

# Arctic Oscillation and Polar Vortex Analysis and Forecasts

January 15, 2024

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

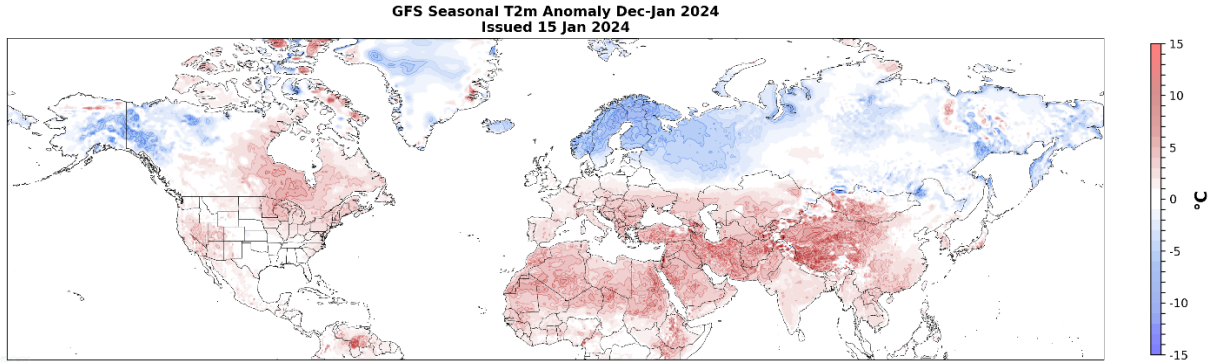
- The Arctic Oscillation (AO) is currently negative and is predicted to trend positive later this week and remain positive next week as pressure/geopotential height anomalies across the Arctic are currently mostly positive and are predicted to become increasingly negative over the next two weeks. The North Atlantic Oscillation (NAO) is currently negative with positive pressure/geopotential height anomalies across Greenland and the NAO is predicted to trend positive the next two weeks as pressure/geopotential height anomalies trend negative across Greenland.
- This week, ridging/positive geopotential height anomalies across Greenland will anchor troughing/negative geopotential height anomalies across Europe. This pattern will support a classic -NAO temperature pattern with normal to below normal temperatures across Northern Europe including the United Kingdom (UK) with normal to above normal

temperatures across Southern Europe. However next week the return of troughing/negative geopotential height anomalies across Greenland will support more ridging/positive geopotential height anomalies across Europe and the spread north of normal to above normal temperatures across much of Europe including the UK.

- This week, ridging/positive geopotential height anomalies across Greenland will force troughing/negative geopotential height anomalies across Northern Asia with ridging/positive geopotential height anomalies across Central and Southern Asia. This pattern favors widespread normal to above normal temperatures across Southern and Central Asia with normal to below normal temperatures across Northern Asia. However next week the return of troughing/negative geopotential height anomalies across Greenland will support more widespread ridging/positive geopotential height anomalies across Asia and the spread north of normal to above normal temperatures across much of Asia.
- The general predicted pattern across North America this week is ridging/positive geopotential height anomalies across Greenland and Alaska forcing troughing/negative geopotential height anomalies across the interior of North America including the Central United States (US). This pattern favors normal to above normal temperatures stretching from Alaska across Northern Canada and across Hudson Bay with normal to below normal temperatures across Western Canada and the Central and Eastern US this week. However next week the Alaska ridging will slide into Eastern Siberia allowing troughing/negative geopotential height anomalies in the Gulf of Alaska forcing ridging/positive geopotential height anomalies across much of North America and more widespread above normal temperatures across the US and Canada with the exception of normal to below normal temperatures across Northeastern Canada.
- in the Impacts section I discuss the ongoing complex polar vortex (PV) disruptions in rapid succession, a potential strengthening PV and the impact on Northern Hemisphere (NH) weather. It remains a challenging forecast environment.

## Plain Language Summary

Colder weather is on the retreat across the Hemisphere (NH) continents the next two weeks (see **Figure 9**) as the series of polar vortex (PV) disruptions may finally come to an end. A relatively minor perturbation of the polar vortex (PV) where it stretches out like a rubber could bring a return of colder temperatures to Eastern Canada first and then the Eastern US to end the month of January.



**Figure.** Estimate of the observed surface temperatures (°C; shading) from 1 December 2023 – 30 January 2024 based on GFS initializations and the GFS forecast from the 15 January 2024 forecast.

