Arctic Oscillation and Polar Vortex Analysis and Forecasts

November 27, 2023

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 negative and is predicted to remain negative and possibly strongly negative the next two weeks as pressure/geopotential height anomalies across the Arctic are currently mostly positive and are predicted to remain mostly positive over the next two weeks. The North Atlantic Oscillation (NAO) is currently neutral with mixed pressure/geopotential height anomalies across Greenland and the NAO is predicted to trend strongly negative this week and remain negative the next two weeks as pressure/geopotential height anomalies become increasingly positive across Greenland.
- Over the next two weeks, ridging/positive geopotential height anomalies in the North Atlantic including Greenland will force troughing/negative geopotential height anomalies across Europe with more ridging/positive geopotential height

anomalies across Southeastern Europe. This pattern will support normal to below normal temperatures across much of Europe including the United Kingdom (UK) with normal to above normal temperatures mostly limited to Southeastern Europe the next two weeks.

- This week ridging/positive geopotential height anomalies will dominate Asia with troughing/negative geopotential height anomalies limited to Northeastern Asia. However next week as ridging/positive geopotential height anomalies will consolidates in the Arctic, troughing/negative geopotential height anomalies will spread across Northern Asia. This pattern favors widespread normal to above normal temperatures across much of Asia with the exception of normal to below normal temperatures limited to Northwest Russia and Northeastern Asia. However next week normal to below normal temperatures will spread across much of Northern Asia with normal to above normal temperatures across Southern Asia and Eastern Siberia.

- The general predicted pattern across North America this week is ridging/positive geopotential height anomalies across Alaska and Western Canada forcing troughing/negative geopotential height anomalies across Eastern Canada and much of the United States (US). Then next week, troughing/negative geopotential height anomalies will develop across Alaska and the Gulf of Alaska forcing ridging/positive geopotential height anomalies across much of North America. This pattern favors normal to above normal temperatures across Alaska and Western Canada with normal to below normal temperatures across Eastern Canada and much of the US this week. However next week above normal temperatures will spread across much of North America from the Rockies eastward with normal to below normal temperatures limited to the west coast of North America including Alaska.

- in the Impacts section I discuss my expected evolution of polar vortex (PV) behavior over the coming weeks and the impact on Northern Hemisphere (NH) weather. I also include the AER winter surface temperature anomalies for the NH.

Plain Language Summary

A stretching of the polar vortex (PV) like a rubber band being pulled on both ends is bringing colder and snowier weather to East Asia but even more so to eastern North America this week (see **Figure 3**). Separately high pressure in the North Atlantic and eventually Greenland will bring colder and even snowier weather to Europe this week and early December (see **Figure 6**).

A larger PV disruption will deepen the cold in Europe but bring milder weather to much of North America. At that point we will probably reach the most important crossroad of the winter going down a milder or a colder path. But despite all the unknowns, I do include the winter forecast including from AER in **Figure iii**.

Impacts

We currently have a stretched PV (see **Figure 12**) for this week bringing colder temperatures for much of the US (see **Figure 3**) and even above normal snow cover to the US after being well below normal last week (not shown). Meanwhile high pressure ridging in the northern North Atlantic and spreading west towards Greenland is forcing deep low pressure troughing across Europe allowing cold temperature previously limited to Scandinavia to spread across much of Europe (see **Figure 6**). I thought that it is interesting that the low pressure bringing cold and snow to Europe is directly coupled to the stratospheric PV center (see **Figure i**) where I highlight this in the WAFxz plot and eddy geopotential height.
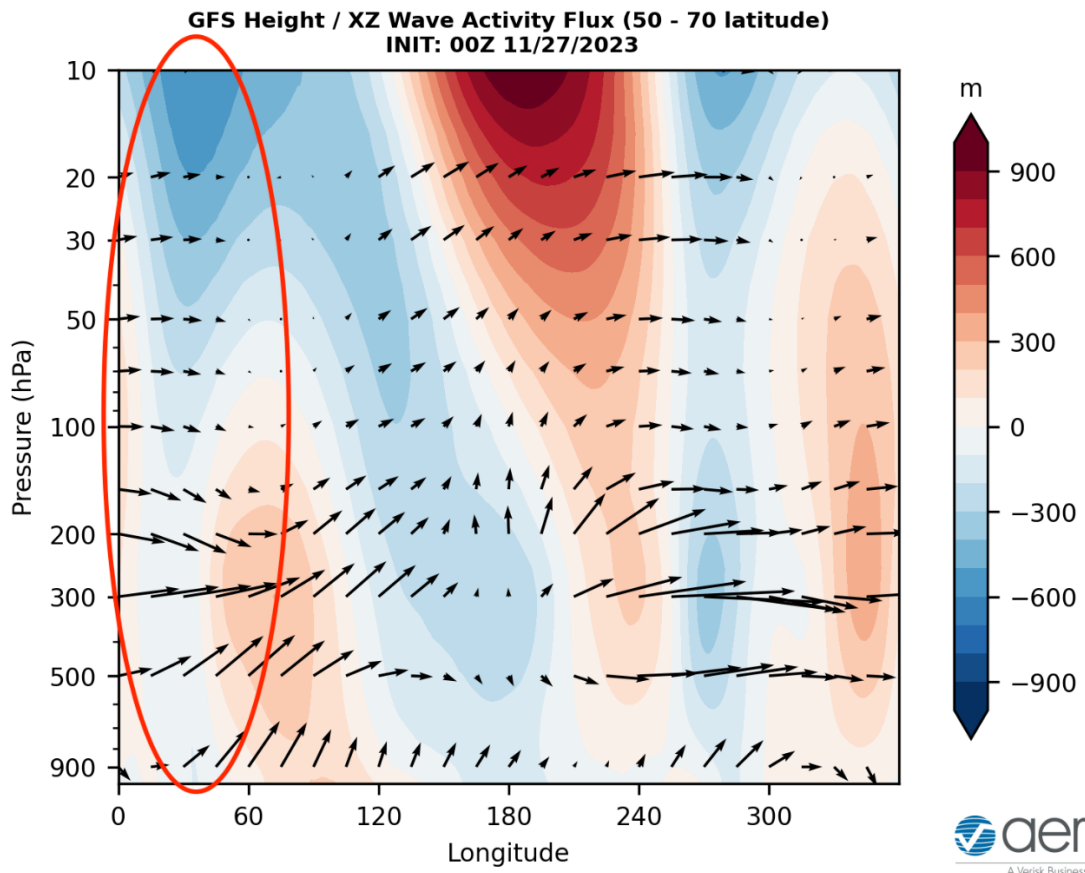

Figure i. Longitude-height cross section of geopotential eddy height anomalies (shading) and wave activity flux (vectors) initialized 27 November 2023. The forecasts are from the 00z 27 November 2023 GFS ensemble. The red oval highlights that the trough over Europe is conencted to the polar vortex in the stratosphere.

The deep troughing in Europe is also supporting the advancing snow cover in the region that erased an impressive deficit in snow cover across western Eurasia. And looking at NH snow cover extent this fall, the advance comes in stalls and spikes (see **Figure ii**). This stepwise increase in snow cover extent seems to me a bit unusual and seems

to coincide with PV disruption (rapid increase) followed by a strengthening PV (long stall).
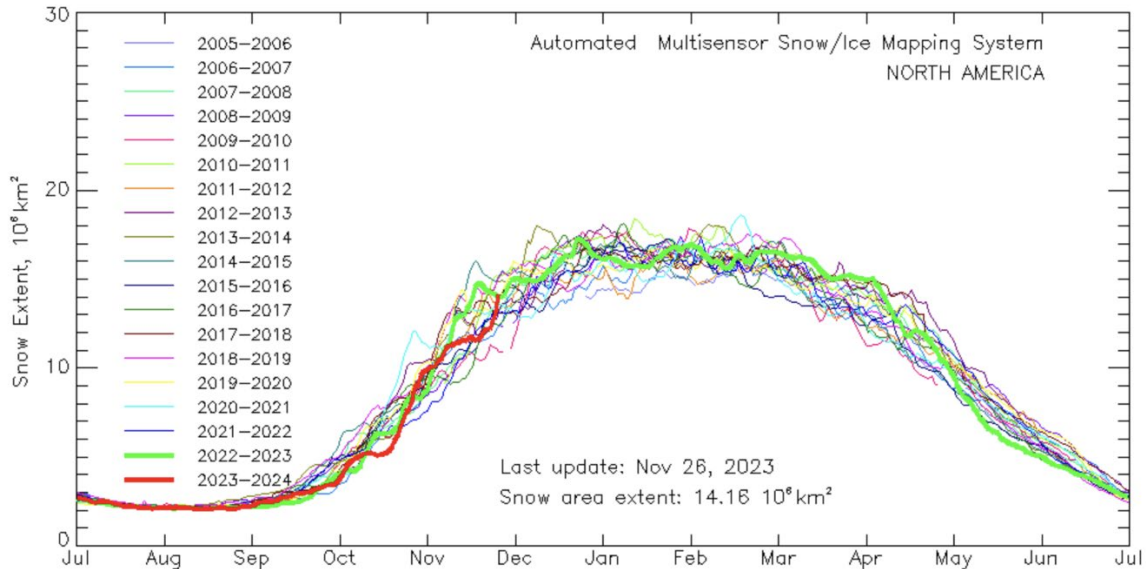
Daily snow extent and anomalies

Figure ii. Observed North American snow cover extent through 26 November 2023. Plot taken from https://www.star.nesdis.noaa.gov/smcd/emb/snow/HTML/snow_extent_monitor.html

The stretched PV is predicted to be followed by a Canadian warming as I discussed in last week's blog. And I must say the surface temperature anomaly plot included with the Canadian warming is looking pretty good as a first guess with the predicted surface temperature anomalies for the first week or two of December. In general the pattern is a tripole of sorts, warm for North America (especially Canada), cold for northern Eurasia and warm for southern Eurasia (see Figureiv_20Nov2023 and compare with **Figures 6** and **9** below).

