JANUS RESEARCH GROUP

Arctic Oscillation and Polar Vortex Analysis and Forecasts

November 24, 2025

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 and is predicted to remain near neutral to possibly positive the next two weeks as pressure/geopotential height anomalies across the Arctic are currently mixed and are predicted to remain mostly mixed the next two weeks. The North Atlantic Oscillation (NAO) is currently neutral as weak pressure/geopotential height anomalies dominate across Greenland, and the NAO is predicted to remain neutral to positive the next two weeks as pressure/geopotential height anomalies are predicted to remain mostly negative but weak across Greenland the next two weeks.
- The transition from ridging/positive geopotential height anomalies to troughing across Greenland will still support troughing/negative geopotential height anomalies across much of Europe this week but then next week ridging/positive geopotential height anomalies will strengthen across Europe. This week, normal to below normal temperatures will be widespread across Europe including the United Kingdom (UK), except for normal to above normal temperatures in Southeastern Europe. However next week normal to above normal temperatures will spread northward across much of Europe including the UK.
- The next two weeks the general pattern across Asia is ridging/positive geopotential height anomalies in Western Asia and Eastern Siberia supporting troughing/negative geopotential height anomalies across Northern and Eastern Eastern Asia. This pattern favors normal to above normal temperatures across Western and Southern Asia and Eastern Siberia with

normal to below normal temperatures beginning in Western and Central Siberia and spreading southeastward into Northeast Asia.

- The general pattern across North America the next two weeks is ridging/positive geopotential height anomalies across western North America supporting deepening troughing/negative geopotential height anomalies in eastern North America. This patten will favor normal to below normal temperatures building in Western Canada and spreading across central and Eastern Canada and into the Central and Eastern United States (US). During the second week of December cold air could build in Alaska and Northwestern Canada and spread south and east.
- The focus this week is again in on the anomalous relatively large polar vortex (PV) disruption so early in the season and its impact on our weather. I also include the Janus winter temperature forecast.

Plain Language Summary

So far this fall, it has been relatively mild across the Northern Hemisphere (NH) continents with the biggest or maybe more accurately only exception of Siberia (see **Figure**). As I tweeted out what happens in Siberia doesn't stay in Siberia and if you look at the temperature forecasts, it is looking much colder for North America at least for the beginning of winter (see **Figures 6** and **9**). I do think that the fall temperature pattern across Eurasia has been supportive of a weaker polar vortex (PV) and it is again the focus of this week's blog. In today's blog I also include the winter temperature anomaly forecast for the Northern Hemisphere.

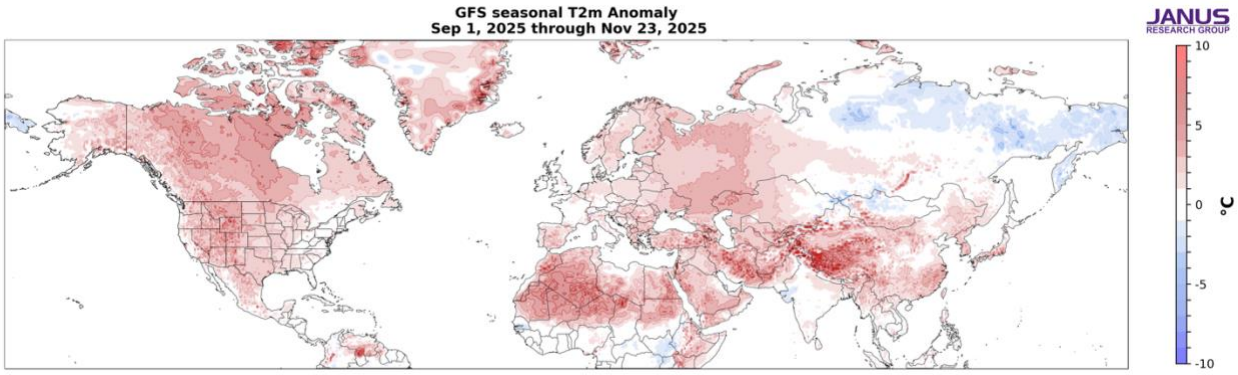

Figure. Estimate of the observed surface temperatures (°C; shading) from 01 Sep to 23 Nov 2025 based on GFS initializations and the GFS forecast from the 24 Nov 2025 run.

Impacts

I include in this week's blog the winter surface temperature anomaly forecast for the Northern Hemisphere.

Once again in general, the two-week forecast for the mid-tropospheric circulation is characterized by low pressure centered near the North Pole and high-pressure ridging kind of floating around the mid-latitudes (see **Figure i**). But clearly the main region of high-latitude blocking, over the next two weeks is predicted to strengthen over Alaska, the Gulf of Alaska and Eastern Siberia. This will focus cold air to the south both across cold air will build across Western and Central Siberia and spread into Northeast Asia. Meanwhile cold air will also build in Western Canada and then spread south and east across Canada and the US. Strong high-latitude blocking in the North Pacific sector rather than in the North Atlantic sector is a signature of a stretched polar vortex (PV)/wave reflection event rather than the more traditional sudden stratospheric warming (SSW) but more on that later. Though not showing up in the animation, high-latitude blocking is predicted to become focused in the Eurasian sector of the Arctic (see **Figure 8**). This pattern favors cold air being weighted in more towards North America than Eurasia.

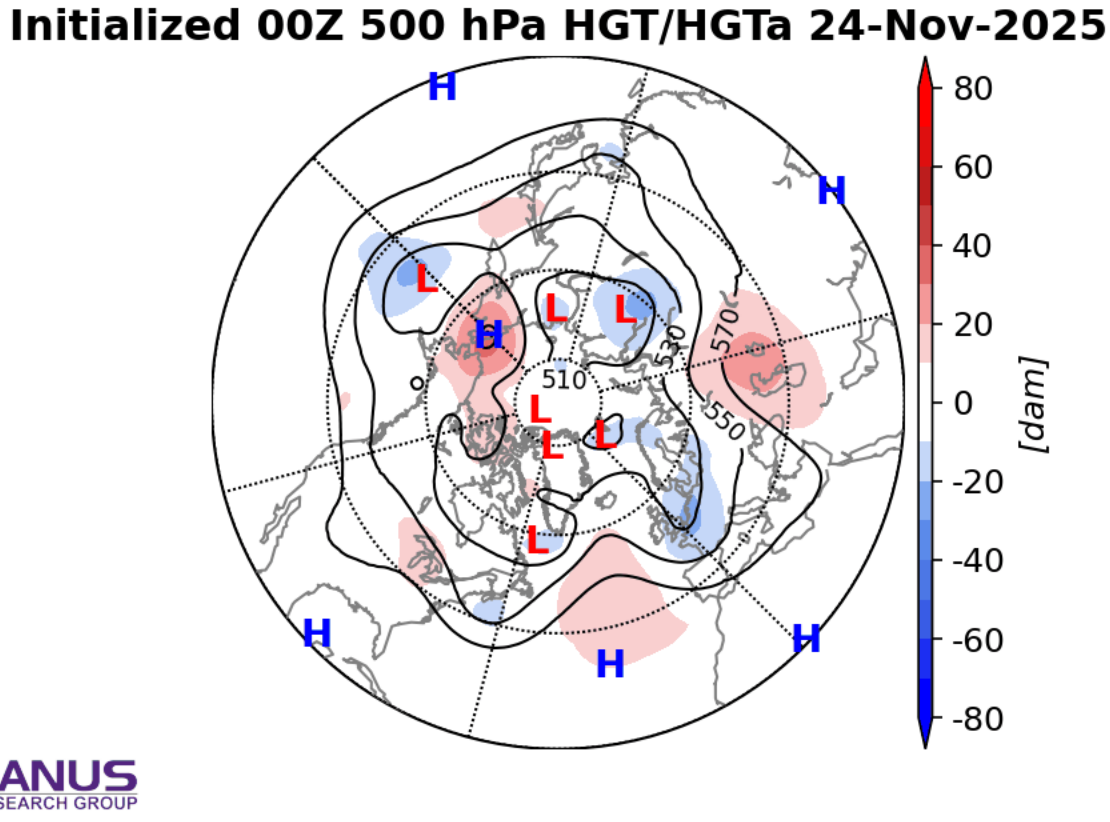

Figure i. Initialized 500 mb geopotential heights (dam; contours) and decameter anomalies (dam; shading) across the Northern Hemisphere for 24 Nov 2025 and forecasted from 25 Nov to 09 Dec 2025. The forecasts are from the 00Z 24 Nov 2025 GFS model ensemble.

The polar vortex (PV) has been getting lots of hype and not without reason. As I have been discussing we had one Canadian warming that transitioned to a stretched PV. Then a second Canadian warming that is trying its hardest to become a sudden stratospheric warming (SSW - defined as a reversal of the wind from westerly to easterly at 60°N and 10 hPa) or very close to it as shown in **Figure ii**. If an SSW is achieved this week, it would be unprecedented in the satellite era. As we showed in Agel et al. 2025 Canadian warmings are followed almost exclusively by stretched PVs or SSWs. Whether we see two stretched PVs or one stretched PV and one SSW, this is consistent with our analysis.