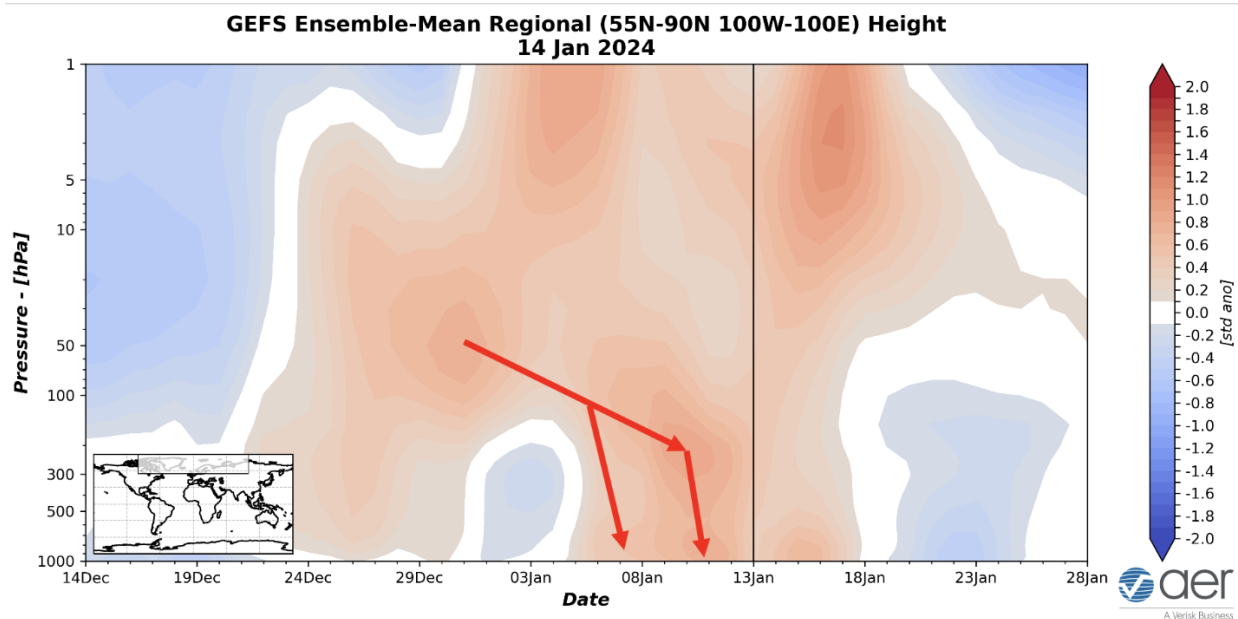
So far this winter cold temperatures have been found in Northern Europe and Northern Asia with Scandinavia and Northwest Russia the big winners (see **Figure**). However cold is making a showing in North America with the recent Arctic outbreak. Cold temperatures for now mostly limited to Alaska and Northwest Canada could expand southeastward with time.

## Impacts

As I discussed last week, persistent splitting of the PV center could yet yield a major warming (a reversal in the zonal mean zonal wind at 60°N and 10hpa from westerly to easterly/from positive to negative). If it does get there, I think that the here again, gone again and now here again Ural ridging (making a surprise return this week) was ultimately made the difference or the straw that broke the camel’s back (see **Figure 2**). I am hoping it is achieved simply so the event is recorded in the compendium of sudden stratospheric warmings (SSWs) and not end in anonymity after this winter. It is a very interesting event and deserves to be studied further. But I will repeat myself, I think it is most informative to associate the impacts to our weather more closely associated with a stretched PV rather than a classical SSW. The stretched PV has finally brought winter to North America, just in time for my official start to winter, including the US with a bang with record cold and disruptive snowstorms.

Ironically if major warming is achieved, it could be described as “putting the cart before the horse” as the traditional tropospheric response to SSWs, Greenland blocking and negative NAO, preceded the major warming! Almost as if time is going in reverse. We still don’t understand how downward propagation or influence from the stratosphere to the troposphere physically works and we only know it from empirical evidence. And using the North Atlantic regional polar cap geopotential height anomalies (PCHs) shown in **Figure i**, you could reasonably make the argument that the Greenland block originated from the Canadian warming in late December rather than the series of SSWs in January. Who knew Canadian warmings could be so much fun? Though the argument could be made that the peak in the tropospheric response was constructive interference from the Canadian warming and the minor SSW or a colliding, merging

or marriage of the downward influence from both. But of course, this is me spit balling on the fly so I don't want to make this seem like settled science.

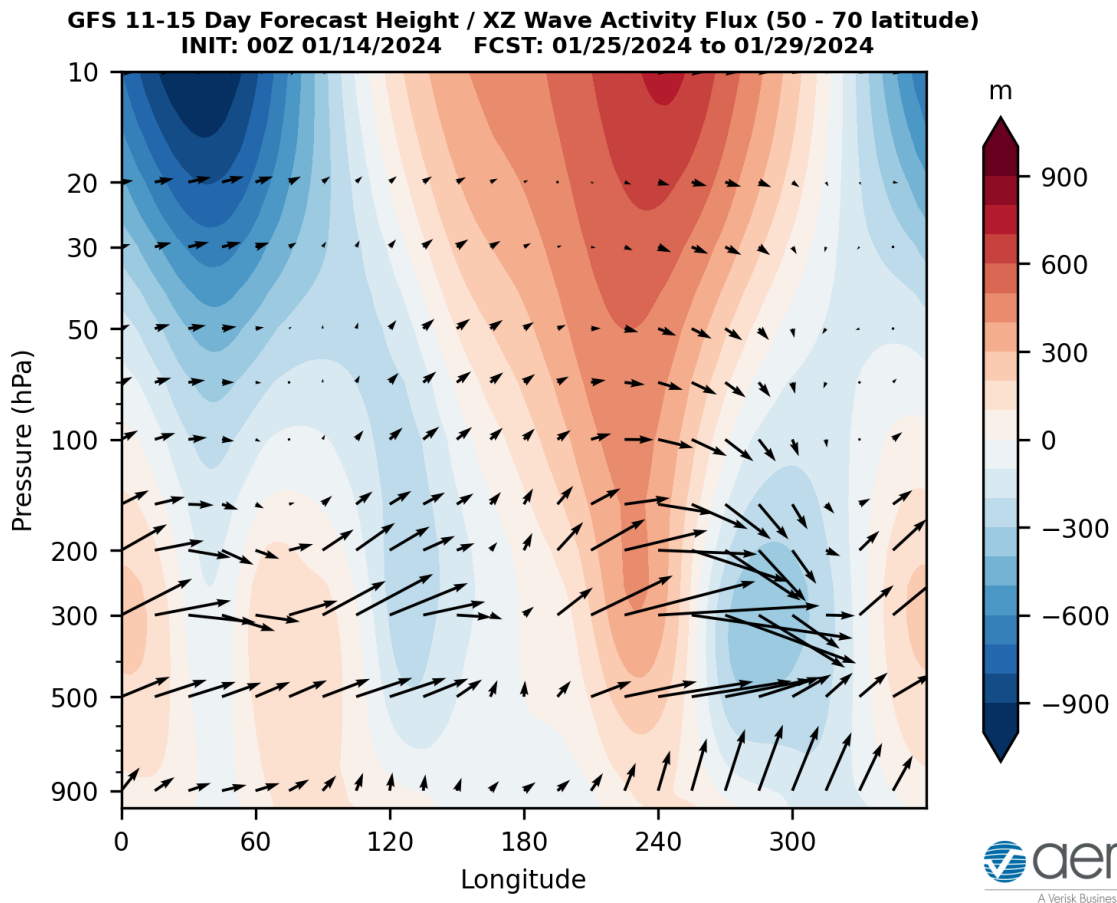


**Figure i.** Observed and predicted daily polar cap height (i.e., area-averaged geopotential heights poleward of 60°N) standardized anomalies over the North Atlantic sector only (see insert). The forecast is from the 00Z 14 January 2024 GFS ensemble.