But I don't expect the Canadian warming to last very long, or the surface temperature pattern associated with it. The latest ECMWF weeklies are predicting a perpetual Canadian warming, but I am highly skeptical. So, the obvious question becomes what comes next, the teaser at the end of the discussion section from last week. A frequent collaborator of my recent papers, Laurie Agel, computed for a manuscript in preparation (and I am really hoping that it will be submitted shortly) the transition from Canadian warmings, which I find very interesting. Canadian warmings overwhelmingly transition to just two other PV phases one is a larger sudden stratospheric warming but most commonly to a stretched PV. A Canadian warming can transition to other PV states (in the strong PV category) but it is significantly less likely.

Our toy and flawed polar vortex strength forecast model has been performing surprisingly well so far this PV season, correctly predicting peak PV strength for the last week with a weakening trend culminating in a weaker than normal PV second week of December that is now expected to be a Canadian warming or a minor warming of the polar stratosphere. The PV model is predicting a slow strengthening trend of the PV after December 10th but nothing comparable to late November. Also, I don't feel that a negative AO/NAO is a favorable pattern for significant weakening of the PV. I hope that anyone who reads the blog regularly know that it is my strong opinion that Scandinavian/Ural/Barents-Kara seas blocking or high-pressure ridging is the one atmospheric feature that is most favorable for weakening the PV. Based on these two data points, I feel that a direct transition from the Canadian warming to a more substantial weakening of the PV akin to a sudden stratospheric warming (SSW) is less likely. Therefore, is seems reasonable to me the most likely PV phase or state to follow the Canadian warming early next month is a stretched PV.

If my reasoning is correct what NH surface temperature pattern should follow this broad strokes tripole pattern? Based on our research and my own observations writing the blog, the larger stretched PV events begin with the core of the cold temperatures in Central and Eastern Asia followed by cold temperatures beginning about a week later in North America mostly east of the Rockies. There isn't a strong relationship between stretched PVs and European temperatures. But if it does turn much colder in North America this often fires up the jet stream over the North Atlantic which results in a westerly maritime flow across much of Europe that favors milder temperatures with the possible exception of Scandinavia (at this point I am emotionally hesitant to predict anything but cold for Scandinavia).

So, what do I expect in the coming weeks as far as temperature anomalies. We have the cold now in the Eastern US and to a lesser extent in Northeast Asia associated with the latest stretched PV. With the upcoming Canadian warming, it looks like the cold will continue to spread across Europe and the coldest temperatures across the NH will become focused in Northern Europe and Western Asia. Concurrently temperatures should turn milder across eastern North America. From a timing standpoint this would evolve over the first two weeks of December.

Now if I am correct then what comes next is a stretched PV, then I would expect the core of the cold to shift from western Eurasia to eastern Eurasia with the deepest cold firmly in Siberia. At this point the populated regions of Northeast Asia are under increasing risk to an Arctic outbreak. It is my experience that with the larger stretched PV events, the cold in Asia is a precursor to cold in North America as happened in February 2021 and December 2022. To be clear I am not predicting cold of the magnitude of those two events, but I do think that the potential is there for a more intense cold air outbreak than what we have so far observed in the fall of 2023 (and admittedly not a high bar). From a timing standpoint this would evolve over the second and third weeks of December.

The impact on our weather from stretched PVs is usually in the order of one to two weeks, so as we approach the holidays, we should see yet another transition in the PV and its associated weather. This could be the most important inflection point of the winter of 2023/24. I have discussed this before in the blog, based on my experience, stretched PVs can be a precursor to the larger PV disruptions of the SSW variety, we saw that scenario just last winter (if my memory serves me correctly). But on the other hand, the atmospheric structure that favors stretched PVs also blocks or protects the PV from upwelling energy from the troposphere, allowing a runaway strong PV and this is nicely exemplified by December 2019 and the PV in winter 2019/20 was record strong. A strong PV doesn't preclude stretched PVs and this characterized the winter of 2021/22.

I think that I have been saying this for at least two decades "Siberia is the refrigerator of the Northern Hemisphere." I would be very skeptical of a cold winter if the dynamical model forecasts that I showed in last week's blog (see (see Figureiii_20Nov2023) verify with widespread above normal temperatures especially across Siberia. If it can turn colder for an extended period of time that would favor an SSW over a strong PV. The weather models are predicting high-pressure ridging in the region of the Urals and the Barents-Kara Seas (for an example see **Figure 14**). This also favors an SSW as well as stretched PVs over a strong and circular PV but I have been burned before by the weather models that have really struggled so far in late fall and early winter. Finally, our PV model is predicting a further weakening of the PV the last week of December but it is just one data point, so confidence is very low. But this should be interesting to follow in the coming days.

All that I wrote is highly speculative even if it may sound like I have it all figured out. But I am trying to apply my research from two decades ago until today to predict the weather beyond the weather models but I hope the limitations are well appreciated.

It is the last few days of November so in blog tradition, I include the NH winter surface temperature anomalies forecast in **Figure iii.** I include the North American Multi Model Ensemble (NMME) winter forecast (top) and the C3S (a European model ensemble) winter forecast (middle) and the AER winter forecast (bottom).
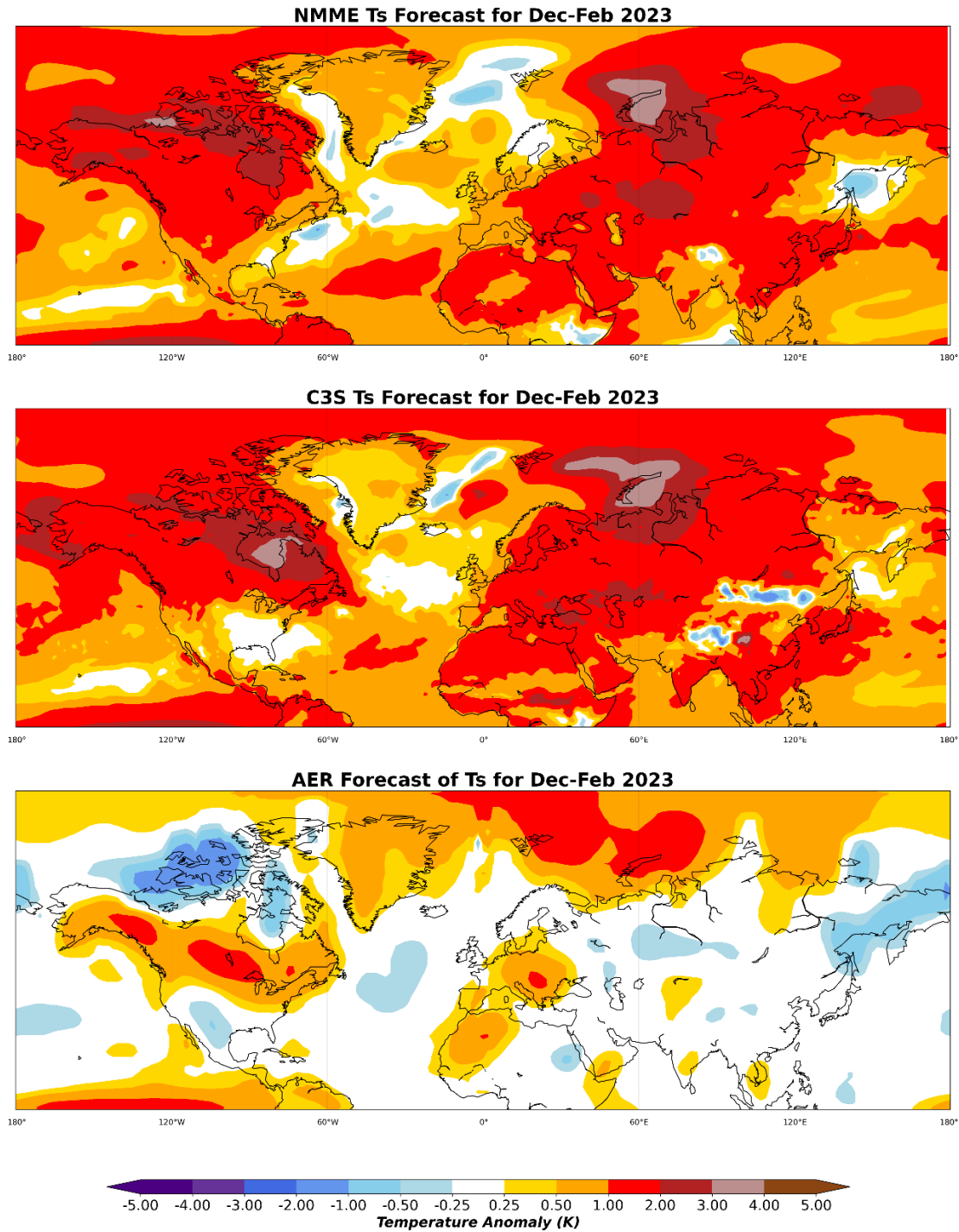
Figure iii. The NMME winter temperature anomaly forecast for December 2023, January and February 2024 from https://www.cpc.ncep.noaa.gov/products/NMME/ (top). The C3S winter temperature anomaly forecast for December 2023, January and February 2024 from https://www.copernicus.eu/en (center). c) The AER winter

temperature anomaly forecast for December 2023, January and
February 2024 (bottom).

