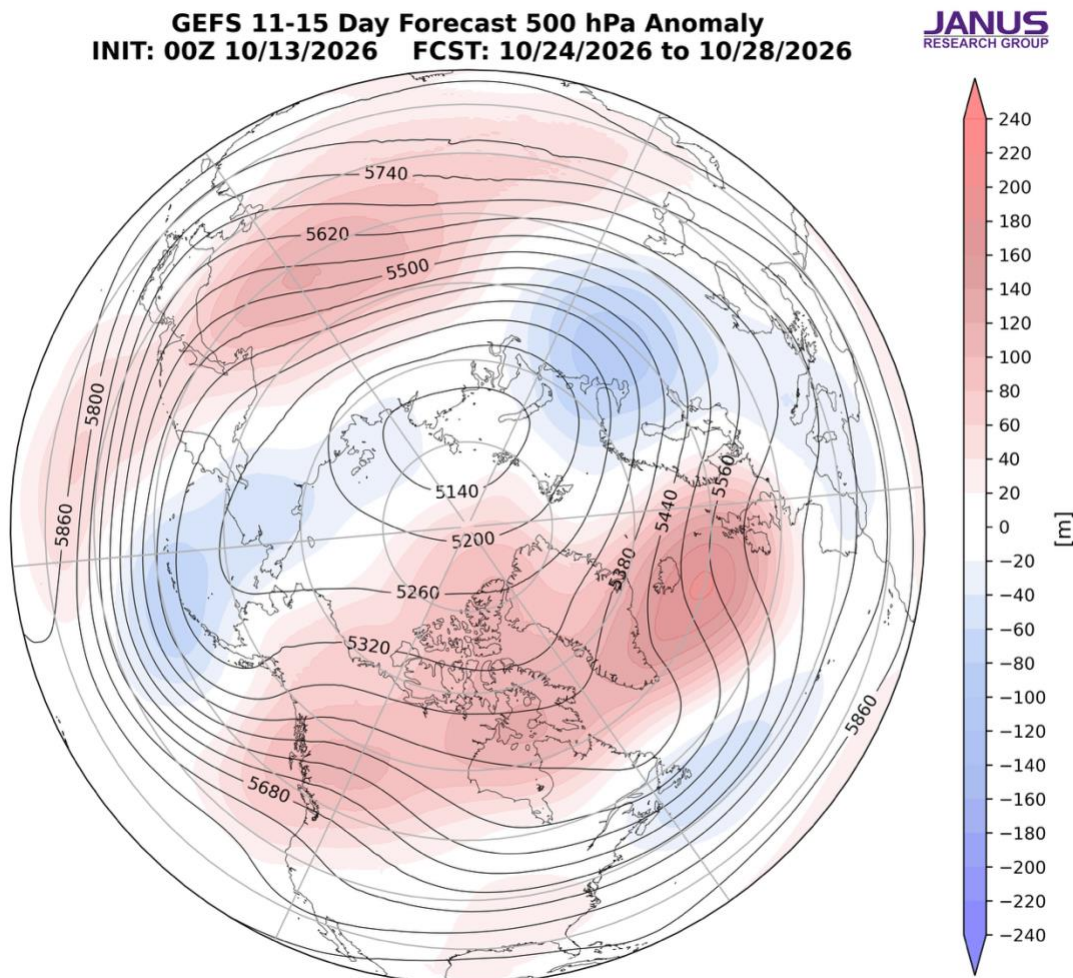


Figure 8. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 24 Oct to 28 Oct 2026. The forecasts are from the 00Z 13 Oct 2026 GFS ensemble.

As the previous ridging/positive geopotential height anomalies across Northern Europe continues to slide west towards Greenland, this will promote deepening troughing/negative geopotential height anomalies across Europe this period (**Figure 8**). This pattern will favor expanding normal to below normal temperatures across much of Europe including the UK except

for normal to above normal temperatures in Portugal and Southeastern Europe this period (**Figures 9**). Deepening troughing/negative geopotential height anomalies across Europe will in turn promote strengthening ridging/positive geopotential height anomalies centered across East Asia this period (**Figure 8**). This pattern favors widespread normal to above normal temperatures across most of Asia especially Central Asia with normal to below normal temperatures limited to Western Russia and parts of Eastern Siberia this period (**Figure 9**).