But before I leave **Figure i**, it is very interesting to compare it to **Figure 11** below, the full PCHs version. Notice there is a second “drip” of warm/positive PCHs from the lower stratosphere the very end of January in the full PCH forecast. That is always associated with a dripping of a negative AO/NAO from SSWs. But looking at **Figure i**, that drip is missing so it can't be associated with a negative NAO. I have noticed that in the more extreme PV stretched you observe that seeming “classical drip” as in **Figure 11**. But rather than high-latitude blocking in the North Atlantic sector, the high latitude blocking occurs in the North Pacific sector. In practical terms this results in the placement of cold in North America rather than in Europe, as expected by the more established scientific literature. In these challenging forecast periods, an expanded set of diagnostics can be very helpful.

But unraveling what will happen next remains challenging. All the models are predicting that the PV will rapidly strengthen after the peak in the SSW, again something consistent with wave reflection and stretched PVs more so than SSWs, especially those with no associated wave reflection. And trying to anticipate the weather from the wave energy diagnostics has been especially useful. The GFS 5-day averaged Wave Activity Flux (WAFz), especially in the vertical and longitudinal direction coupled with eddy geopotential heights were ahead of the weather models in predicting the return of a western ridge/eastern trough pattern across North America. Even though the PV is strengthening, it persists long enough to support at least more

wave reflection (see **Figure ii**) that pushes the atmosphere into a western ridge/eastern trough pattern across North America to end the month. So, we have the North American Arctic outbreak winding down this week and into next week. This is followed by a relaxation of the pattern rather than a complete breakdown so after a relatively brief milder pattern (but as always with a milder pattern the sky seems to be the limit), colder temperatures should return at least to eastern North America the last week of January. Given the intensity of the last Arctic outbreak, anything close in magnitude is nearly impossible but the same doesn't apply to a good snowstorm. Also, fairly consistent with stretched PVs the NAO is predicted to flip positive and a milder pattern is predicted for Europe through at least the end of the month and probably into early February.



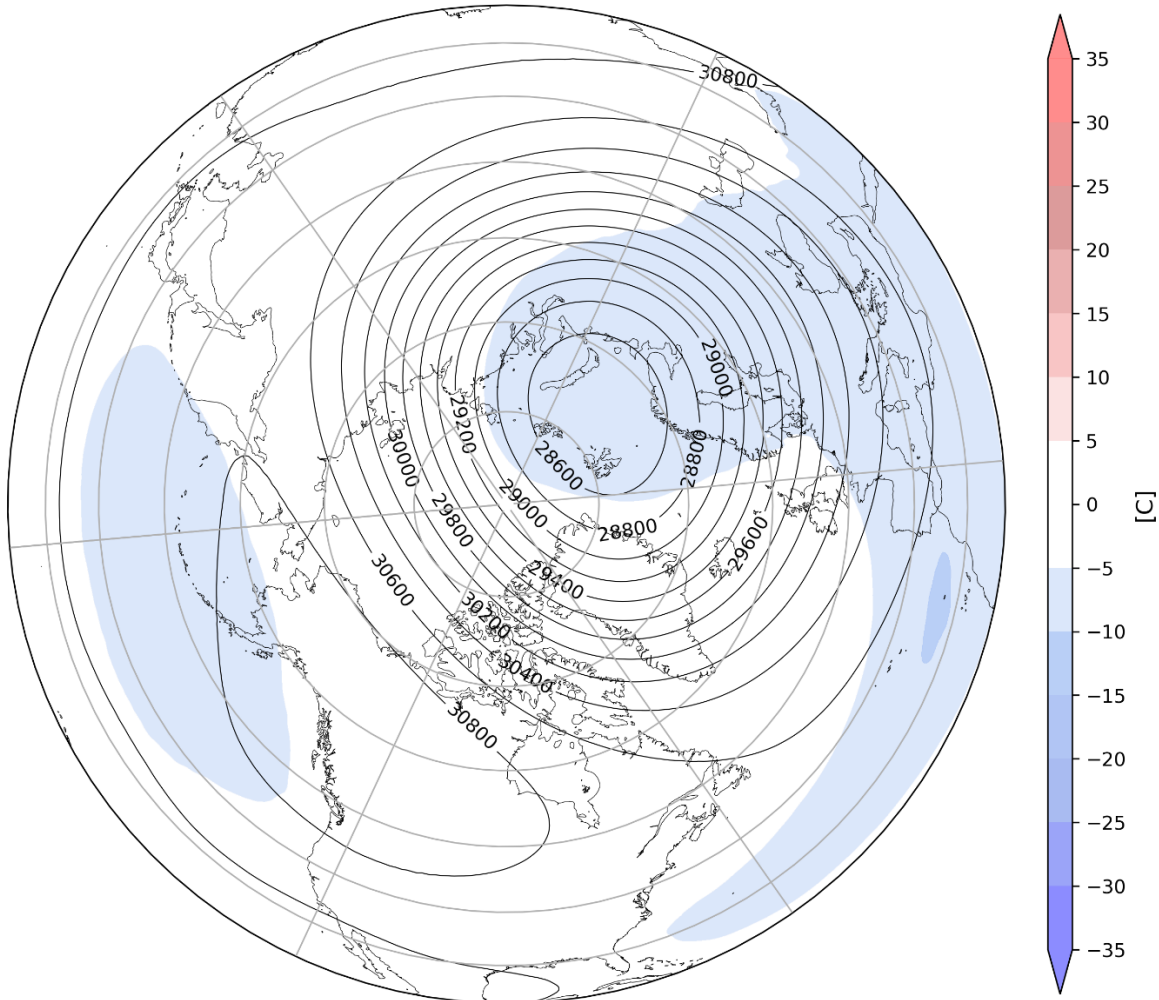
**Figure ii.** Longitude-height cross section of geopotential eddy height anomalies (shading) and wave activity flux (vectors) a) initialized 12 December 2022 and b) forecasted for 25 – 29 January 2024. The forecasts are from the 00z 14 January 2024 GFS ensemble.