The two dynamical model forecasts, both the American ensemble and the European ensembles, predict almost universal relative warmth especially across Eurasia but also North America with the possible exception of near seasonal in the Southeastern US, which is related to the ongoing El Niño. But the dynamical winter forecasts are almost indistinguishable from other recent winters despite the change in El Niño/Southern Oscillation (ENSO) phase.

The AER model is colder but overall lacks strong anomalies. The predicted weak temperature anomalies are a result of only slightly above normal October Eurasian snow cover extent and below normal October sea ice extent in the Barents-Kara Seas that was relatively higher than most recent years. Also included is El Niño that resulted in stronger anomalies in North America with warm in Alaska, Canada and the Northern US and cold in the south-central US.

For the first time this year, we have developed a version of the model based on ERA5 instead of the NCEP/NCAR reanalysis and I hope to include it in Wednesday's update but I think that the overall message remains the same, which give me comfort.

Near-Term

This week

The AO is predicted to be negative to strongly negative this week **(Figure 1)** with strong positive geopotential height anomalies across the Arctic and with mixed geopotential height anomalies across the mid-latitudes of the NH (**Figure 2**). With predicted strong positive geopotential height anomalies across Greenland (**Figure 2**), the NAO is predicted to be negative to strongly negative this period as well.
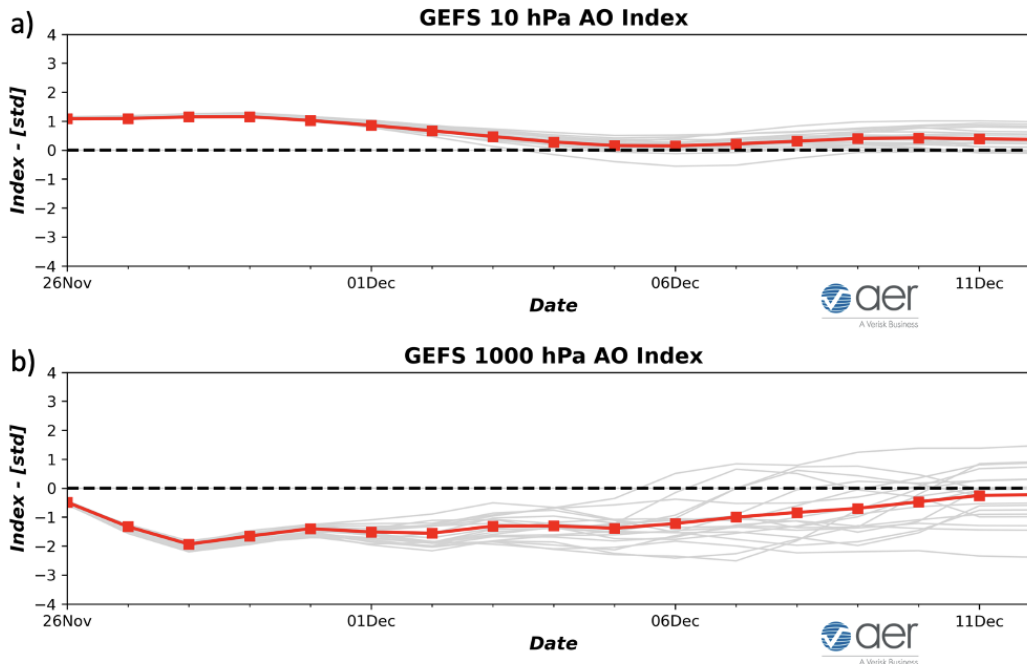
Figure 1. (a) The predicted daily-mean AO at 1000 hPa from the 00Z 27 November 2023 GFS ensemble. (b)The predicted daily-mean near-surface AO from the 00Z 27 November 2023 GFS ensemble. Gray lines indicate the AO index from each individual ensemble member, with the ensemble-mean AO index given by the red line with squares.

Ridging/positive geopotential height anomalies centered in the Barents-Kara Seas will support troughing/negative geopotential height anomalies across much of Europe with more ridging/positive geopotential height anomalies across Southeastern Europe this week (**Figures 2**). **The pattern favors n**ormal to below normal temperatures across Northern **E**urope including the UK with normal to above normal temperatures across Southern Europe (**Figure 3**). This week Asia is predicted to be dominated by ridging/positive geopotential height anomalies centered near the Urals with troughing/negative geopotential height anomalies in Northwestern and Northeastern Asia (**Figure 2**). This pattern favors widespread normal to above normal temperatures across much of Asia with normal to below normal temperatures limited to Northwest Russia and parts of Northeast Asia **(Figure 3)**.
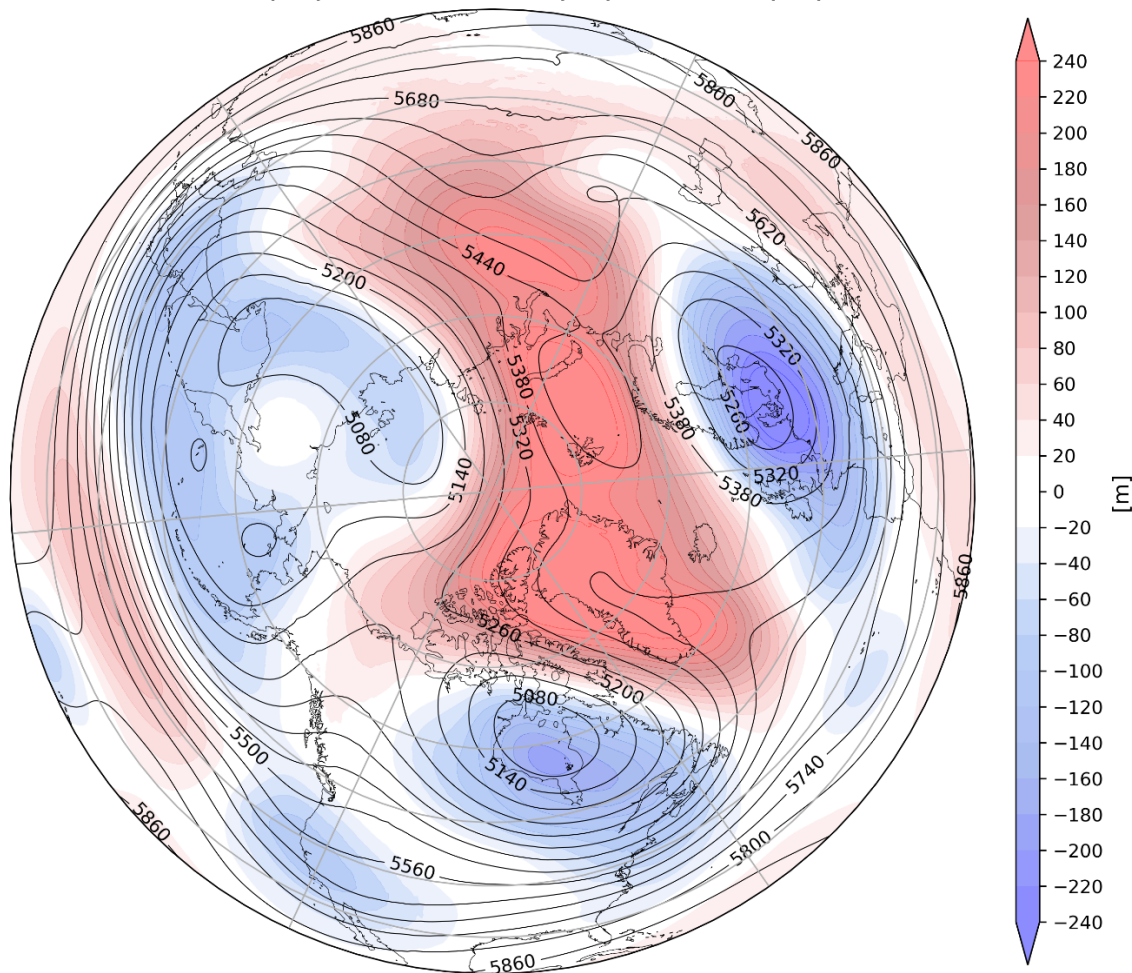
Figure 2. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 28 November – 2 December 2023. The forecasts are from the 00z 27 November 2023 GFS ensemble.