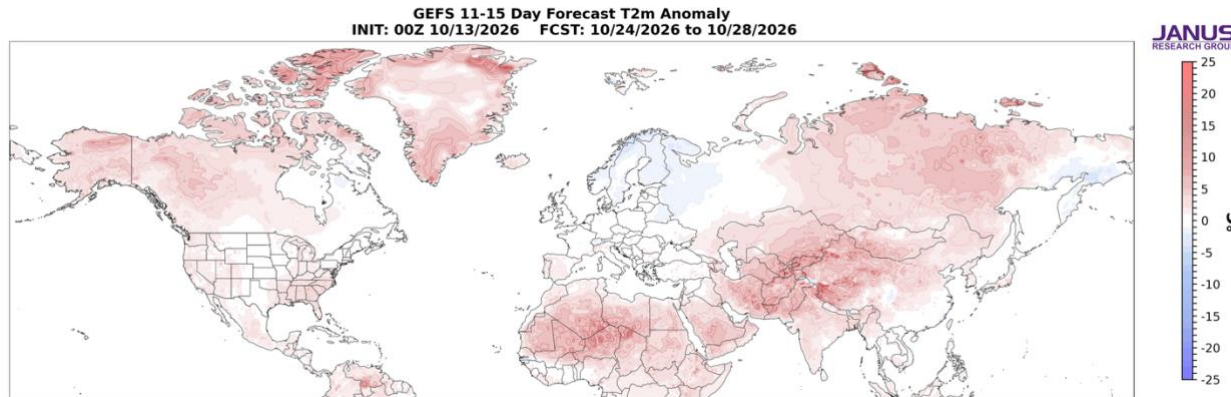


Figure 9. Forecasted surface temperature anomalies ($^{\circ}\text{C}$; shading) from 24 Oct to 28 Oct 2026. The forecasts are from the 00Z 13 Oct 2026 GFS ensemble.

Ridging/positive geopotential height anomalies are predicted to continue sloshing around North America sliding over to across Alaska, Western Canada and the Western US forcing deepening troughing/negative geopotential height anomalies across Eastern Canada and the Eastern US this period (**Figure 8**). This pattern supports widespread normal to above normal temperatures across Alaska, much of Canada and the US, though my expectations would be for cooling temperatures across Eastern Canada and Eastern US possibly beginning this period (**Figure 9**).

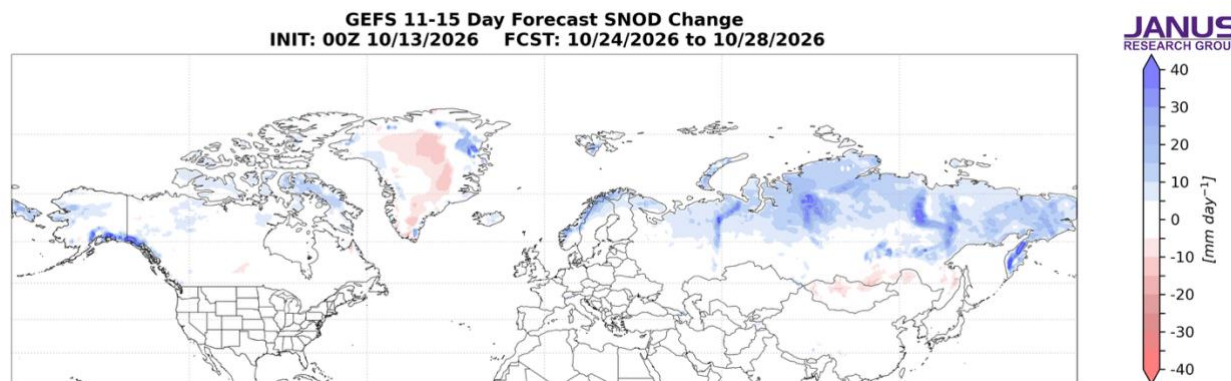


Figure 10. Forecasted snowfall (mm/day; shading) from 24 Oct to 28 Oct 2026. The forecasts are from the 00Z 13 Oct 2026 GFS ensemble.