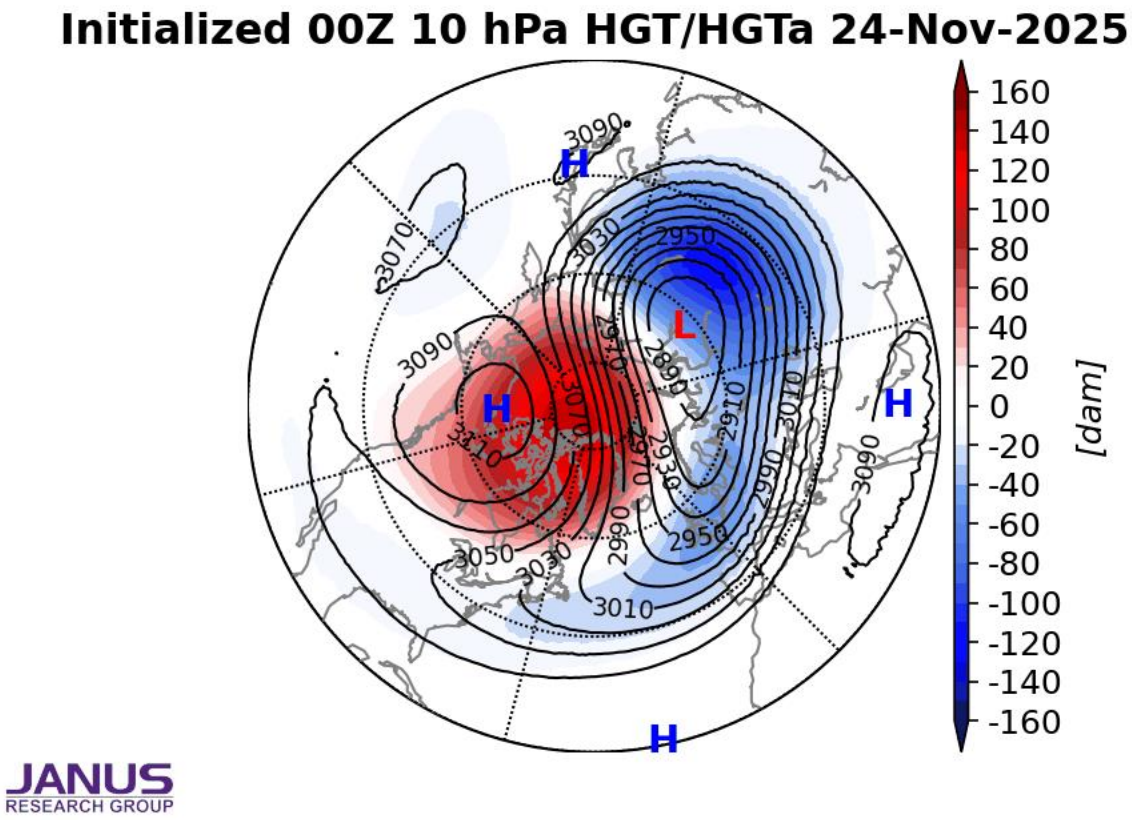

Figure ii. Forecasted average 10 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere for 24 Nov 2025 and forecasted from 25 Nov to 09 Dec 2025. The forecasts are from the 00Z 24 Nov 2025 GFS model ensemble.

Over the past two weeks I have discussed how I am skeptical that an SSW will actually happen and was leaning more towards a stretched PV or an SSW quickly evolving into a stretched PV. And to be honest still not sure how to define the current event as either just a long wind-up into a stretched PV or a true SSW that quickly morphed into a stretched PV through wave reflection of Rossby wave energy. But what I am not conflicted about is that as far as how it couples with the troposphere and the influence on our weather, it is a classical stretched PV and to argue will it or won't it be recorded in the annals of PV history as an SSW is a distraction from that. I guess

people like records, and it is already in unprecedented territory but it is really mostly of academic interest and not practical interest. I actually believe that even if it achieves SSW status (hey I am rooting for that as well) its impacts on our weather will not be as impressive as the non-SSW PV disruptions of November 2009 or December 2000. But to be fair, that is a question I won't know the answer to until January. Though as far as Europe, hard to see how this gets anywhere close to the weather of December 2009.

The energy diagnostics since late last week have really been highlighting a textbook wave reflection event. The one from today is probably the best one yet (see **Figure iii**). Wave energy goes up and east over Asia, reflects off the stratospheric PV and then heads down and east over North America where the energy is re-absorbed and amplifies the standing wave over North America (wester ridge-eastern trough) and delivering cold air from the Arctic south, east of the Rockies. The westward wave tilt with height over Asia and the eastward wave tilt with height over North America also nearly classic.

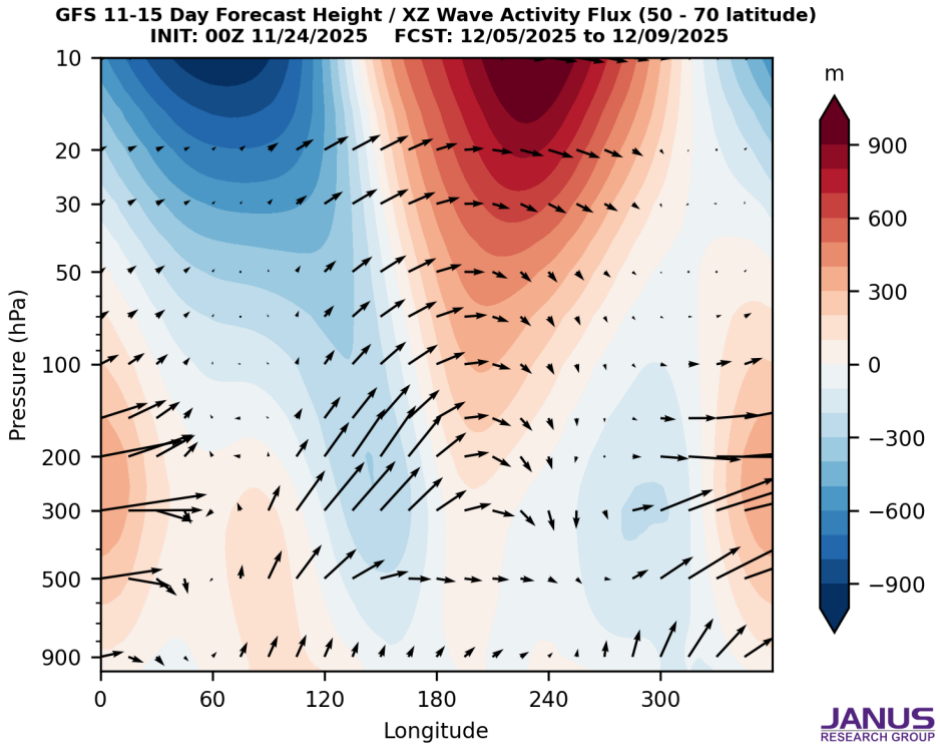

Figure iii. Longitude-height cross section of geopotential eddy height anomalies (shading) and wave activity flux (vectors) forecasted for 05 December through 09 December 2025. The forecasts are from the 00Z 24 November 2025 GFS ensemble.

And here are the big takeaways whether to frame the PV disruption as an SSW or stretched PV/reflective event:
Duration-

The influence on our weather from an SSW can be multiple weeks to up to two months, whereas that from a stretched PV is on the order of days to up to two weeks.
Intensity –
Our analysis and I believe others as well. The most severe winter weather (cold and snow) from SSWs is focused across Northern Asia and Northern Europe whereas for a stretched PV it is North America east of the Rockies.
And below I created a simple table for what impacts and timing to expect from an SSW compared to a stretched PV.

Region	Cold and snow with SSW	Cold and snow with Stretched PV
Europe	Yes (first two weeks)	No
Canada east of the Rockies	Yes (after first two weeks exception being NE Canada)	Yes (following Asia)
US east of the Rockies	Yes (after first two weeks but mild before)	Yes (following Canada)
East Asia	Yes (pre-SSW)	Yes (first)

This table is highly simplified and there is large event-to-event variability for both SSWs and stretched PVs. But if you take an average of all events, I think the table provides a first order expectation.

And speaking of duration the PV is literally accelerating from 0-60 in record time. That is impressive strengthening of the PV now predicted by the models. Not sure if the GFS forecast is reliable but I can't recall such a rapid warming of the stratospheric polar cap geopotential height anomalies (PCHs) as shown in **Figure 11**! I definitely need to look into that.

For me the big downside of thinking of the PV disruption as a stretched PV rather than an SSW is the precipitous drop in long term visibility in the weather. I will probably get grief for this but I see a metaphorical three-pronged fork in the road after the stretched PV in early December. The first would be that the reflective layer in the stratosphere that gives rise to the stretched PV also protects the PV from upwelling energy from the troposphere and allows it to strengthen, which is now clearly visible in the weather model forecasts. From here the PV can remain undisturbed and if allow, the PV will turn into a runaway train that is almost immune from disturbances from the troposphere and we have a beast of a PV for much of the winter and it remains mild to very mild across much of the NH. Great example of this is winter 2019/20.

The second scenario is that though there is short-term strengthening of the PV, high-latitude blocking resumes its assault on the PV and we see more stretched PVs and/or Canadian Warmings until finally there is knockout punch and a true SSW either in January or February. The December stretched PV followed by an SSW in January happened in winter 2005/06 and a December stretched PV followed by an SSW in February happened in winter 2017/18.

And finally, the third scenario is that the stretched PVs just keep repeating for much of the winter. This happened as recently as last winter but maybe most famously in winter 2013/14 see Cohen et al. 2022).

I think all three scenarios are plausible and hard to choose the most likely option. As you can see from the winter forecast, the model is favoring options two and/or three. I think to be fair for the forecast to best verify, option two needs to happen. I also think that the easterly quasi-biennial oscillation favors option two but in my mind, both options two and three are close to a toss-up.

Why I am leaning away from option one for now other than that it would totally trash our winter forecast, is the appearance in the longer-range weather forecast of my favorite blocking high - Ural-Scandinavian high-pressure ridging. That should start knocking on the PV and not let the PV shift into hyperdrive.

After the long wind-up here is the forecast. In **Figure iv,** I include the Janus winter forecast and the C3S (a European model ensemble) winter forecast. The predictors in the Janus winter-season model are 1) Eurasian October snow cover extent, 2) ENSO (this year a weak La Niña is predicted) 3) an estimate of sea ice in the Barents-Kara Seas (well below normal) and 4) the dominant October-mean sea level pressure anomaly across northern Eurasia (slightly positive). The largest negative temperature anomalies are in Central Asia and central North America and coincide where both La Niña and low Barents-Kara Seas favor relatively cold temperatures. Only slightly above normal October Eurasian snow cover extent was not much of a factor.