The pattern this week across North America is ridging/positive geopotential height anomalies across Alaska and Western Canada forcing troughing/negative geopotential height anomalies across Eastern Canada and much of the US **(Figure 2).** This pattern will favor normal to above normal temperatures across Alaska and Western Canada with normal to below normal temperatures across much of Eastern Canada and much of the US **(Figure 3).**
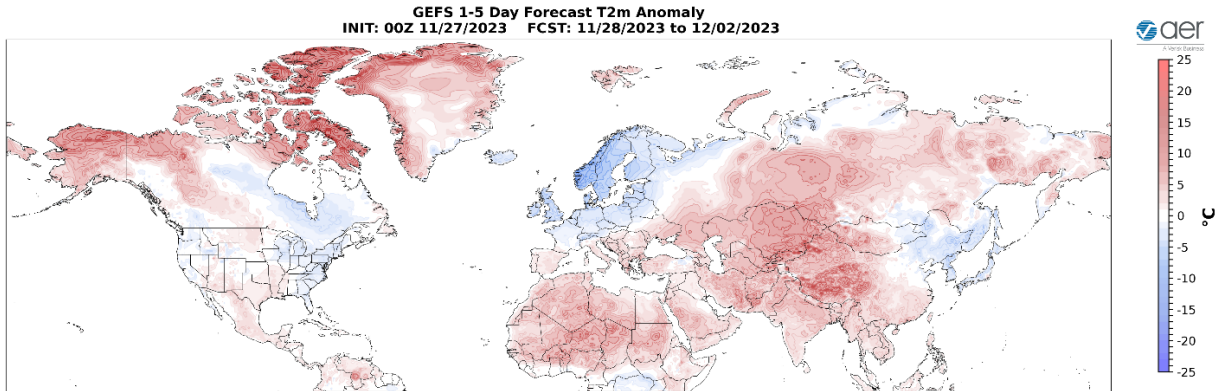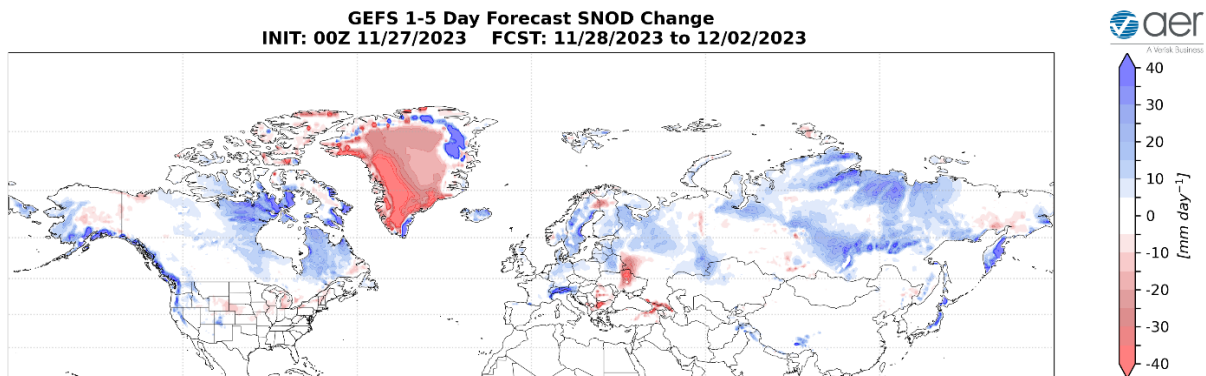
Figure 3. Forecasted surface temperature anomalies (°C; shading) from 28 November – 2 December 2023. The forecast is from the 00Z 27 November 2023 GFS ensemble.

Troughing and/or cold temperatures will support new snowfall across Scandinavia, the Baltics, the Alps and much of Northern Asia while mild temperatures will support snowmelt across Southeastern Europe Scandinavia and parts of Eastern Siberia this week (**Figure 4**). Troughing and/or cold temperatures will support new snowfall across Western and Southeastern Alaska, the West Coast of and Eastern Canada, and the higher elevations of the Western US while mild temperatures will support snowmelt across parts of Alaska and the US Plains and Northeastern US this week (**Figure 4**).

Figure 4. Forecasted snow depth changes (mm/day; shading) from 28 November – 2 December 2023. The forecast is from the 00Z 27 November 2023 GFS ensemble.

Near-Mid Term

Next week

With mostly positive geopotential height anomalies across the Arctic and with mixed geopotential height anomalies across the mid-latitudes this period (**Figure 5**), the AO should remain negative this period (**Figure 1**). With predicted mostly positive

pressure/geopotential height anomalies across Greenland (**Figure 5**), the NAO will remain negative this period as well.
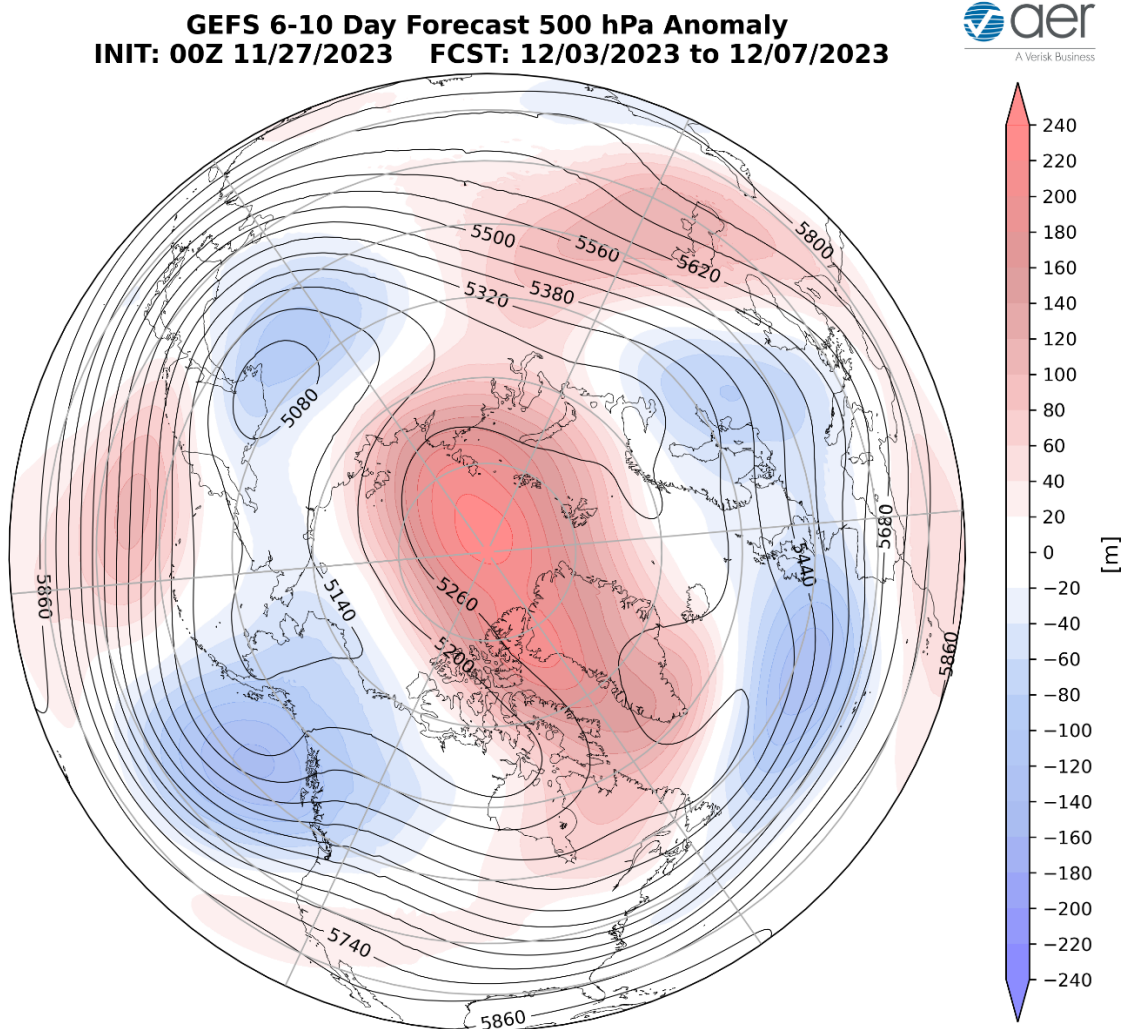

Figure 5. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 3 – 7 December 2023. The forecasts are from the 00z 27 November 2023 GFS ensemble.

Persistent ridging/positive geopotential height anomalies across the North Atlantic and Greenland will support troughing/negative geopotential height anomalies across Europe with ridging/positive geopotential height anomalies limited to Southeastern Europe are predicted this period (**Figure 5**). The pattern will favor normal to below normal temperatures across most of Europe including the UK **with** normal to above normal temperatures limited to the Balkans and Turkey (**Figures 6**). With ridging/positive geopotential height anomalies consolidating in the Central Arctic will allow troughing/negative geopotential height anomalies to become widespread across Northern Asia with more ridging/positive geopotential height anomalies stretched across

Southern Asia this period (**Figure 5**). This pattern favors widespread normal to above normal temperatures across much of Southern and Central Asia with normal to below normal temperatures across Northern Asia including much of Siberia this period (**Figure 6**).
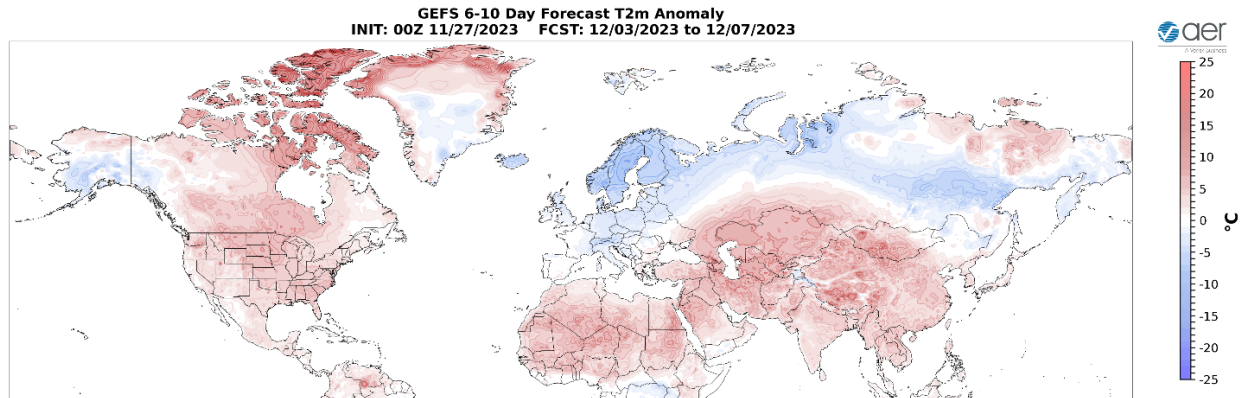

Figure 6. Forecasted surface temperature anomalies (°C; shading) from 3 – 7 December 2023. The forecasts are from the 00z 27 November GFS ensemble.