But stretched PVs often result in a strengthening PV that could lead to a lengthy mild pattern across the NH or a “rinse, lather repeat” pattern of a strong circular PV accompanied by milder weather and a stretched PV accompanied by colder weather in East Asia and/or North America east of the Rockies. Too early to know if the stretched PV/wave reflection is the last one for an

extended period or will keep repeating. For what it's worth, if you believe the ECMWF weeklies, then it will keep repeating in February based on the mid-tropospheric forecast. Hey I do like to say that even a blind squirrel finds a nut then and again.

Seems to me that another SSW in such close proximity to the one ending this week is highly unlikely, yet the models seem to be suggesting a Canadian warming to end the month, PV behavior that is most akin to an SSW (see **Figure iii**). Then as I discussed earlier this winter, a Canadian warming most often transitions to a stretched PV (most likely scenario in my opinion) or to a more mature SSW (least likely scenario in my opinion). Also, as I discussed back in December, Canadian warmings favor a mild to very mild weather pattern across North America but with colder weather across Northern Europe and Northern Asia.

**GEFS 11-15 Day Forecast 10 mb GPH & T Anomaly**  
**INIT: 00Z 01/15/2024 FCST: 01/26/2024 to 01/30/2024**



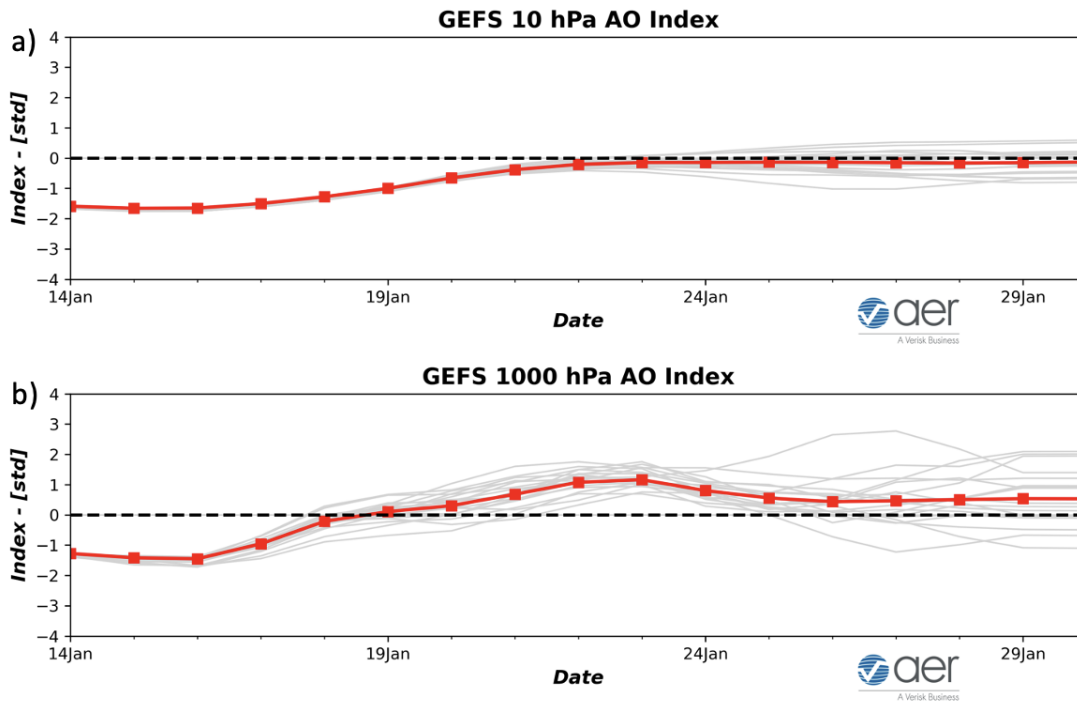
**Figure iii.** Forecasted 10 mb geopotential heights (dam; contours) and temperature anomalies ( $^{\circ}\text{C}$ ; shading) across the Northern Hemisphere from 26 – 30 January 2024. The forecasts are from the 00Z 15 January 2024 GFS model ensemble.

So lots to sort out and many different directions the weather can go in February. So, I think best to stop here before someone saws off the very long limb I just walked out onto. But I think continue to expect high model forecast volatility, low confidence, and a challenging environment to make a forecast beyond a week. But I am trying my best even on vacation or a work vacation more accurately.