Troughing and/or cold temperatures will support new snowfall across Norway, and much of Siberia while warm temperatures will cause snowmelt in Mongolia this period (**Figure 10**). Troughing and/or cold temperatures will support new snowfall across southern and western Alaska and the West Coast of and Northern Canada this period (**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 troposphere with warm/positive PCHs in the mid- to lower-stratosphere troposphere (**Figure 11**). However next week, the warm/positive PCHs in the lower stratosphere are predicted to start descending eventually even reaching the lower troposphere.

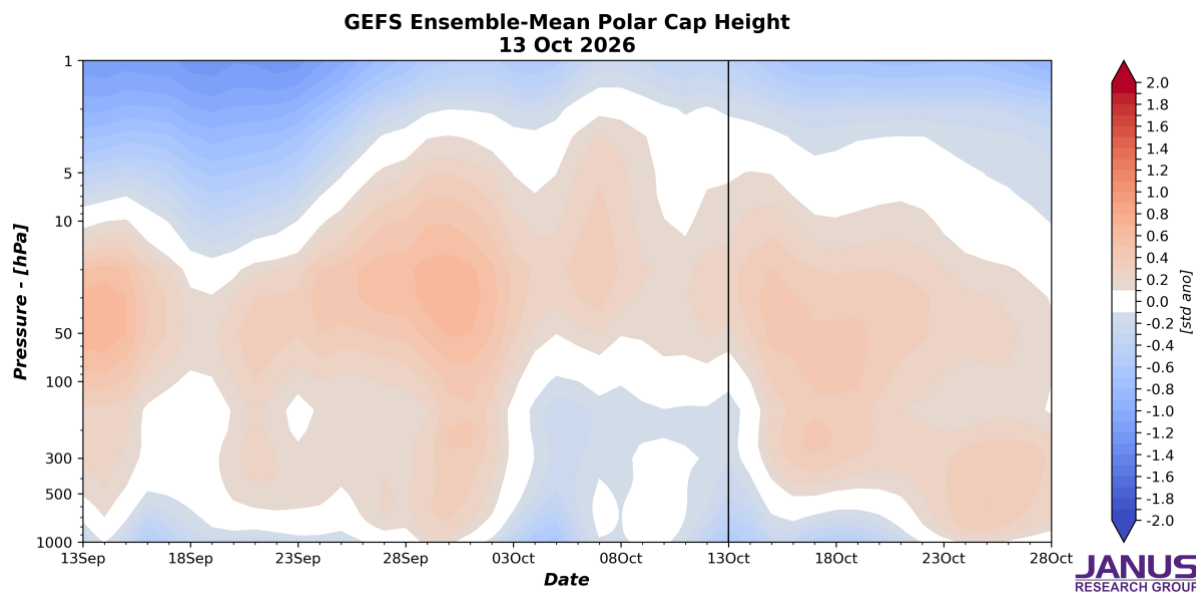


Figure 11. Observed and predicted daily polar cap height (i.e., area-averaged geopotential heights poleward of 60°N) standardized anomalies. The forecast is from the 00Z 13 Oct 2026 GFS ensemble.

This week the predicted cold/negative in the lower troposphere (**Figure 11**) are consistent with the predicted positive surface AO (**Figure 1**). However, beginning next week and the warm/positive PCHs descend through the troposphere (**Figure 11**) the surface AO is predicted to trend negative (**Figure 1**).