The predicted general pattern across North America this period is deepening troughing/negative geopotential height anomalies across Alaska and the Gulf of Alaska forcing ridging/positive geopotential height anomalies across eastern North America (**Figure 5**). This pattern favors widespread normal to above normal temperatures across much of North America with normal to below normal temperatures limited to across Southern Alaska and Northwestern Canada (**Figure 6**).
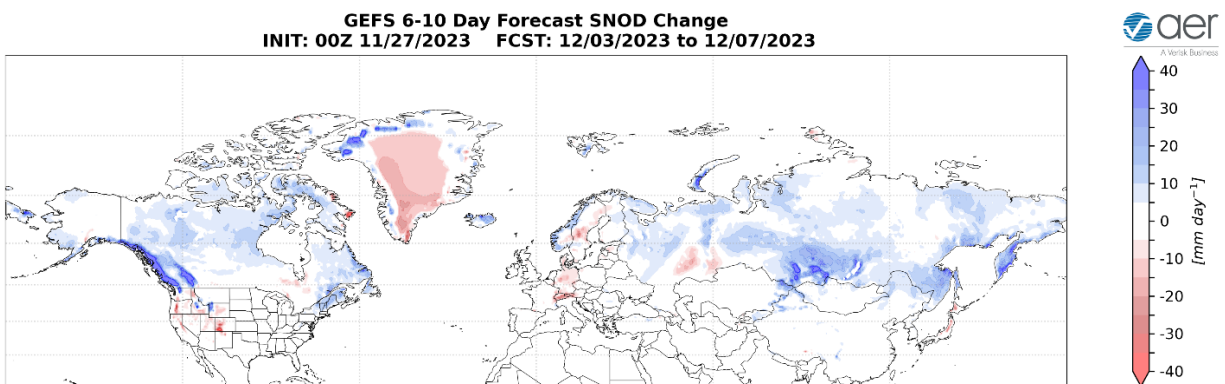

Figure 7. Forecasted snow depth changes (mm/day; shading) from 3 – 7 December 2023. The forecast is from the 00Z 27 November 2023 GFS ensemble.

Troughing and/or cold temperatures will support new snowfall across Norway, Northern Asia including much of Siberia while mild temperatures will support snowmelt in the Central Europe and the Alps this period (**Figure 7**). Troughing and/or cold temperatures will support new snowfall across Southern Alaska, much of Canada and New England

while mild temperatures will support snowmelt in Ontario and the Western US 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 should remain neutral to negative this period (**Figure 1**). With predicted weak but positive pressure/geopotential height anomalies across Greenland (**Figure 8**), the NAO will also likely be neutral to negative this period as well.
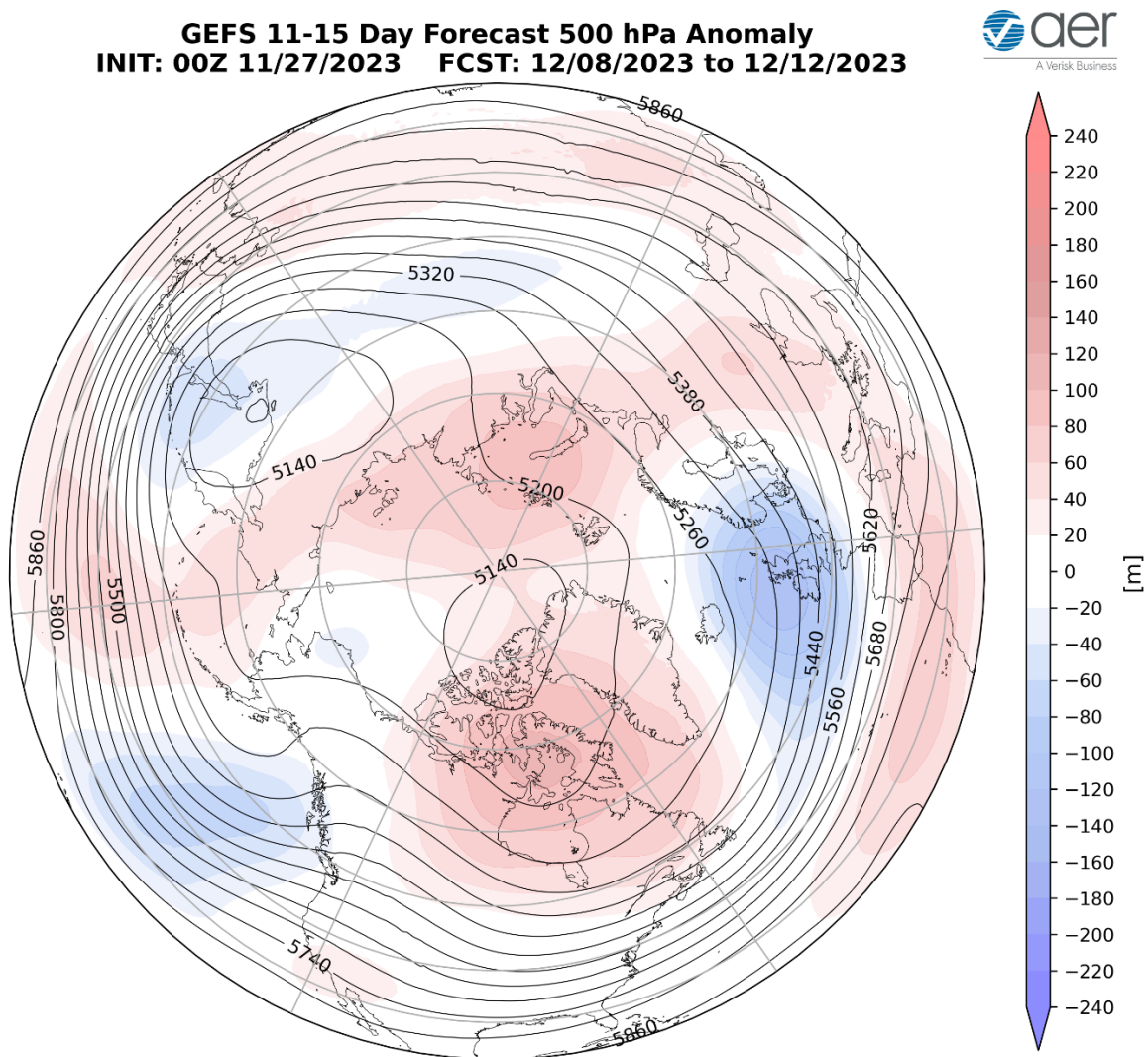

GEFS 11-15 Day Forecast 500 hPa Anomaly
INIT: 00Z 11/27/2023   FCST: 12/08/2023 to 12/12/2023

Figure 8. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 8 – 12 December 2023. The forecasts are from the 00z 27 November 2023 GFS ensemble.

Predicted ridging/positive geopotential height anomalies from Greenland to the Barents-Kara Seas should continue to anchor troughing/negative geopotential height anomalies across Northern Europe with ridging/positive geopotential height anomalies across Southeastern Europe should persist this period (**Figure 8**). This pattern should favor normal to below normal temperatures across Northern and Eastern Europe including the UK with normal to above normal temperatures across the Southern and Western Europe this period (**Figures 9**). Ridging/positive geopotential height anomalies are predicted to continue to dominate Southern and Central Asia with troughing/negative geopotential height anomalies across Northern Asia this period (**Figure 8**). The predicted pattern favors widespread normal to above normal temperatures across Southern and Central Asia with normal to below normal temperatures mostly widespread across Northern Asia this period (**Figure 9**).
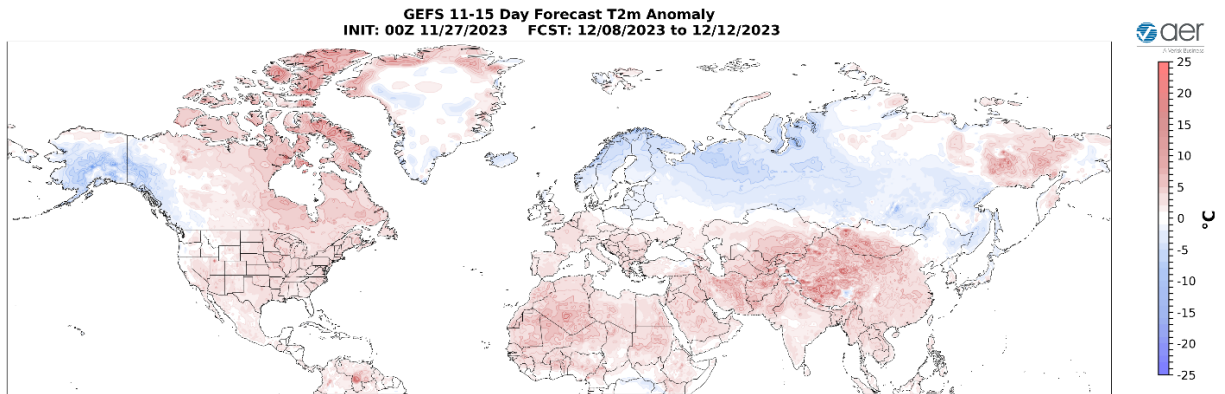

Figure 9. Forecasted surface temperature anomalies (°C; shading) from 8 – 12 December 2023. The forecasts are from the 00z 27 November 2023 GFS ensemble.