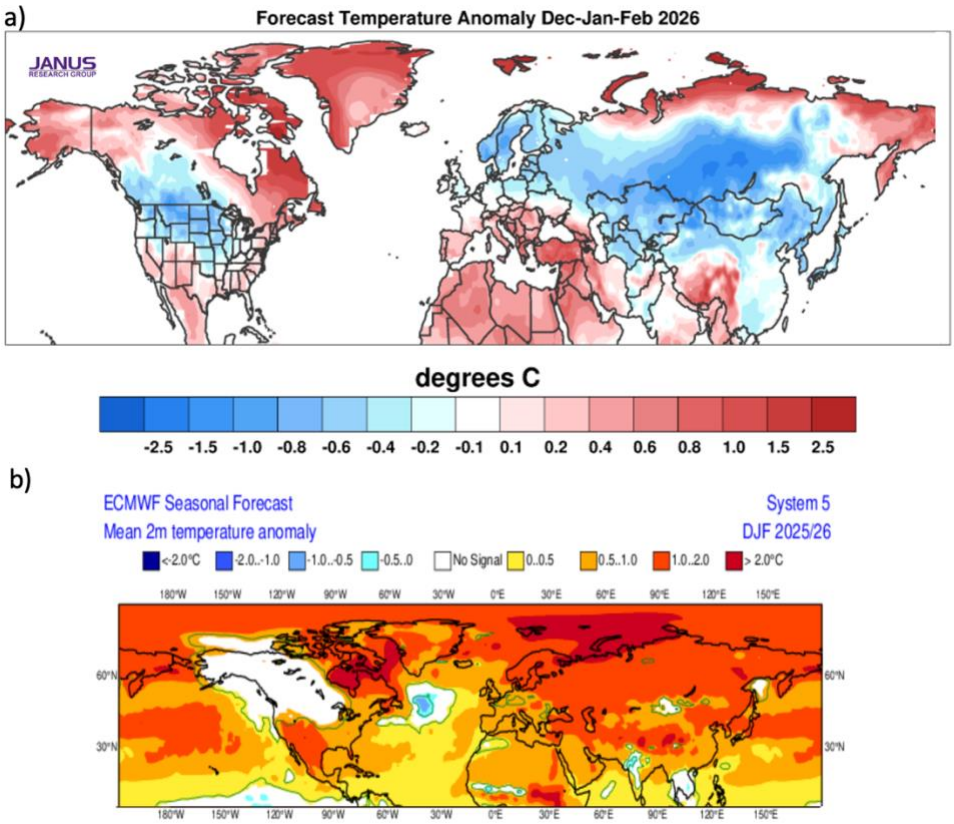

Figure iv. The temperature anomaly forecast for December, January and February 2026 from the Janus model (top) and the C3S ensembles (bottom).

The dynamical model forecast the European ensembles, predict almost universal relative warmth especially across northern Eurasia with the exception of near normal temperatures across northwestern North America. If you think the dynamical forecast looks familiar you would not be wrong; for all three recent La Niñas, the dynamical winter forecasts have been almost indistinguishable.

As I have been discussing in recent weeks, I believe whether we have a winter that matches the dynamical model forecasts with nearly universal warmth or a colder forecast that better matches the Janus forecast, will come down to which feature can persevere or endure the longest in the coming weeks, a strengthening stratospheric polar vortex (PV) or high latitude high pressure blocking in the troposphere.

I gave a videotaped presentation of the winter forecast in December for the Southern New England Winter Conference back in October. If you want more color around the forecast this might be of interest: SNEWC_25Oct205. You can also view a PowerPoint presentation earlier this month that I did in tandem with my colleague Jennifer Francis: Woodwell_13Nov25 earlier this month.

I will just end with an update on Northern Hemisphere (NH) snow cover extent (SCE). I have been highlighting a November dipole with above normal SCE in eastern Eurasia and below normal SCE in western Eurasia, has also been discussed in other studies, and I have shared their results in previous blogs. The current SCE across Eurasia remains a dipole (see **Figure v**) that is consistent with those previous studies that argue it favors a weaker PV (I am ignoring Europe as I doubt the positive anomalies will last long. As I said last week, though to be fair it is more of one region being close to normal and the other well below normal. It does seem that the overall atmospheric circulation pattern will continue to support the overall dipole pattern. Maybe this pattern is finally coupling with the atmosphere given the forecasts of Ural-Scandinavian high-pressure ridging.

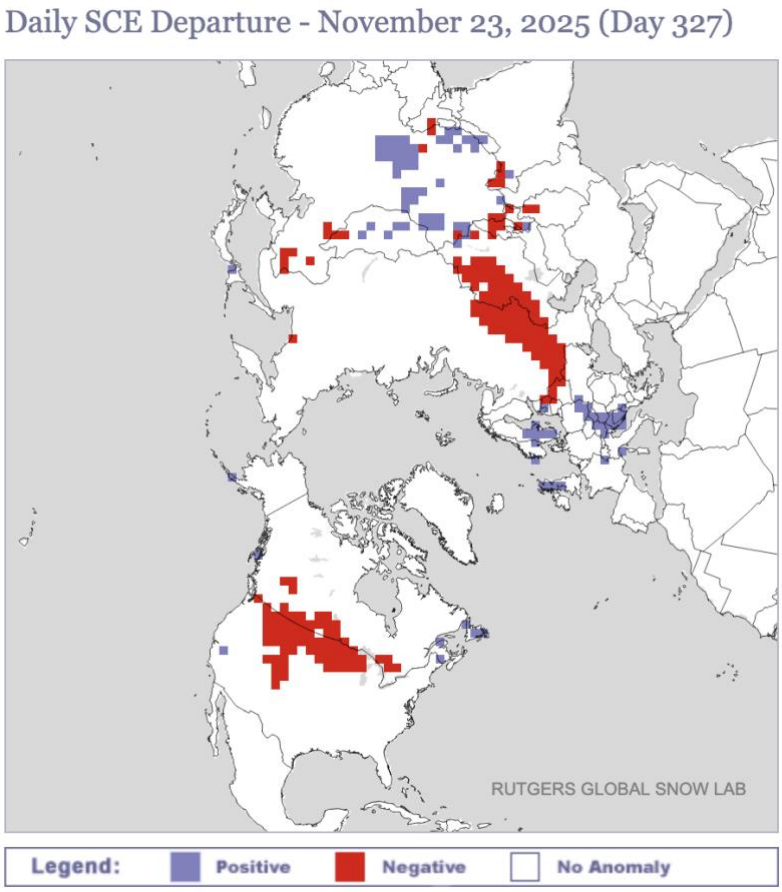

Figure v. Daily snow cover extent across Northern Hemisphere for 23 November 2025 shown in red. Plot taken from https://climate.rutgers.edu/snowcover/index.php.

Looking at the NH SCE it seems to be well normal for this time of year. I do believe that SCE can be a precursor or foreshadow of winter weather to come. Seeing so much red doesn't exactly instill in me confidence in the winter forecast that I include this week verifying, but the numbers are the numbers.

Finally, I have been trying very hard to produce a NH snowfall anomaly forecast for the winter months only. Hopefully I can deliver on that effort by next blog.

Near-Term

This week

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

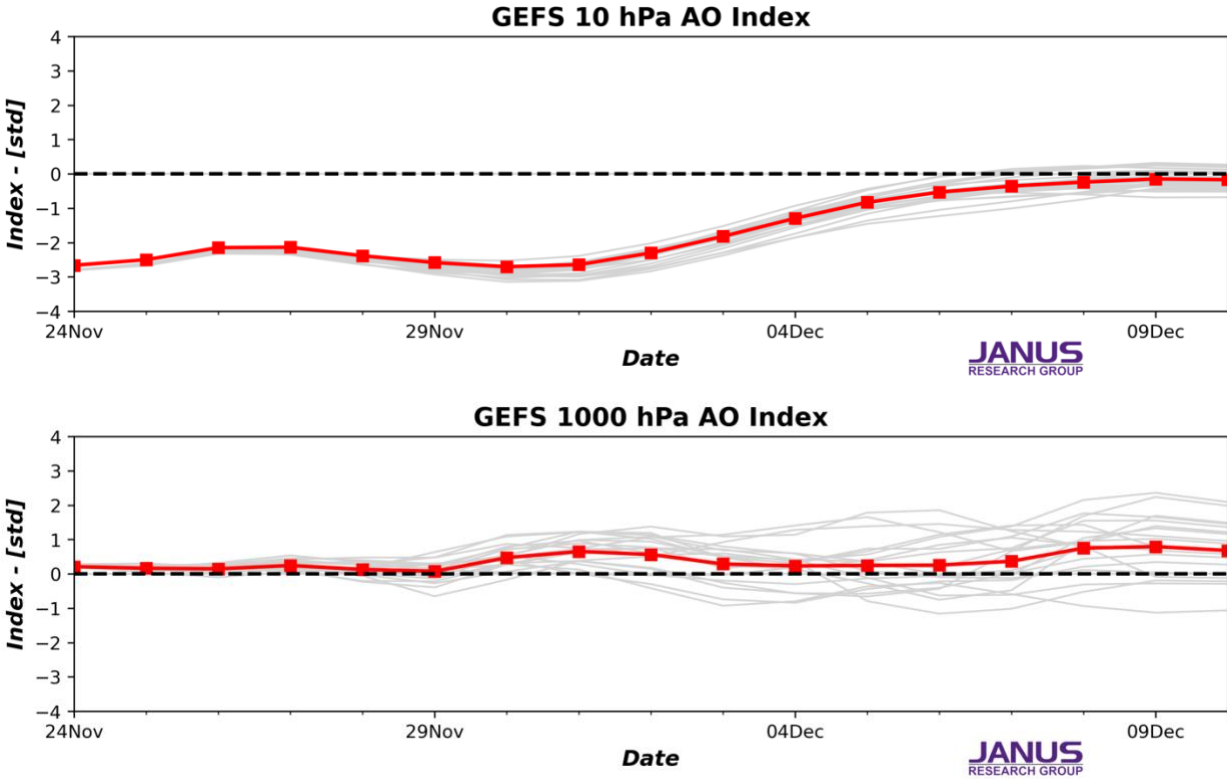

Figure 1. The predicted daily-mean AO at a) 10 hPa and b) 1000 hPa from the 00Z 24 Nov 2025 GFS ensemble. Gray lines indicate the AO index from each individual ensemble member, with the ensemble mean AO index given by the red line with squares.