## Near-Term

### *This week*

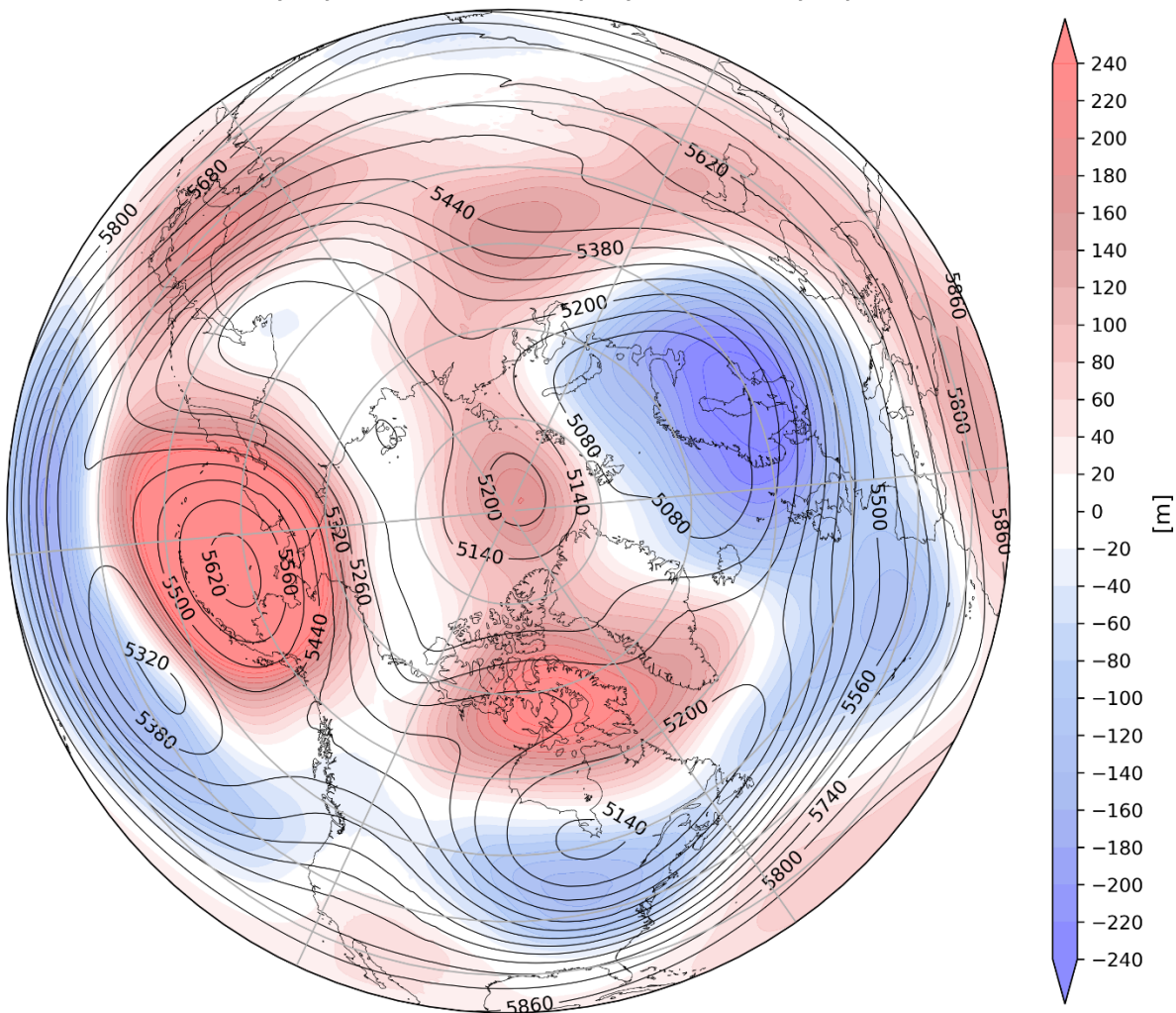
The AO is predicted to be negative this week (**Figure 1**) with mostly positive geopotential height anomalies across the Arctic and with mixed geopotential height anomalies across the mid-latitudes of the NH (**Figure 2**). With predicted positive geopotential height anomalies across Greenland (**Figure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



**Figure 1.** (a) The predicted daily-mean AO at 1000 hPa from the 00Z 15 January 2024 GFS ensemble. (b) The predicted daily-mean near-surface AO from the 00Z 8 January 2024 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 near Iceland will anchor troughing/negative geopotential height anomalies across Northern Europe with some weak ridging/positive geopotential height anomalies across Southern Europe this week (**Figures 2**). The pattern favors normal to below normal temperatures across Northern Europe including the UK with normal to above normal temperatures across Southern Europe (**Figure 3**). Predicted ridging/positive geopotential height anomalies centered near Greenland and the North Pole will support troughing/negative geopotential height anomalies across Northern Asia with ridging/positive geopotential height anomalies across Southern Asia and near the Urals this period (**Figure 2**). This pattern favors widespread normal to above normal temperatures across Southern and Western Asia with normal to below normal temperatures across much of Northern Asia (**Figure 3**).

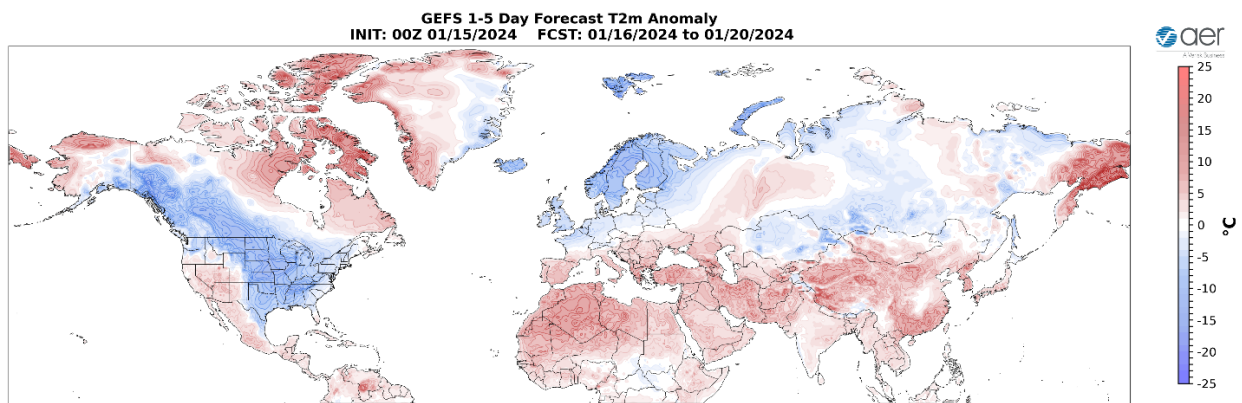
**GEFS 1-5 Day Forecast 500 hPa Anomaly**  
**INIT: 00Z 01/15/2024 FCST: 01/16/2024 to 01/20/2024**