Persistent troughing/negative geopotential height anomalies across Alaska and the Gulf of Alaska will continue to force ridging/positive geopotential height anomalies across eastern North America this period (**Figure 8**).   This pattern favors widespread normal to above normal temperatures across much of Canada and the US with normal to below normal temperatures limited to Alaska and the west coasts of Canada and the US (**Figure 9**).
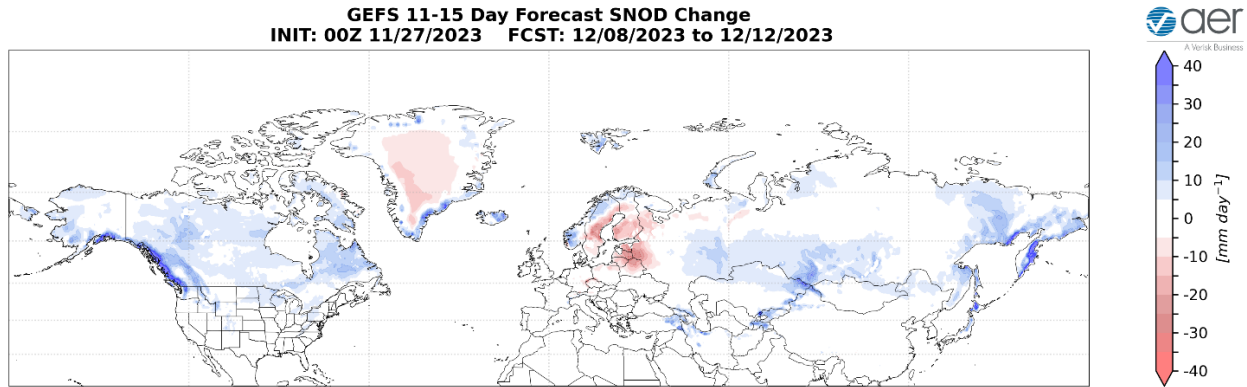
Figure 10. Forecasted snow depth changes (mm/day; shading) from 8 – 12 December 2023. The forecast is from the 00Z 27 November 2023 GFS ensemble.

Troughing and/or cold temperatures will support new snowfall across Norway, Southern and Eastern Siberia while mild temperatures will support snowmelt in Sweden, Finland and the Baltics this period (**Figure 10**). Troughing and/or cold temperatures will support new snowfall across western Alaska, much of Canada and the Northern US Rockies. Though not shown, mild temperatures will support snowmelt in parts of Eastern Canada and the Eastern US this period (**Figure 10**).

Longer Term

30–day

The latest plot of the polar cap geopotential height anomalies (PCHs) currently shows cold/negative PCHs throughout the stratosphere with warm/positive PCHs in the troposphere (**Figure 11**). However, next week warm/positive PCHs are predicted to develop in the upper to mid-stratosphere related to a Canadian warming (**Figure 11**).
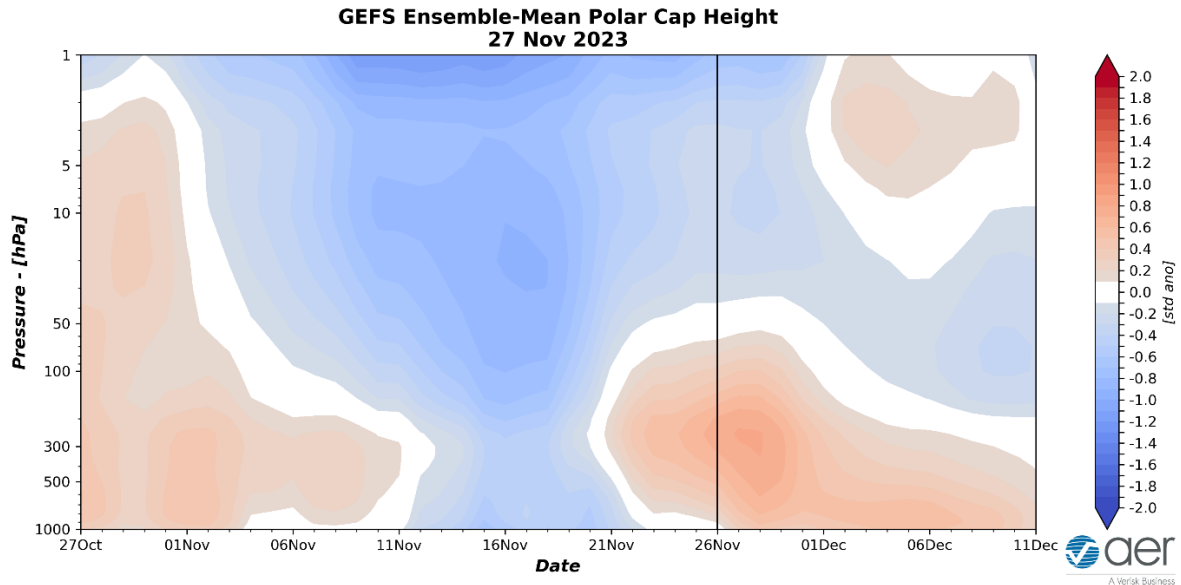
Figure 11. Observed and predicted daily polar cap height (i.e., area-averaged geopotential heights poleward of 60°N) standardized anomalies. The forecast is from the 00Z 27 November 2023 GFS ensemble.

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

Also shown in **Figure 1** is the stratospheric AO. The stratospheric AO is currently positive and is predicted to remain positive into early December. This is consistent with cold/negative stratospheric PCHs and a strong PV. However, at the end of the first week of December the stratospheric AO will approach neutral related to the Canadian warming.
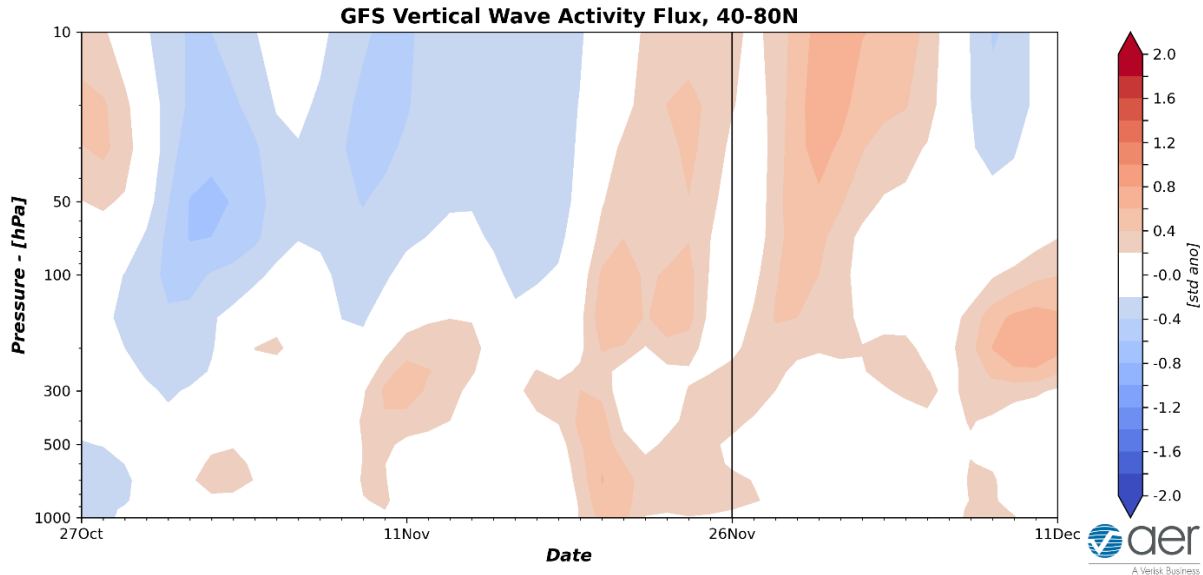
GFS Vertical Wave Activity Flux, 40-80N

Figure 12. Observed and predicted daily vertical component of the wave activity flux (WAFz) standardized anomalies, averaged poleward of 40-80°N. The forecast is from the 00Z 27 November 2023 GFS ensemble.