Previous ridging/positive geopotential height anomalies across Greenland will continue to support troughing/negative geopotential height anomalies centered across much of Europe with the exception of ridging/positive geopotential height anomalies across Southeastern Europe (**Figure 2).** This pattern will support widespread normal to below normal temperatures across Western and Central Europe including the UK with the exception of normal to above normal temperatures across Eastern Europe this period (**Figure 3**). This week ridging/positive geopotential height anomalies will be focused in Western and Southern Asia as well as Eastern

Siberia with troughing/negative geopotential height anomalies across and Eastern Asia (**Figure 2**). This pattern favors normal to above normal temperatures across much of Asia but especially Western and Central Asia including the Levant region and Eastern Siberia with normal to below normal temperatures across Western and Central Siberia and far East Asia this period **(Figure 3**).

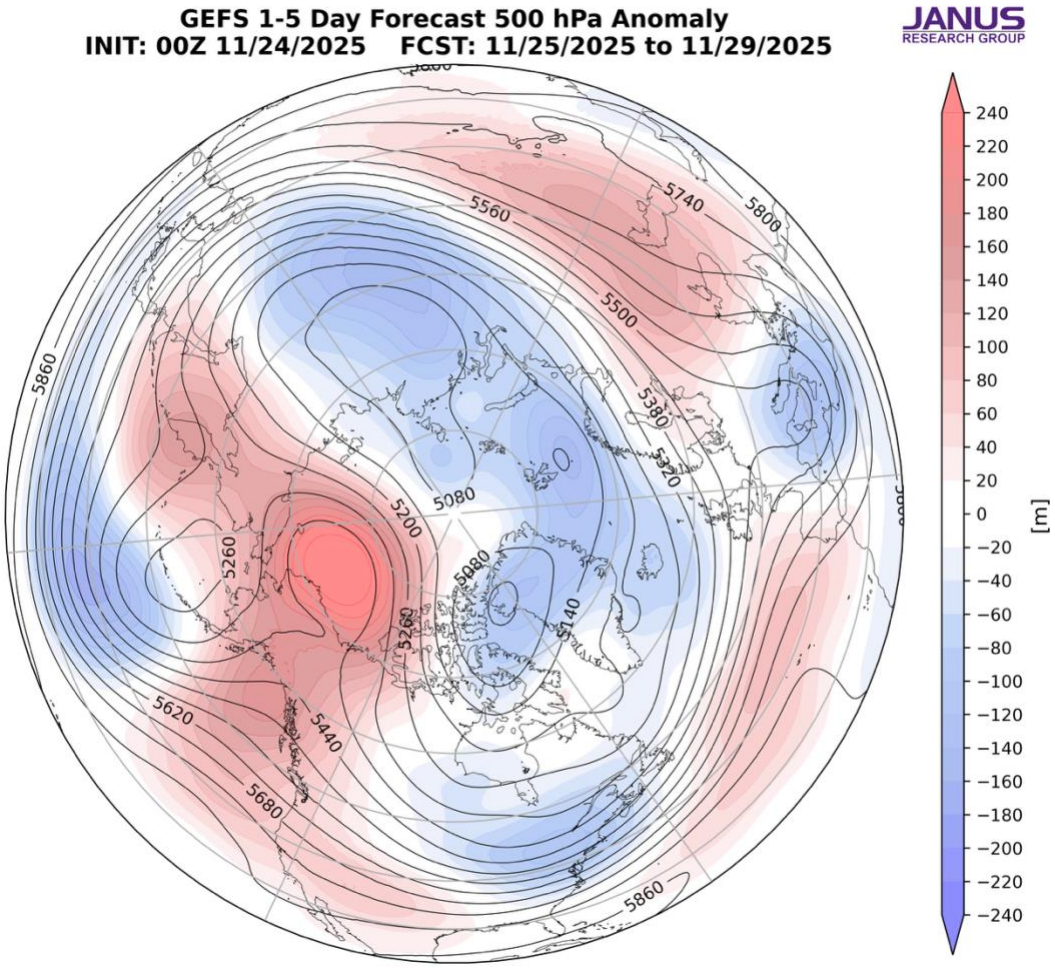

Figure 2. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 25 Nov to 29 Nov 2025. The forecasts are from the 00Z 24 Nov 2025 GFS ensemble.

This week ridging/positive geopotential height anomalies will dominate western North America with troughing/negative geopotential height anomalies in Eastern Canada and the Eastern US this week (**Figure 2**). This patten will favor widespread normal to above normal temperatures across much of Alaska, Eastern Canada and the Western US with normal to below normal temperatures across Western Canada and the Eastern US except for New England this week (**Figure 3**).

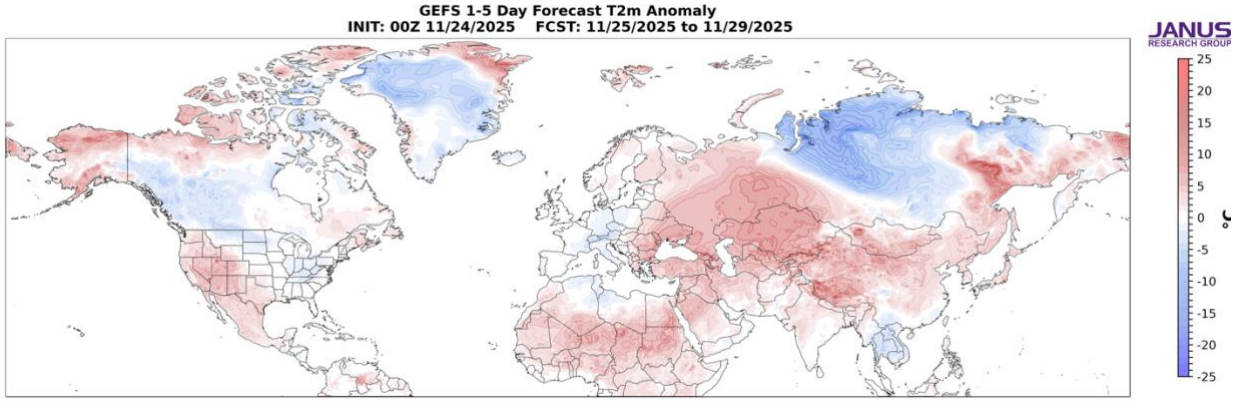

Figure 3. Forecasted surface temperature anomalies (°C; shading) from 25 Nov to 29 Nov 2025. The forecasts are from the 00Z 24 Nov 2025 GFS ensemble.

Troughing and/or cold temperatures will support new snowfall across northern Scandinavia, parts of Siberia and Northeast Asia while milder temperatures will support snowmelt across Scandinavia, the Alps and Northwest Russia this week (**Figure 4**). Troughing and/or cold temperatures will support new snowfall mostly on either side of the US-Canadian border, the US Northern Rockies and downwind of the Great Lakes while milder temperatures will support snowmelt across Quebec this week (**Figure 4**).

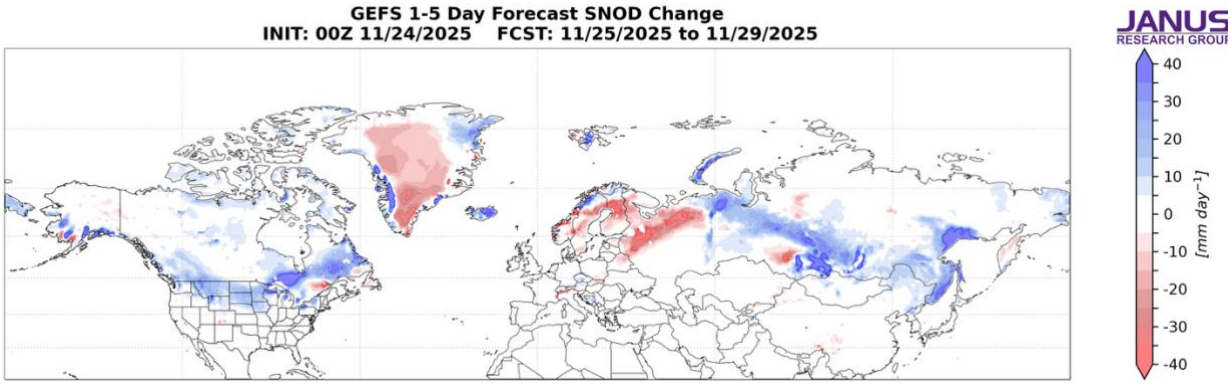

Figure 4. Forecasted snowfall (mm/day; shading) from 25 Nov to 29 Nov 2025. The forecasts are from the 00Z 24 Nov 2025 GFS ensemble.