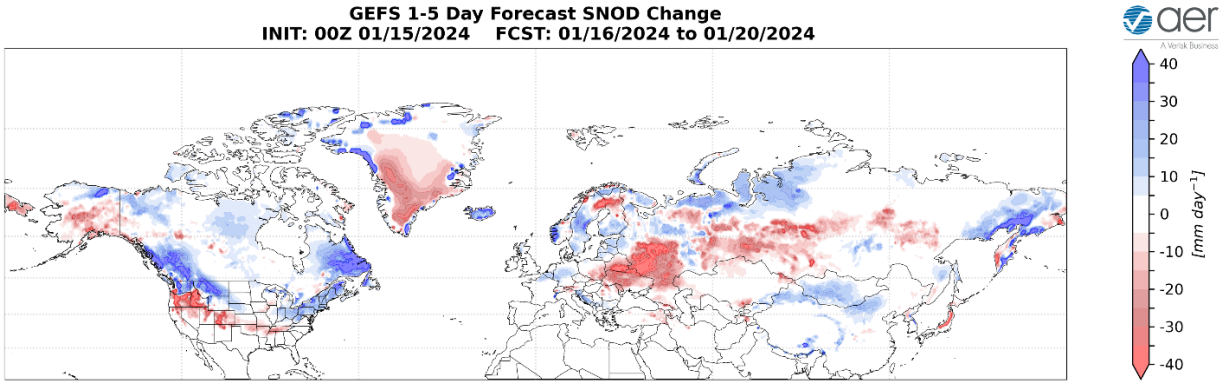
**Figure 2.** Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 16 – 20 January 2024. The forecasts are from the 00z 15 January 2024 GFS ensemble.

The pattern this week across North America is ridging/positive geopotential height anomalies centered near Baffin Bay and Alaska forcing troughing/negative geopotential height anomalies across the interior of Canada and the Central US with more ridging/positive geopotential height anomalies in the Southwestern US (**Figure 2**). This pattern will favor normal to above normal temperatures across Alaska, Eastern Canada and the Southwestern US with normal to below normal temperatures across Western Canada and the Northern and Eastern US (**Figure 3**).



**Figure 3.** Forecasted surface temperature anomalies ( $^{\circ}\text{C}$ ; shading) from 16 – 20 January 2024. The forecast is from the 00Z 15 January 2024 GFS ensemble.

Troughing and/or cold temperatures will support new snowfall across Northern Europe including Scotland, Northern Siberia, Central Asia and the Tibetan Plateau while mild temperatures will support snowmelt across Eastern Europe, Northwestern Russia and Southern Siberia this week (**Figure 4**). Troughing and/or cold temperatures will support new snowfall across northern Alaska, Southwestern and Eastern Canada, the Northwestern US, the Great Lakes and the Northeastern US while mild temperatures will support snowmelt across southern Alaska and the Southwestern US this week (**Figure 4**).



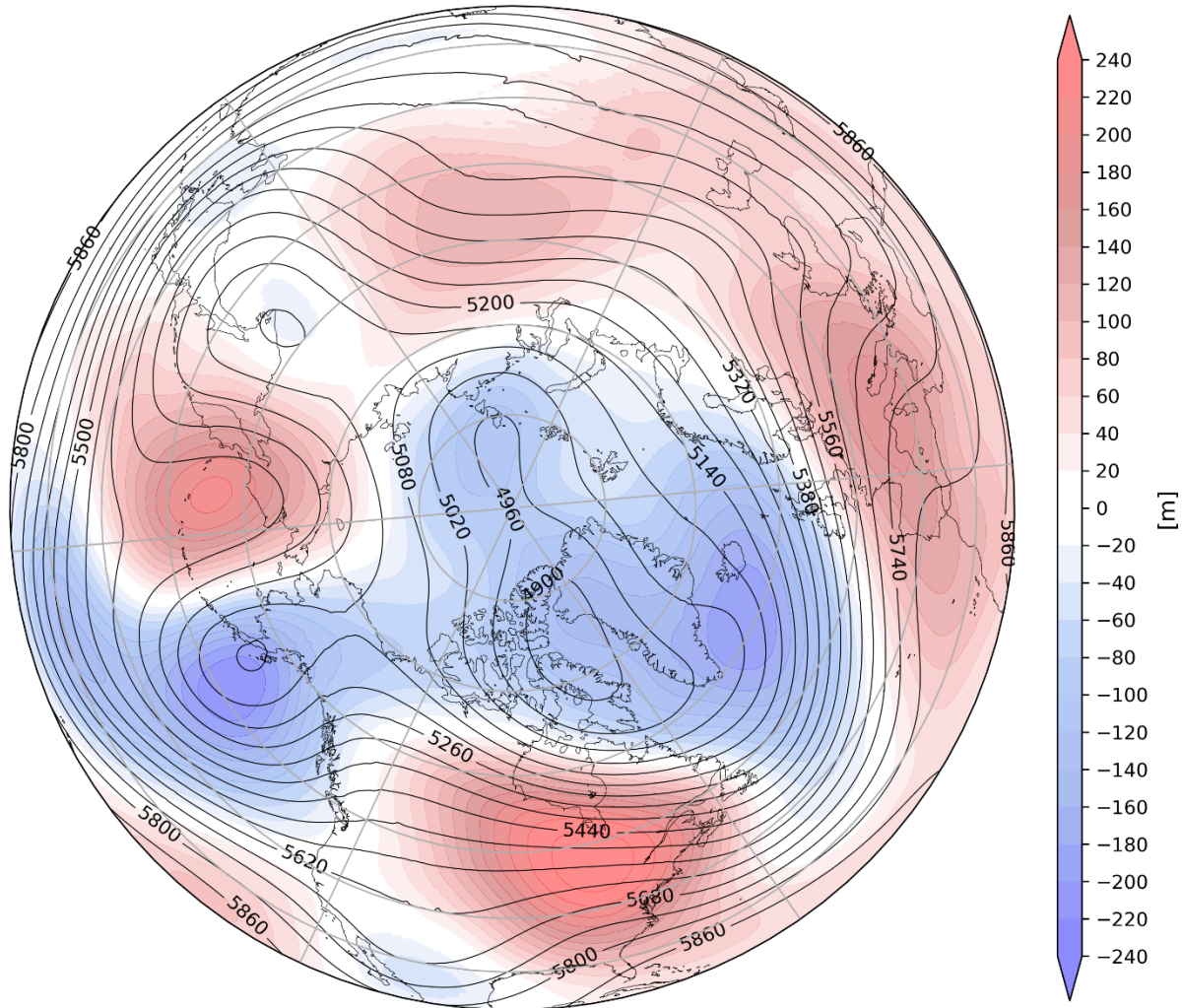
**Figure 4.** Forecasted snow depth changes (mm/day; shading) from 16 – 20 January 2024. The forecast is from the 00Z 15 January 2024 GFS ensemble.