Vertical Wave Activity Flux (WAFz) from the troposphere to the stratosphere or poleward heat transport in the stratosphere has become more active since the end of last week (**Figure 12**). This has resulted in a stretched PV (**Figure 12**) and a negative trend of the stratospheric AO (**Figure 1**). Over the next two weeks the WAFz is predicted to become even more active (**Figure 12**), which should result in a Canadian warming in early December.
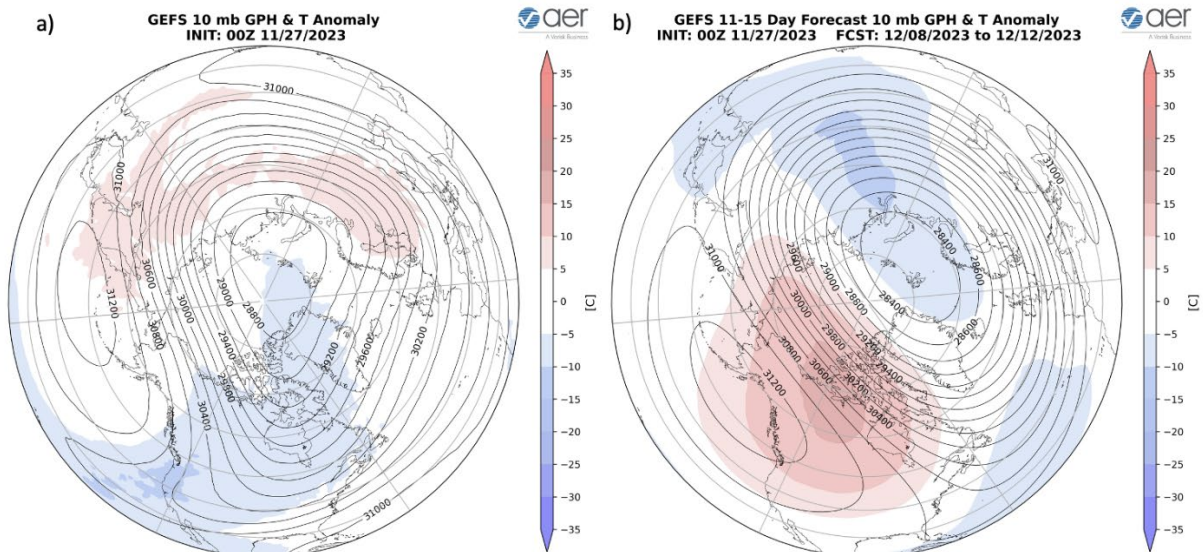
Figure 13. (a) Initialized 10 mb geopotential heights (dam; contours) and temperature anomalies (°C; shading) across the Northern Hemisphere for 27 November 2023 . (b) Same as (a) except forecasted averaged from 8 – 12 December 2023. The forecasts are from the 00Z 27 November 2023 GFS model ensemble.

Currently the polar vortex (PV) is elongated in shape with the PV center shifted slightly south of the North Pole in the direction of the Barents-Kara Seas (**Figure 13a**). The elongated PV shape is characteristic of a stretched PV and is oriented from Siberia towards Western Canada. However, starting next week and continuing into early December, the PV is predicted to become more perturbed shifting towards Scandinavia (**Figure 13b**). This elongated PV configuration is predicted to rotate along an axis from Siberia to Greenland. Induced northerly flow across Europe is related to colder temperatures in Europe.
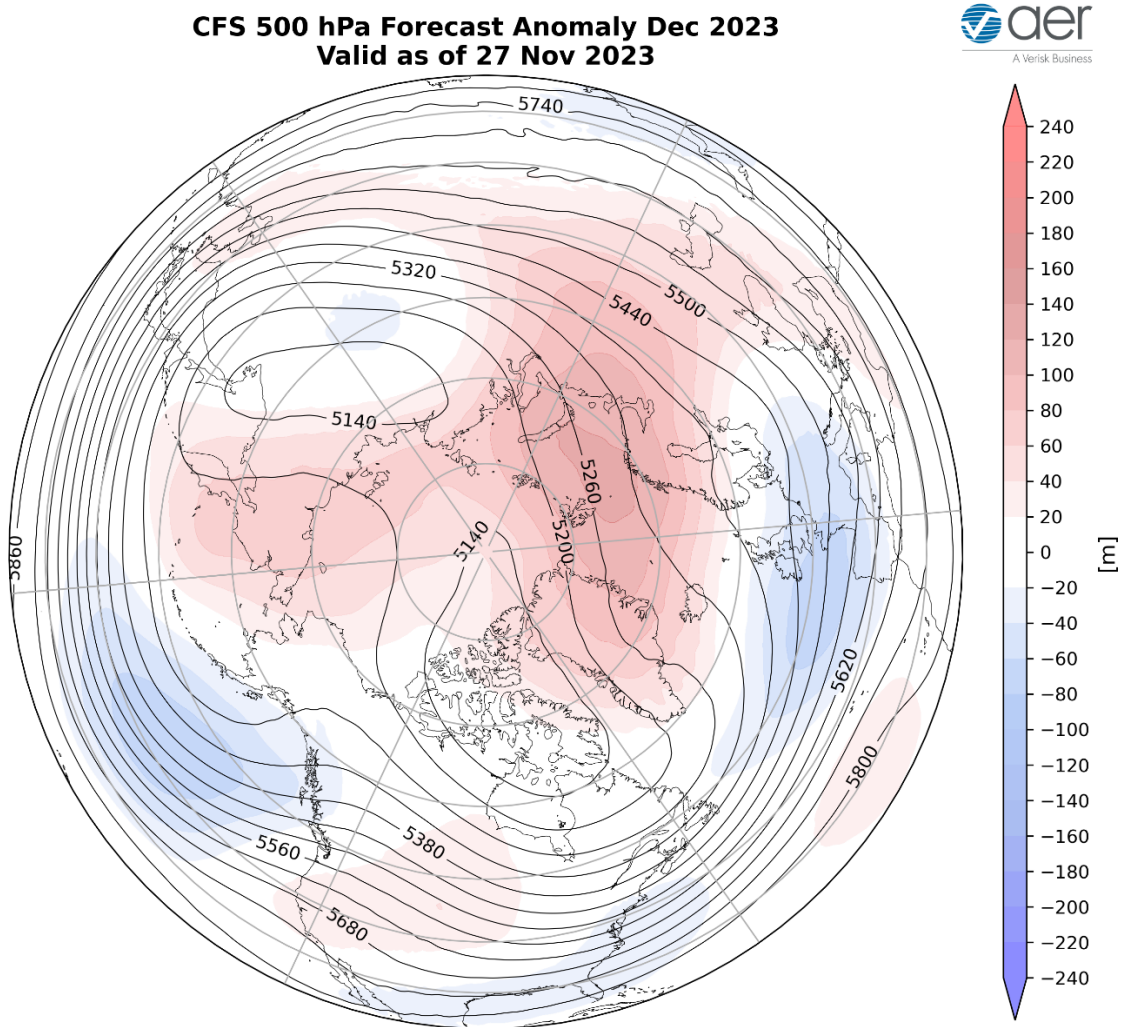

CFS 500 hPa Forecast Anomaly Dec 2023
Valid as of 27 Nov 2023

Figure 14. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere for December 2023. The forecasts are from the 00Z 27 November 2023 CFS.

I include in this week's blog the monthly 500 hPa geopotential heights (**Figure 14**) and surface temperatures for December (**Figure 15**) from the Climate Forecast System (CFS; the plots represent yesterday's four ensemble members). The forecast for the troposphere is ridging from Greenland across to Scandinavia and then the Barents-Kara Seas and then south in Western Russia, Eastern Siberia, Western Canada and the Western US with troughing in Western Europe, Siberia, Northeast Asia, the Gulf of Alaska and eastern North America (**Figure 14**).   This pattern favors seasonable to relatively warm temperatures across Southern Europe, Southern Asia, Eastern Siberia, Central Canada and the Western and Central US with seasonable to relatively cold temperatures across Northern Europe, Northern Asia including Western and Central Siberia, Northeast Asia, Southeastern Canada and the Northeastern US (**Figure 15**).
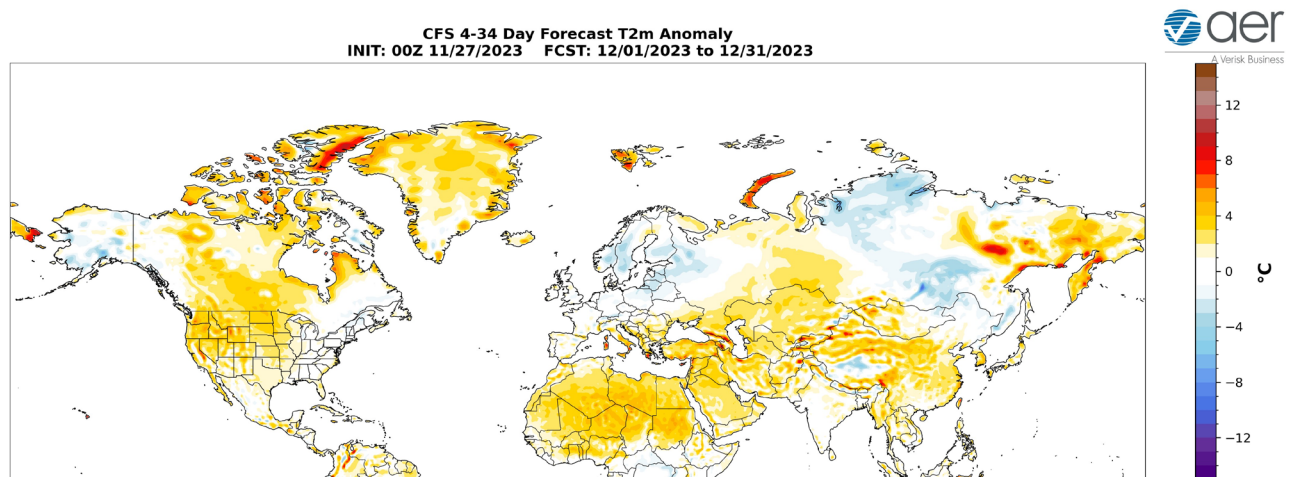

Figure 15. Forecasted average surface temperature anomalies (°C; shading) across the Northern Hemisphere for December 2023. The forecasts are from the 00Z 20 November 2023 CFS.