Near-Mid Term

Next week

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

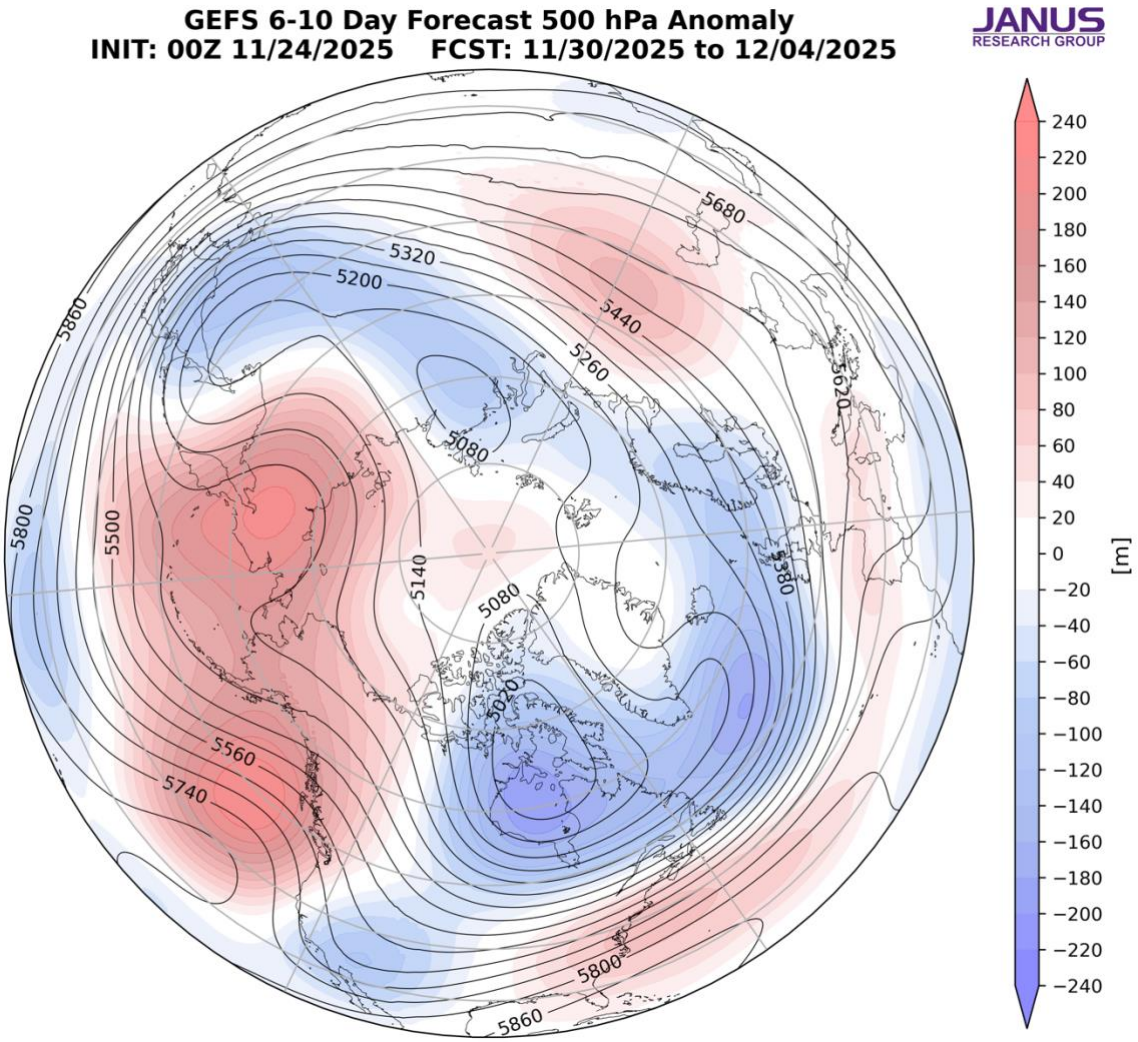

Figure 5. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 30 Nov to 04 Dec 2025. The forecasts are from the 00Z 24 Nov 2025 GFS ensemble.

Deepening troughing/negative geopotential height anomalies across Greenland will support troughing/negative geopotential height anomalies across Northern Europe and ridging/positive geopotential height anomalies across Southern Europe (**Figure 5**). The

zonal pattern will support normal to above normal temperatures widespread across much of Europe including the UK with normal to below normal temperatures limited to northern Scandinavia this period (**Figure 6**). Once again ridging/positive geopotential height anomalies are predicted across Western Asia and Eastern Siberia supporting troughing/negative geopotential height anomalies across Northern and Eastern Asia this period (**Figure 5**). This pattern favors widespread normal to above normal temperatures across much of Asia Including Israel and the Middle East, Central Asia and most of China with normal to below normal temperatures across parts of Western and Central Siberia and Northeast Asia this period (**Figure 6**).

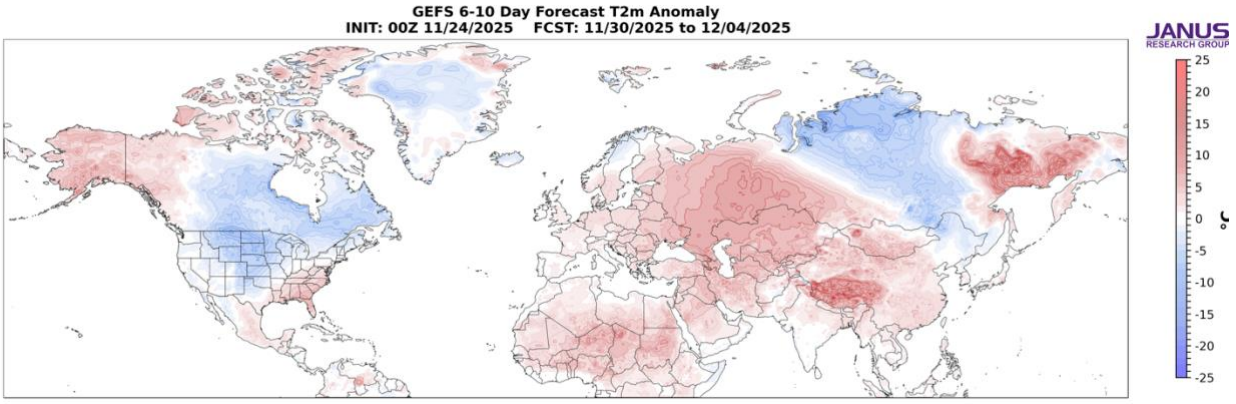

Figure 6. Forecasted surface temperature anomalies (°C; shading) from 30 Nov to 04 Dec 2025. The forecasts are from the 00Z 24 Nov 2025 GFS ensemble.

Persistent ridging/positive geopotential height anomalies across Alaska and the Gulf of Alaska will support downstream troughing/negative geopotential height anomalies across Eastern Canada and the Central US with more ridging across the Southeastern US this period (**Figure 5**). This pattern will favor normal to above normal temperatures across Alaska, the west coast of North America and much of the Eastern US with normal to below normal temperatures across Central and Eastern Canada and the Central and far Northern US (**Figure 6**).

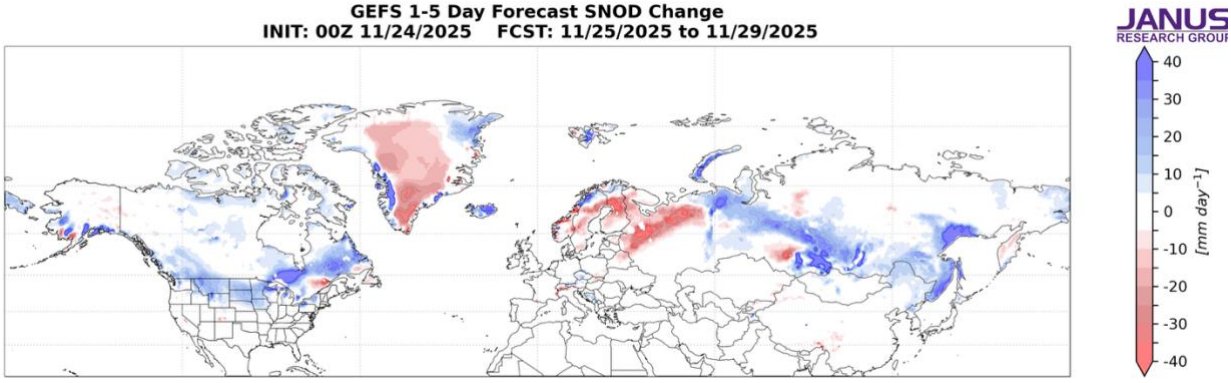

Figure 7. Forecasted snowfall rate (mm/day; shading) from 30 Nov to 04 Dec 2025. The forecasts are from the 00Z 24 Nov 2025 GFS ensemble.

Troughing and/or cold temperatures will support new snowfall in Scandinavia, and parts of Siberia and Northeast Asia while milder temperatures will support snowmelt in the Alps and Northwest Russia this period (**Figure 7**). Troughing and/or cold temperatures will support new snowfall in Alaska, Western, Southern and Eastern Canada the US Northern Rockies the Plains and New England while milder temperatures will support snowmelt in British Columbia this period (**Figure 7**).

Mid Term

Week Two

With predicted mostly mixed to negative 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 sightly positive 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.