## Near-Mid Term

### *Next week*

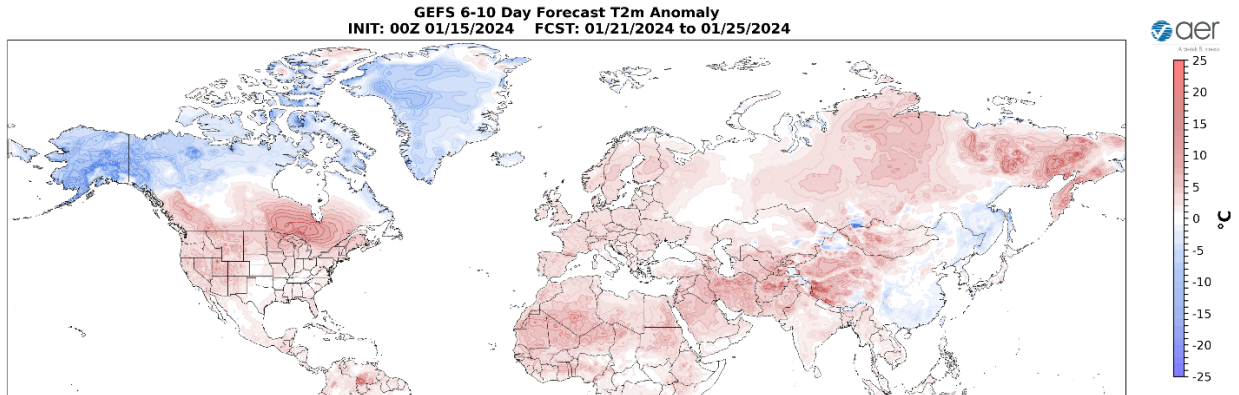
With geopotential height anomalies turning mostly negative across the Arctic and with mixed geopotential height anomalies across the mid-latitudes this period (**Figure 5**), the AO should flip positive this period (**Figure 1**). With pressure/geopotential height anomalies across Greenland also turning mostly negative (**Figure 5**), the NAO should pop into positive territory as well this period.

**GEFS 6-10 Day Forecast 500 hPa Anomaly**  
**INIT: 00Z 01/15/2024 FCST: 01/21/2024 to 01/25/2024**



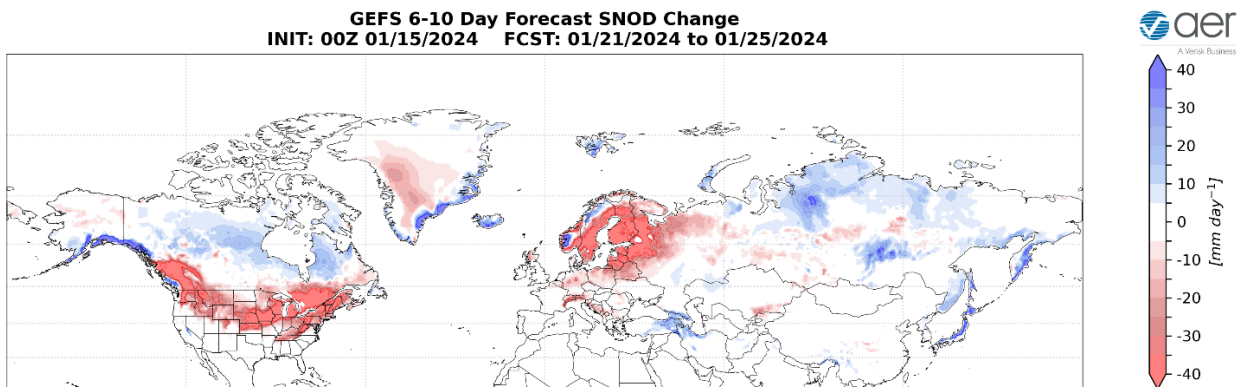
**Figure 5.** Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 21 – 25 January 2024. The forecasts are from the 00z 15 January 2024 GFS ensemble.