Boundary Forcings

Arctic sea ice extent

Arctic sea ice extent continues to grow but did go sideways this week. I continue to expect that the negative sea ice anomalies will become more focused in the North Atlantic sector, though so far this has not happened. Blocking in the Barents-Kara sea region is critical from keeping a runaway PV that will squash any widespread and meaningful cold in Northern Eurasia and eastern North America for weeks and possibly even months to come.
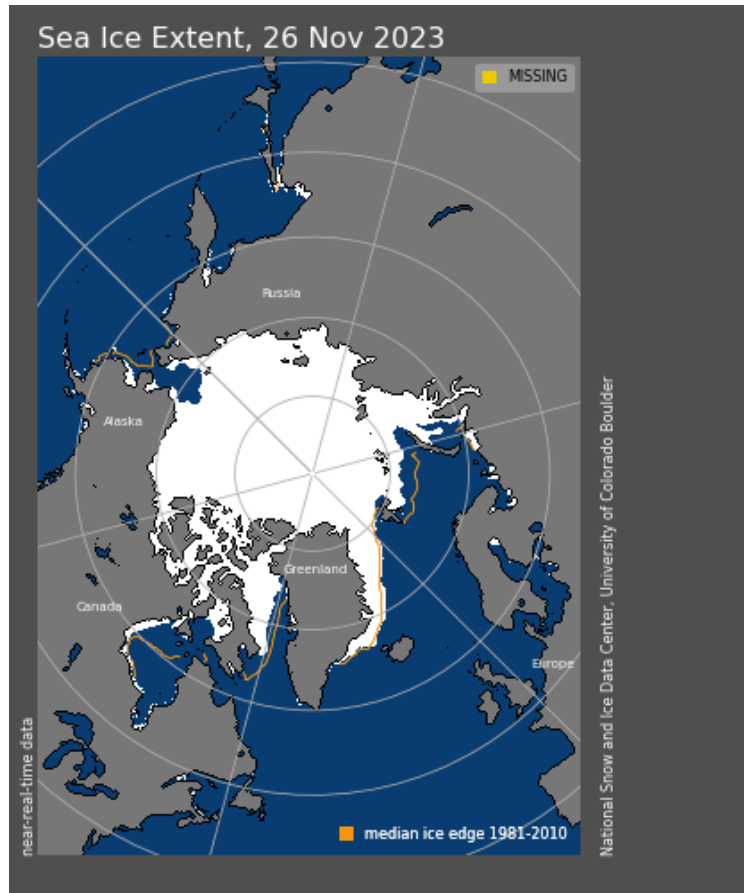
Figure 16. Observed Arctic sea ice extent on 26 November 2023 (white). Orange line shows climatological extent of sea ice based on the years 1981-2010. Image courtesy of National Snow and Ice Data Center (NSIDC). Snow and Ice Data Center (NSIDC).

SSTs/El Niño/Southern Oscillation

Equatorial Pacific sea surface temperatures (SSTs) anomalies are well above normal, especially along the South America coast, indicating that an El Niño is pretty much a sure thing (**Figure 17)** and El Niño conditions are expected through the winter. Observed SSTs across the NH remain well above normal especially in the central North Pacific (west of recent years), the western North Pacific, the eastern North Atlantic and offshore of eastern North America though below normal SSTs exist regionally especially in the South and North Pacific and the North Atlantic.
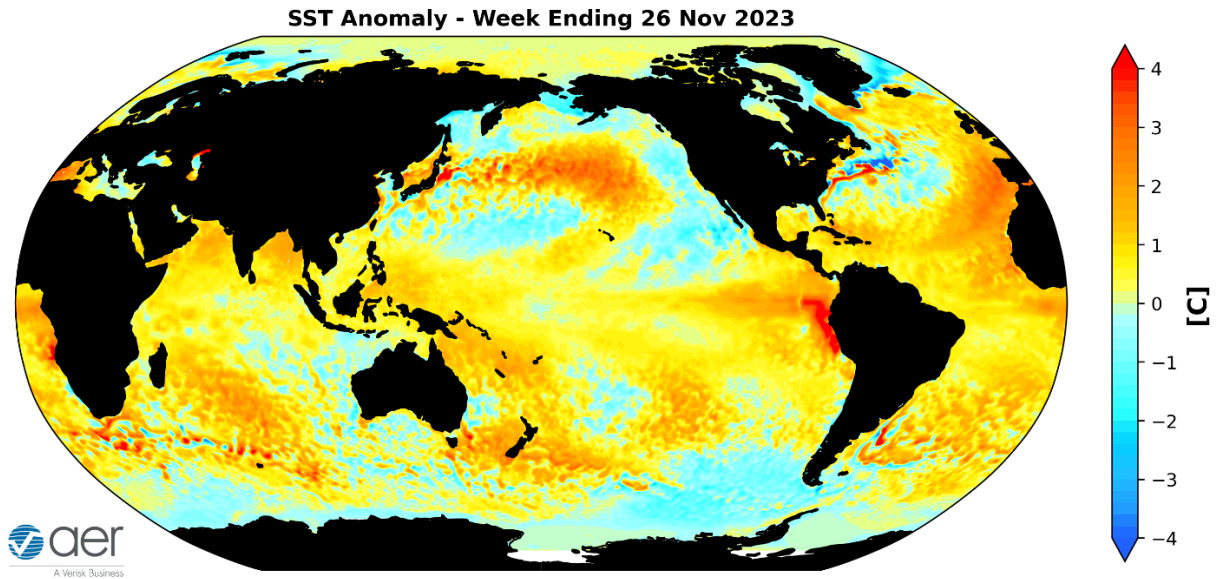
Figure 17. The latest weekly-mean global SST anomalies (ending 26 November 2023). Data from NOAA OI High-Resolution dataset.

Madden Julian Oscillation

Currently the Madden Julian Oscillation (MJO) is in phase two (**Figure 1**). The forecasts are for the MJO to immediately weaken where no phase is favored. Phase two favors troughing along the west coast of North America and ridging in eastern North America. Therefore it seems that the MJO could be having some limited influence on North American weather next week. But admittedly this is outside of my expertise.
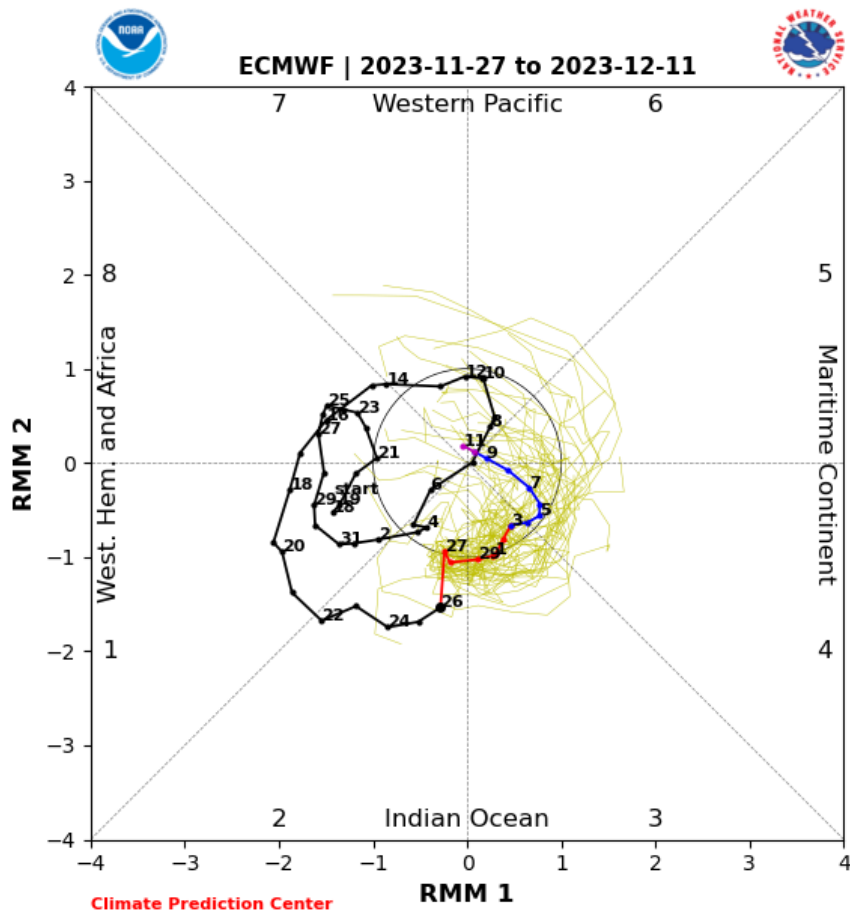
Figure 18. Past and forecast values of the MJO index. Forecast values from the 00Z 27 November 2023 ECMWF model. Yellow lines indicate individual ensemble-member forecasts, with the green line showing the ensemble-mean. A measure of the model "spread" is denoted by the gray shading. Sector numbers indicate 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/clivar_wh.shtml

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

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

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