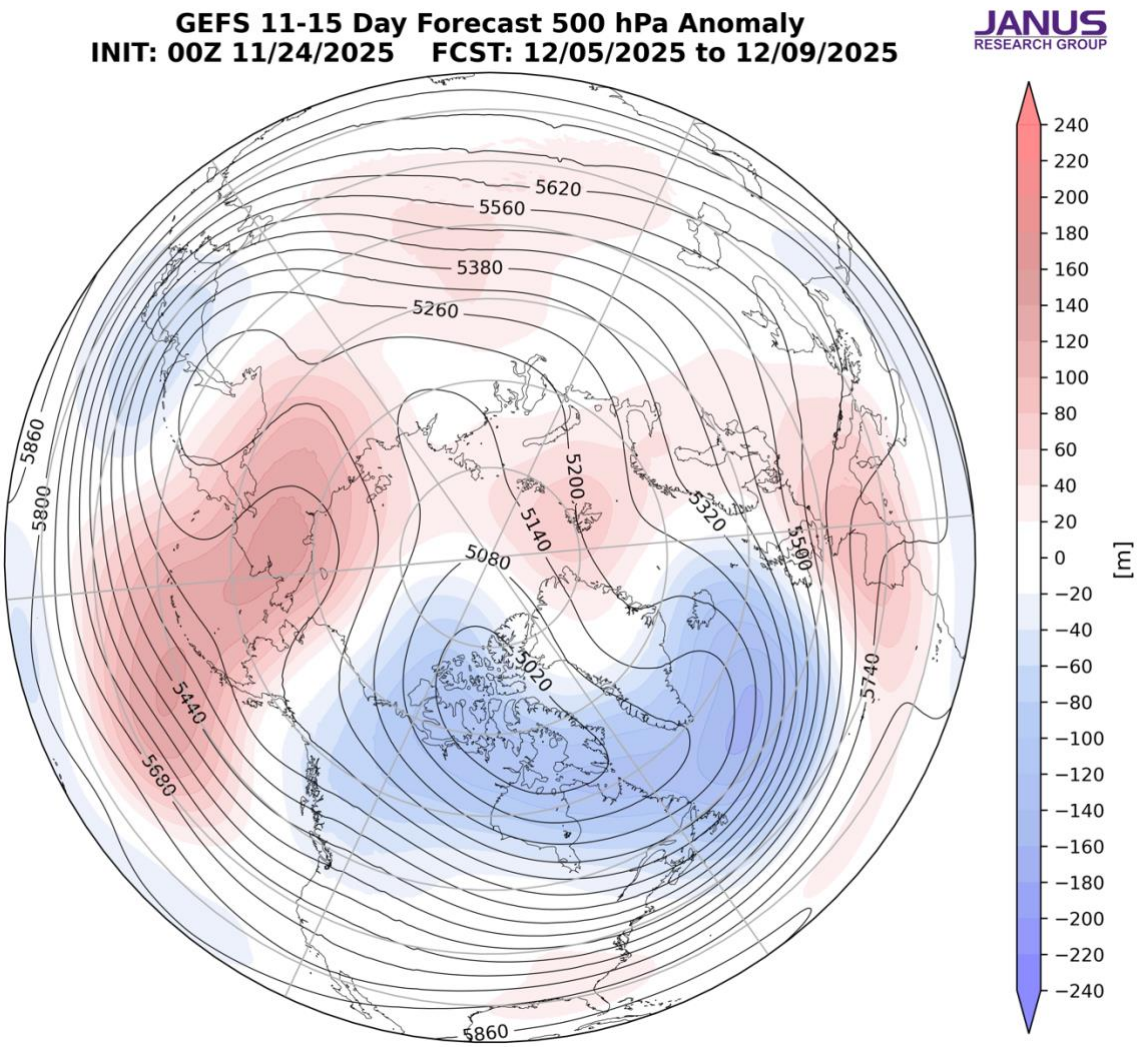

Figure 8. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 05 Dec to 09 Dec 2025. The forecasts are from the 00Z 24 Nov 2025 GFS ensemble.

The lack of ridging/positive geopotential height anomalies across Greenland are predicted to allow troughing/negative geopotential height anomalies to continue to recede north across Europe with ridging/positive geopotential height anomalies spreading across much of Europe this period (**Figure 8**). This pattern should favor widespread normal to above normal temperatures across most of Europe the UK with normal to below temperatures mostly limited to far northern Scandinavia this period (**Figures 9**). Ridging/positive geopotential height anomalies are predicted to dominate Asia centered in Central Asia with persistent but weakening troughing/negative geopotential height anomalies across Siberia into Northeastern Asia this period (**Figure 8**). The predicted pattern favors widespread normal to above normal temperatures across much of Asia including the Middle East and Central Asia with normal to below normal temperatures limited to parts of Siberia and Northeastern Asia this period (**Figure 9**).

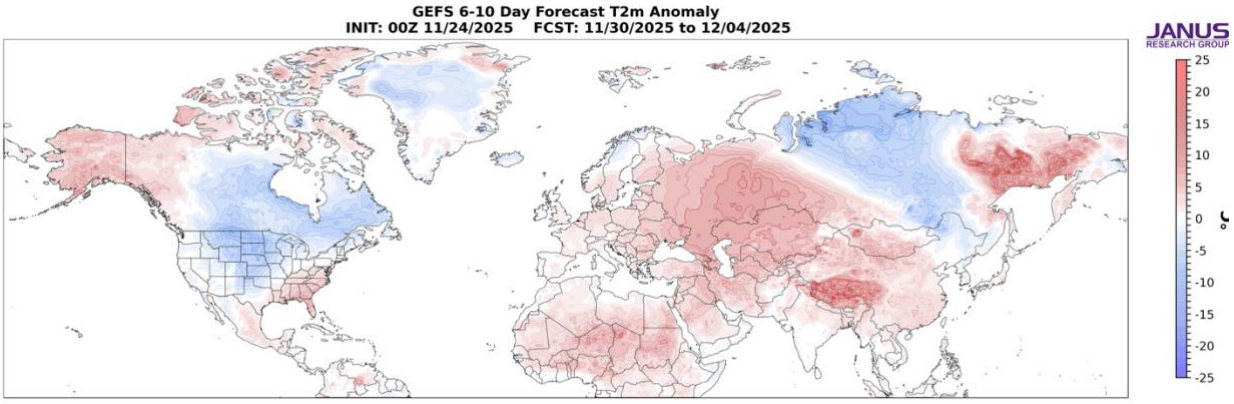

Figure 9. Forecasted surface temperature anomalies (°C; shading) from 05 Dec to 09 Dec 2025. The forecasts are from the 00Z 24 Nov 2025 GFS ensemble.

Ridging/positive geopotential height anomalies previously near Alaska are predicted to drift westward towards the Dateline and merge with ridging over Eastern Siberia supporting troughing/negative geopotential height anomalies across Alaska, Canada and the Northern US with more ridging in the Southeastern US this period (**Figure 8**). This pattern supports widespread normal to below normal temperatures across Alaska, much of Canada and the Northern US with normal to above normal temperatures limited to far Northern Canada and the Southern US this period (**Figure 9**).

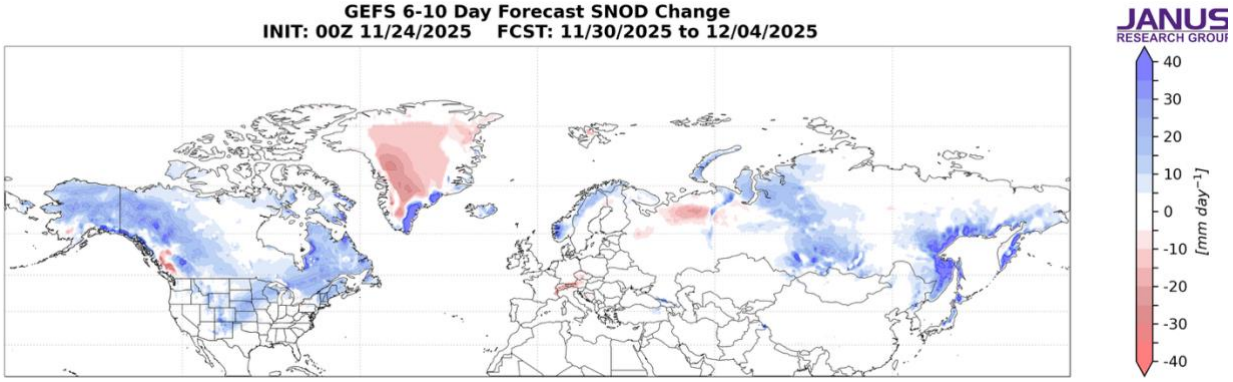

Figure 10. Forecasted snowfall (mm/day; shading) from 05 Dec to 09 Dec 2025. The forecasts are from the 00Z 24 Nov 2025 GFS ensemble.

Troughing and/or cold temperatures will support some possible new snowfall northern Eurasia and the Tibetan Plateau while milder temperatures will support snowmelt in Northwest Russia this period (**Figure 10**). Troughing and/or cold temperatures will support new snowfall in southern Alaska, Canada, the higher elevations of the Western US, downwind of the Great Lakes and northern New England while milder temperatures will support snowmelt in US Plains this period (**Figure 10**).

Longer Term

30–day

Quite a dramatic change in the latest plot of the polar cap geopotential height anomalies (PCHs) that was suggesting a long-lived perturbed PV. The latest one shows warm/positive PCHs throughout the stratosphere and lower troposphere with cold/negative PCHs in the mid troposphere (**Figure 11**). The warm/positive PCHs in the stratosphere are predicted to rapidly weaken while PCHs in the troposphere are predicted to muddle along over the next two weeks.