CFS 500 hPa Forecast Anomaly Nov 2026
Valid as of 13 Oct 2026

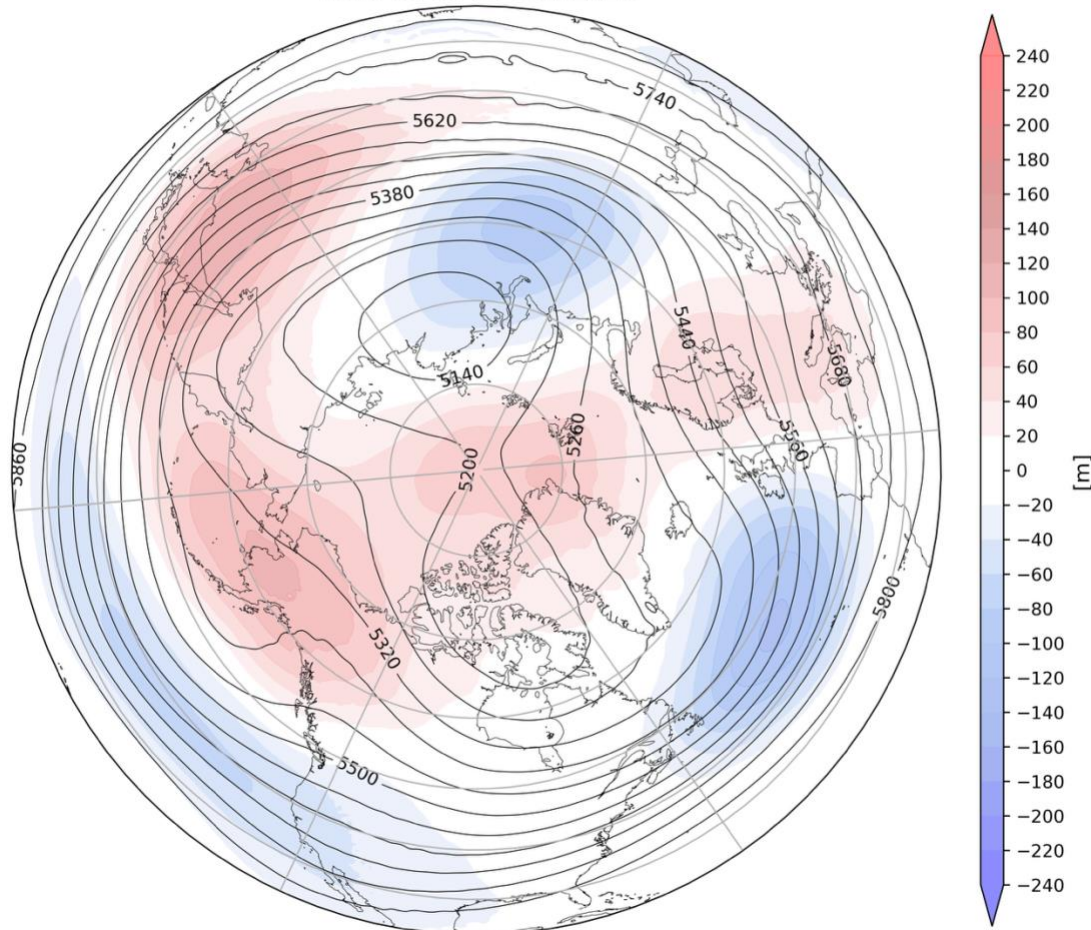


Figure 12. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere for Nov 2026. The forecasts are from the 00Z 13 Oct 2025 CFS.

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 stretching from Central Europe across the Central Arctic including northern Greenland and into the Bering Sea and East Asia with troughing across the mid-latitudes of the North Atlantic, Northern Asia, the mid-latitudes of the North Pacific, Eastern Canada and the Eastern US (**Figure 12**). This pattern favors seasonable to relatively warm temperatures across Western and Central Europe, the Southern half of Asia including the Arabian Peninsula, the Tibetan Plateau, Pakistan and Afghanistan, Northeastern Siberia, Alaska, Western and Northern Canada and the Western US with seasonable to relatively cool temperatures across the Eastern Europe, much of Northern Asia, Southern and Eastern Canada and the Central and Eastern US (**Figure 13**). This pattern

clearly projects onto the pattern of the negative AO, but I think it also suggests a stretched PV. Not saying I am all in on this CFS forecast but I am intrigued.