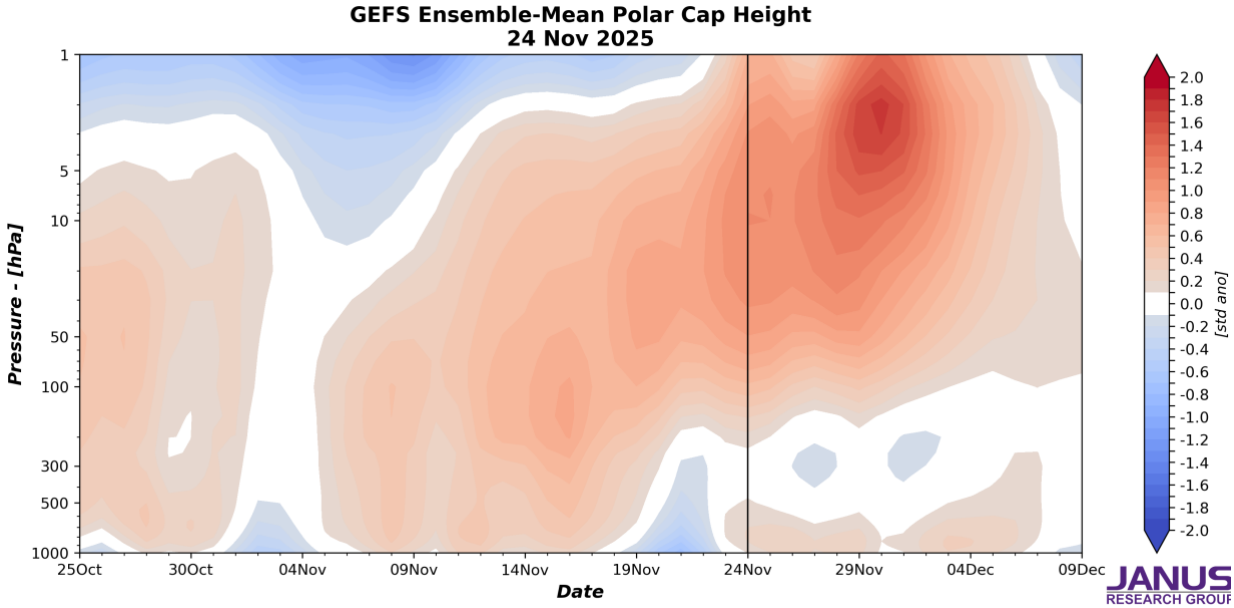

Figure 11. Observed and predicted daily polar cap height (i.e., area-averaged geopotential heights poleward of 60°N) standardized anomalies. The forecast is from the 00Z 24 Nov 2025 GFS ensemble.

The predicted weak and/or mixed PCHs in the lower troposphere this week (**Figure 11**) are consistent with the predicted mixed AO this week (**Figure 1**). Then next week the forecast of weak PCHs in the lower troposphere (**Figure 11**) should favor a near neutral surface AO next week (**Figure 1**).

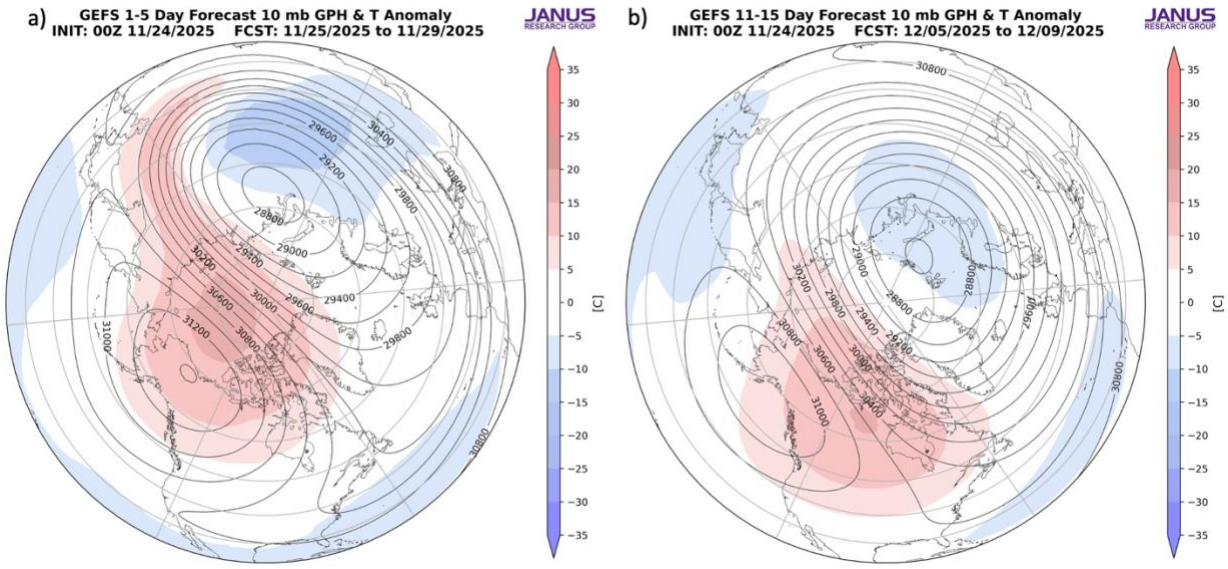

Figure 12. (a) Predicted 10 mb geopotential heights (dam; contours) and temperature anomalies (°C; shading) across the Northern Hemisphere averaged for 25 Nov to 29 Nov 2025. (b) Same as (a) except forecasted averaged from 05 Dec to 09 Dec 2025. The forecasts are from the 00Z 24 November 2025 GFS model ensemble.

This week the polar vortex (PV) is predicted to be elongated in shape, from East Asia to Iceland, with the PV center over Western Siberia with relatively cold temperatures focused in Central Asia and with high pressure centered near Alaska and warm temperatures in the North Pacific sector of the Arctic in the polar stratosphere (**Figure 12a**). With the PV center relatively far south signals an unusually early large PV disruption and may yet qualify as a sudden stratospheric warming. Then, in early December the PV center is predicted to be pushed a little further north over the Barents-Kara Seas while remaining stretched in shape from Siberia to Eastern Canada with high pressure over the Gulf of Alaska and warming extending out of Asia and covering much Canada in the polar stratosphere (**Figure 12b**). This resembles more of classical stretched PV configuration. I include the stratospheric AO in **Figure 1** this week to show just how weak the PV is being predicted by the GFS with a strongly negative stratospheric AO this week but then the stratospheric AO rapidly trends positive to neutral in a sign of a rapidly strengthening PV.

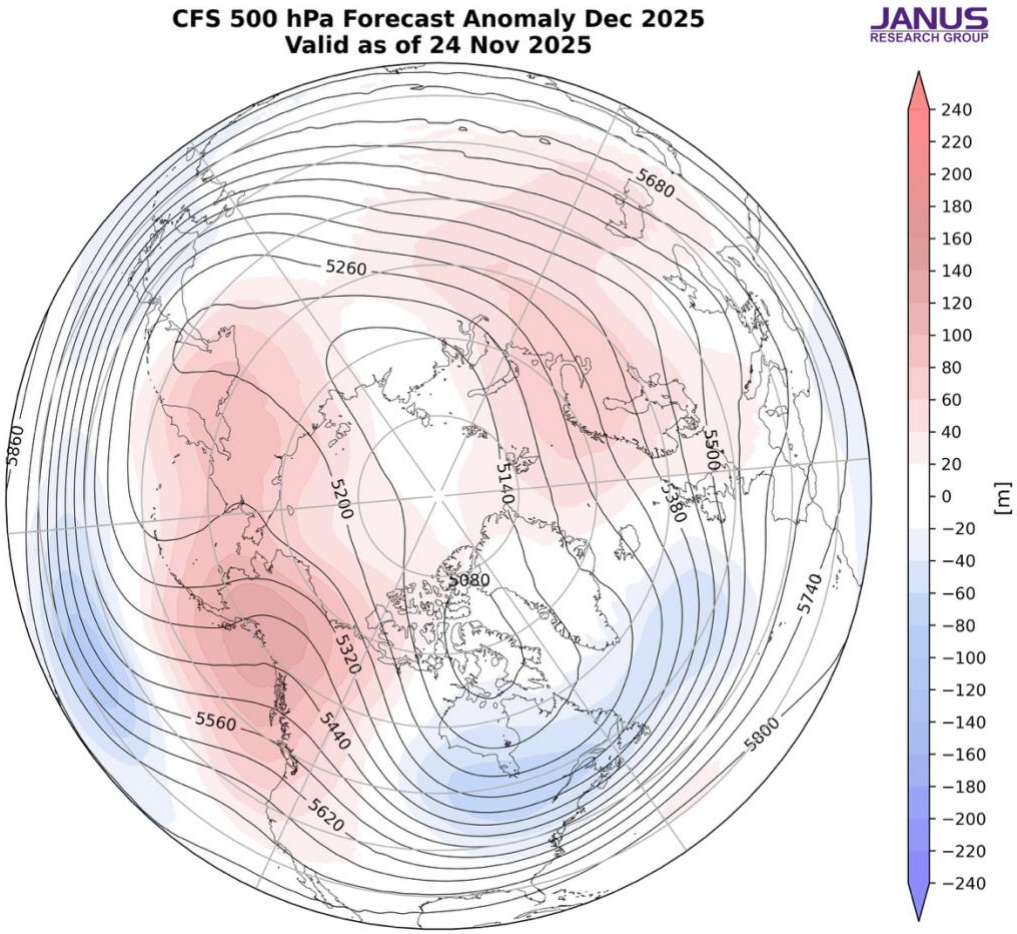

Figure 13. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere for December 2025. The forecasts are from the 00Z 24 Nov 2025 CFS.

I include in this week's blog the monthly 500 hPa geopotential heights (**Figure 13**) and surface temperatures for December (**Figure 14**) from the Climate Forecast System (CFS; the plots represent yesterday's four ensemble members). The forecast for the troposphere is ridging across Northern Europe, the Barents-Kar Seas, Western Asia, Eastern Siberia and across the Bering Sea to Alaska and the Gulf of Alaska with troughing across Northern and Eastern Asia, Eastern Canada and the Eastern US (**Figure 13**). This pattern favors seasonable to relatively warm temperatures across Europe, Southern Asia, including the Middle East and the Tibetan Plateau, Pakistan, Afghanistan, Eastern Siberia, Alaska, Western Canada and the Western US with seasonable to relatively cool temperatures across parts of southeastern Siberia and Northeast Asia, much of Eastern Canada and the Eastern US (**Figure 14**).