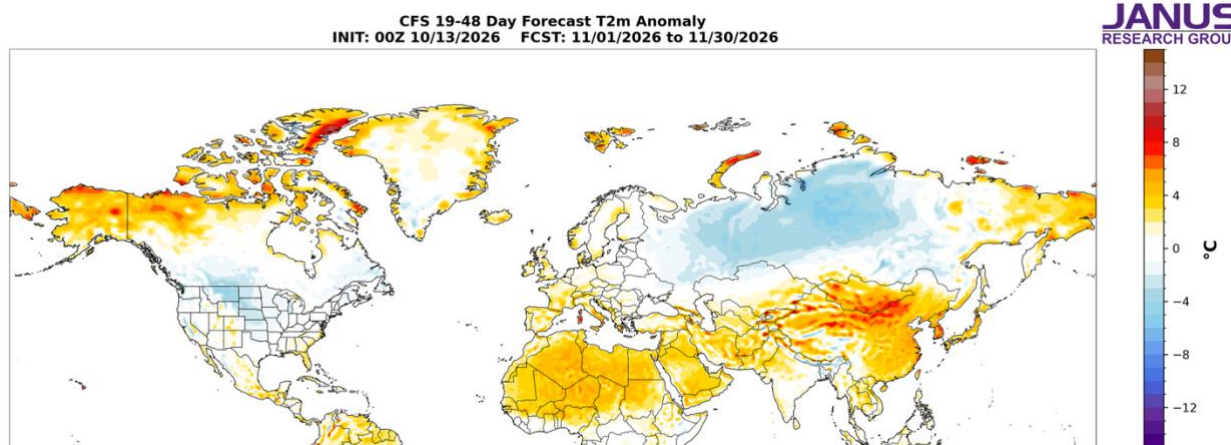


Figure 13. Forecasted average surface temperature anomalies (°C; shading) across the Northern Hemisphere for Nov 2026. The forecasts are from the 00Z 13 Oct 2026 CFS.

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. The El Niño is likely close to its peak and is expected to become the strongest El Niño on record. 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.

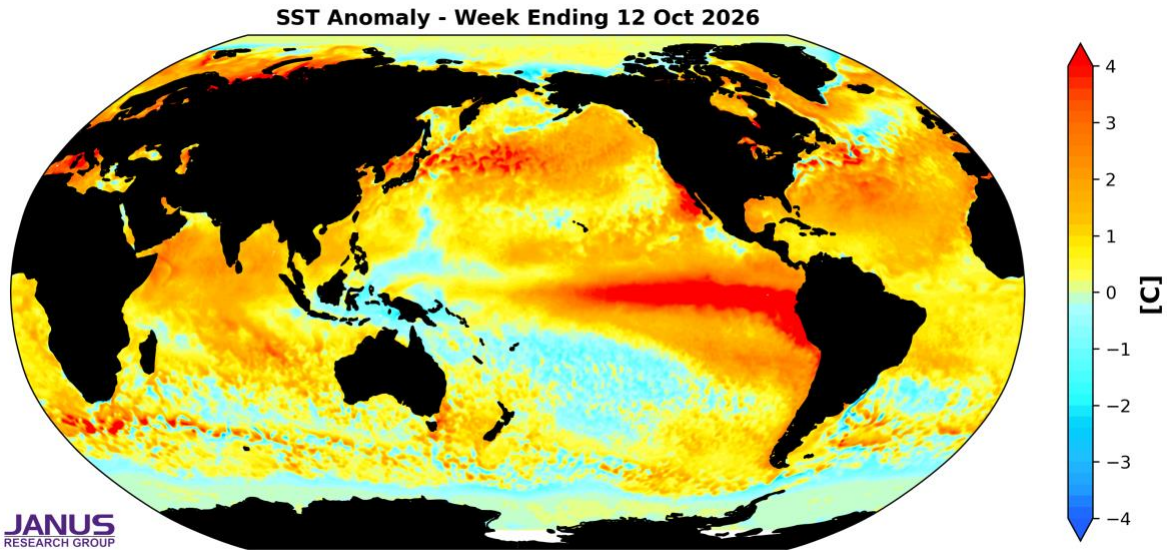


Figure 14. The latest daily-mean global SST anomalies for week ending 12 Oct 2026.