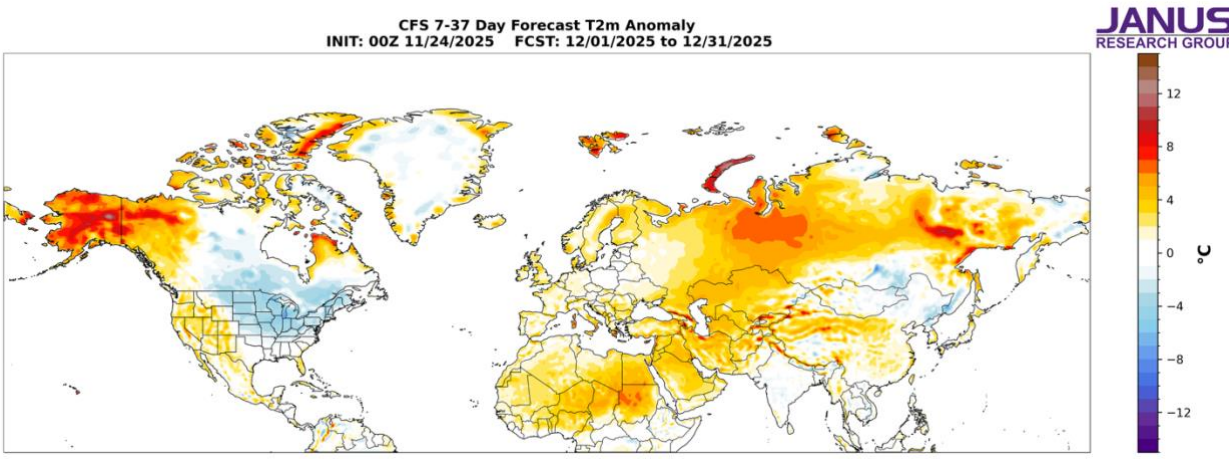

Figure 14. Forecasted average surface temperature anomalies (°C; shading) across the Northern Hemisphere for December 2025. The forecasts are from the CFS 00Z 24 Nov 2025.

Boundary Forcings

Arctic Sea Ice

I am and will continue to watch Arctic sea ice. Current conditions are shown in **Figure 15**. 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. Arctic sea ice anomalies continue to show a strong focus or weighting of negative anomalies towards the North Atlantic sector relative to the North Pacific sector and this is a robust signal of an overall weaker PV this winter. However, the negative anomalies exist both in the Eurasian sector, i.e., Barents kara Seas and the North American sector, i.e., Baffin and Hudson Bays (see **Figure 15**). Therefore, I do think that there may be some competition where the strongest coupling to the atmosphere might be occurring - with low sea ice in the Barents-Kara Seas favoring Ural/Scandinavian blocking and low sea ice/warm temperatures in Baffin and Hudson Bays favoring Greenland/Northeastern Canada blocking. There has been some high-pressure blocking in the North American sector but for December it does seem the Eurasian sector will dominate. In my opinion, Ural/Scandinavian blocking is more favorable for weakening the PV than Greenland/Northeastern Canada blocking. Can the low sea ice in the Barents-Kara Seas lock into a favorable positive feedback loop with Ural/Scandinavian blocking? Could be the key for the winter!

Figure 15. Arctic sea ice cover extent for 23 November 2025. 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

SSTs/El Niño/Southern Oscillation

Equatorial Pacific sea surface temperatures (SSTs) anomalies are slightly below normal, along the equatorial Pacific (**Figure 15**) consistent with neutral conditions but suggestive that La Niña could return once again this winter and current forecasts show large spread and plenty of uncertainty but now mostly favor a return of La Niña conditions this winter. Observed SSTs across the NH remain well above normal especially in the North Pacific and much of the North Atlantic, though below normal SSTs exist regionally especially in the South Pacific. The “warm blob” in the Northeastern North Pacific has received some hype this fall. Warranted or not, something that I am watching as well but is showing signs of fading or already may be gone for this winter.

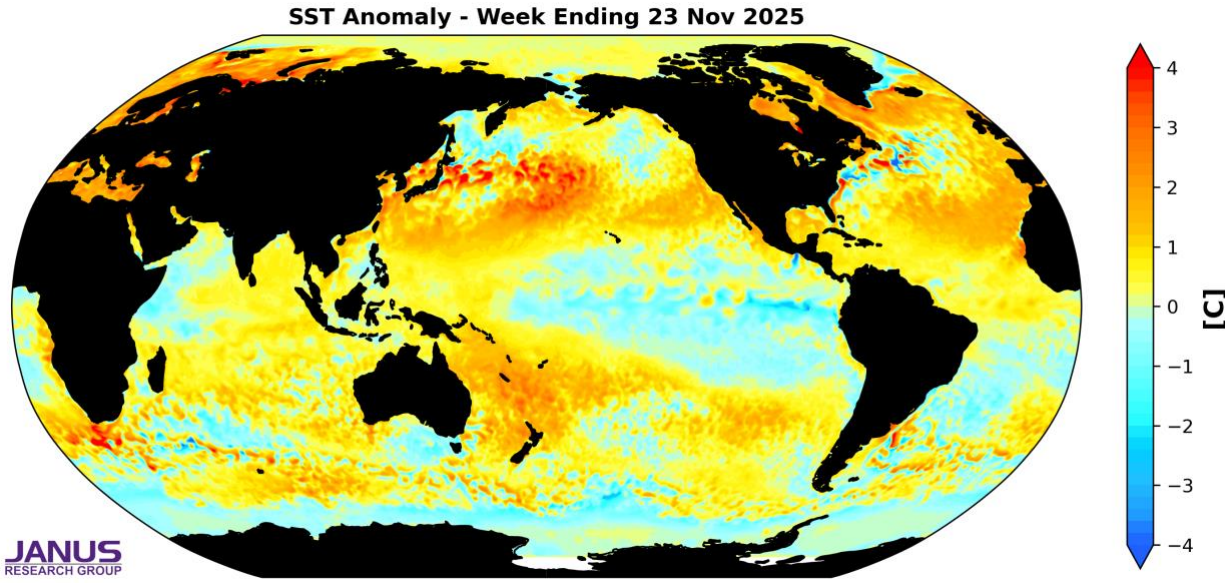

Figure 16. The latest daily-mean global SST anomalies for week ending 23 Nov 2025.

Madden Julian Oscillation

Currently the Madden Julian Oscillation (MJO) is in phase six (**Figure 17**) and the forecasts are for the MJO to move into phase seven over the next two weeks (**Figure 17**). Phase six favors ridging in centered in the US and troughing in Canada. However phase seven does favor ridging near Alaska and downstream troughing over eastern North America and therefore, it seems that the MJO may have some influence on North American weather in December. But admittedly this is outside of my expertise.

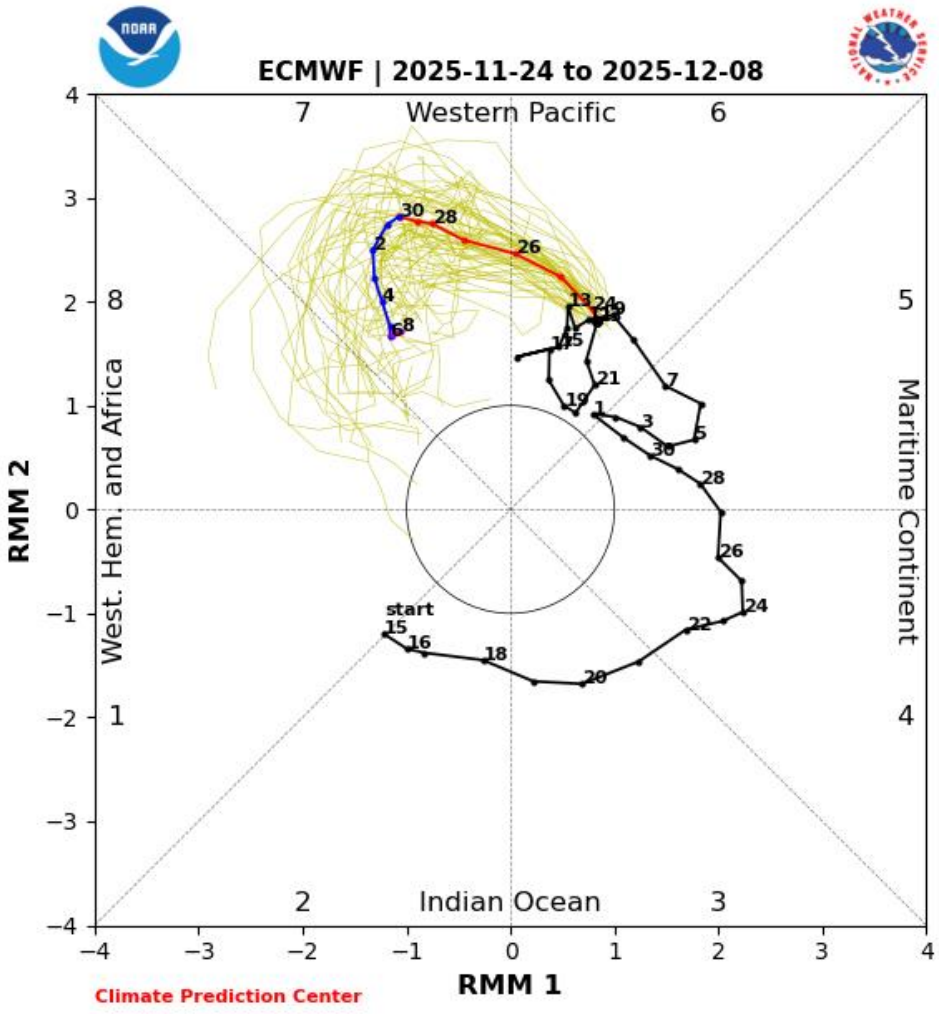

Figure 17. Past and forecast values of the MJO index. Forecast values from the 00Z 24 Nov 2025 ECMWF model. Yellow lines indicate individual ensemble-member forecasts, with the green line showing the ensemble-mean. A measure of the model 'spread' is denoted by the gray shading. Sector numbers indicate 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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