Madden Julian Oscillation

Currently the Madden Julian Oscillation (MJO) is weak but still in phase one (**Figure 15**), and the forecasts are for the MJO to remain weak where mostly no phase is favored but may pop into phase two but barely the next two weeks (**Figure 15**). Phase one favors strong ridging over eastern North America with troughing in western North America while phase two mostly favors troughing across Alaska and Canada with ridging across the 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.

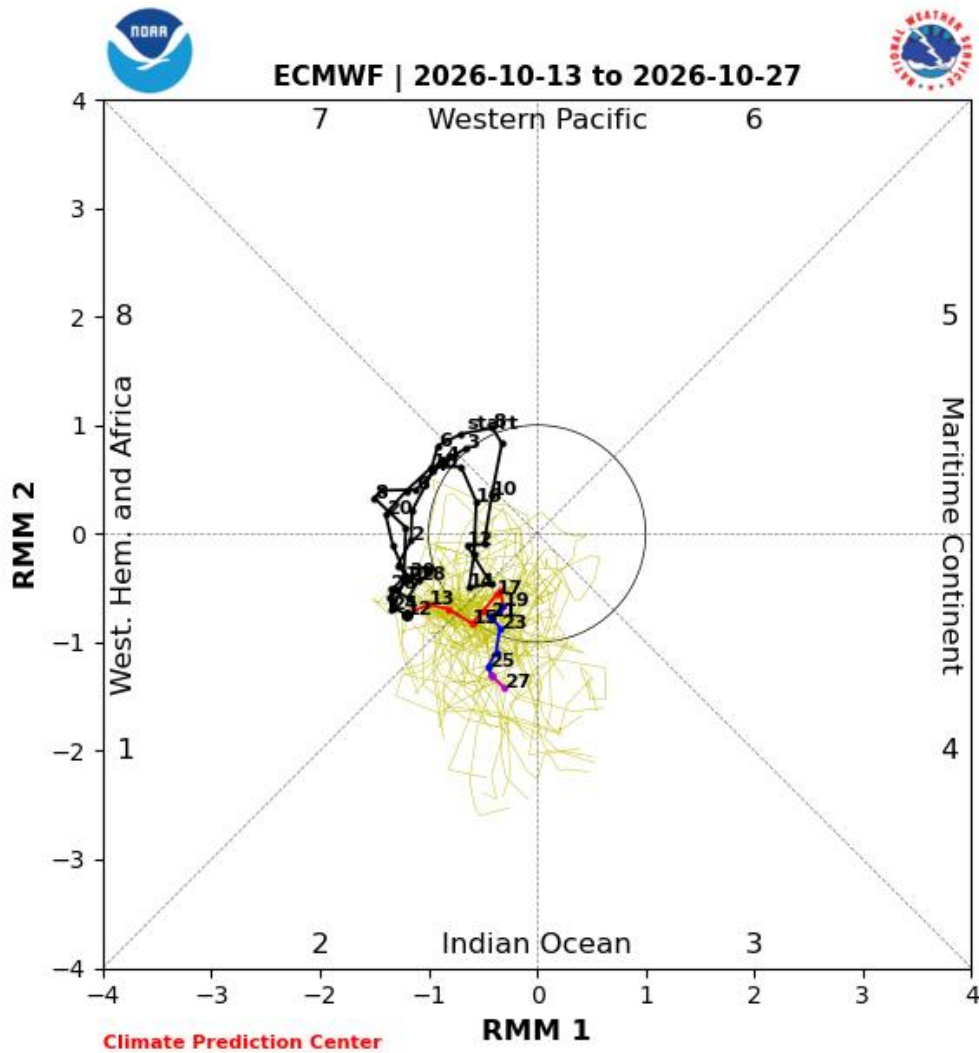


Figure 15. Past and forecast values of the MJO index. Forecast values from the 00Z 13 Oct 2026 ECMWF model. Yellow lines indicate individual ensemble-member forecasts, with the green line showing the ensemble-mean. A measure of the model 'spread' is denoted by the gray shading. Sector numbers indicate 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!