Trouching/negative geopotential height anomalies centered near Greenland will support ridging/positive geopotential height anomalies pushing north across Europe this period (**Figure 5**). This pattern will favor widespread normal to above normal temperatures across much of Europe including the UK with normal to below normal temperatures limited to Northern and Eastern Europe (**Figures 6**). Trouching/negative geopotential height anomalies across Greenland will allow ridging/positive geopotential height anomalies to strengthen across Central Asia bookended by trouching/negative geopotential height anomalies in Northwestern and Northeastern Asia this period (**Figure 5**). This pattern favors widespread normal to above normal temperatures across Asia with normal to below normal temperatures limited to Northwest Russia and Northeastern Asia this period (**Figure 6**).



**Figure 6.** Forecasted surface temperature anomalies (°C; shading) from 21 – 25 January 2024. The forecasts are from the 00z 15 January 2024 GFS ensemble.

The predicted westward drifting of ridging into Eastern Siberia this period will allow troughing/negative geopotential height anomalies across Alaska and the Gulf of Alaska forcing ridging/positive geopotential height anomalies across much of North America (**Figure 5**). This pattern favors normal to above normal temperatures across Southern and Eastern Canada, and the Western US with normal to below normal temperatures across Alaska, Western and Northern Canada and the Eastern US, which is the last remnants of the notable Arctic outbreak (**Figure 6**).



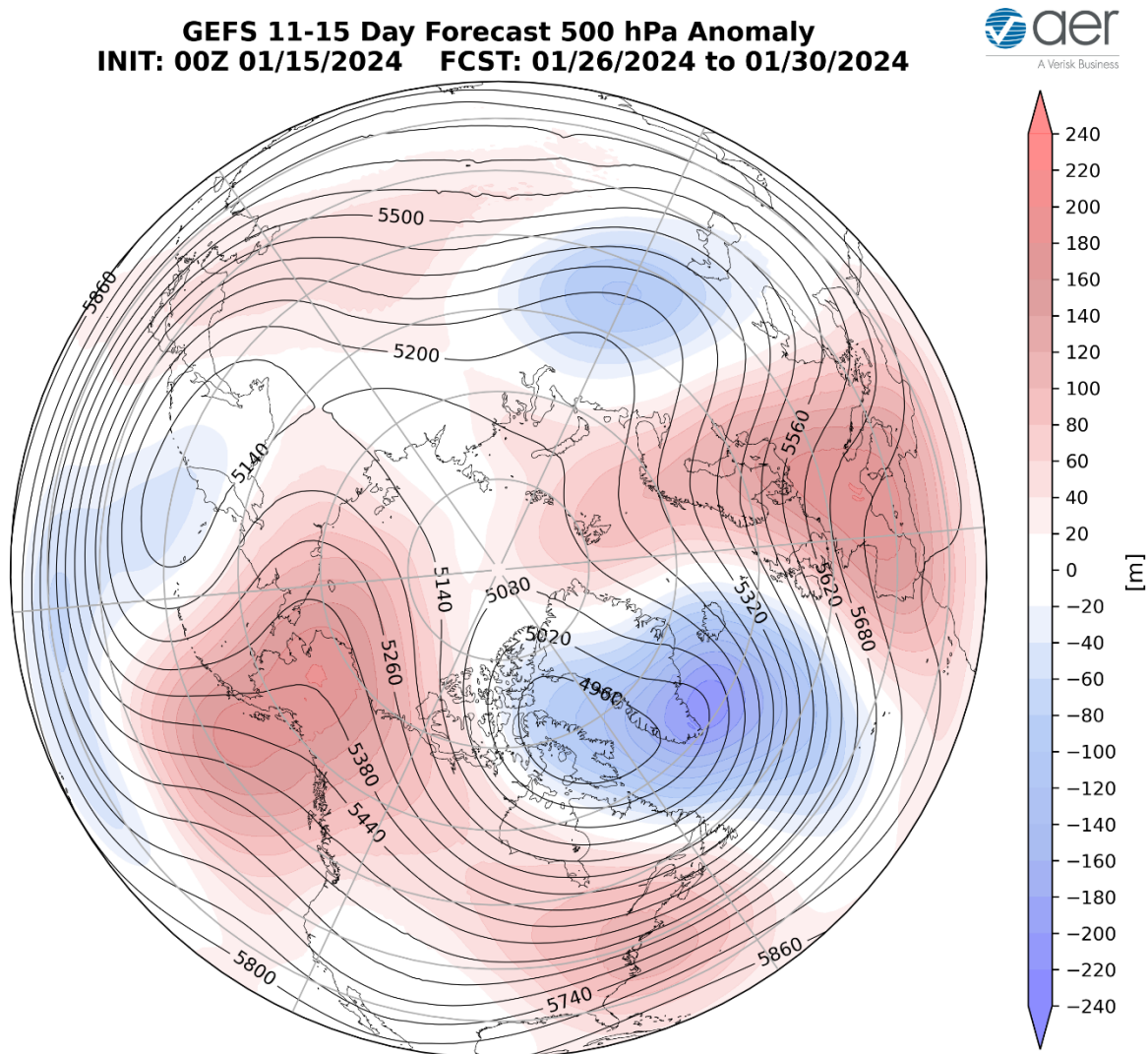
**Figure 7.** Forecasted snow depth changes (mm/day; shading) from 21 – 25 January 2024. The forecast is from the 00Z 15 January 2024 GFS ensemble.

Troughing and/or cold temperatures will support new snowfall across Southeastern Europe, the Tibetan Plateau, Siberia and Northeast Asia while mild temperatures will support snowmelt in Northern and Central Europe and Central Asia this period (**Figure 7**). Troughing and/or cold temperatures will support new snowfall across Southern Alaska and much of Canada, while mild temperatures will support snowmelt in Southernmost Canada, the higher elevations of the Western US, the US Plains and the Northeastern US this period (**Figure 7**).

# Mid Term

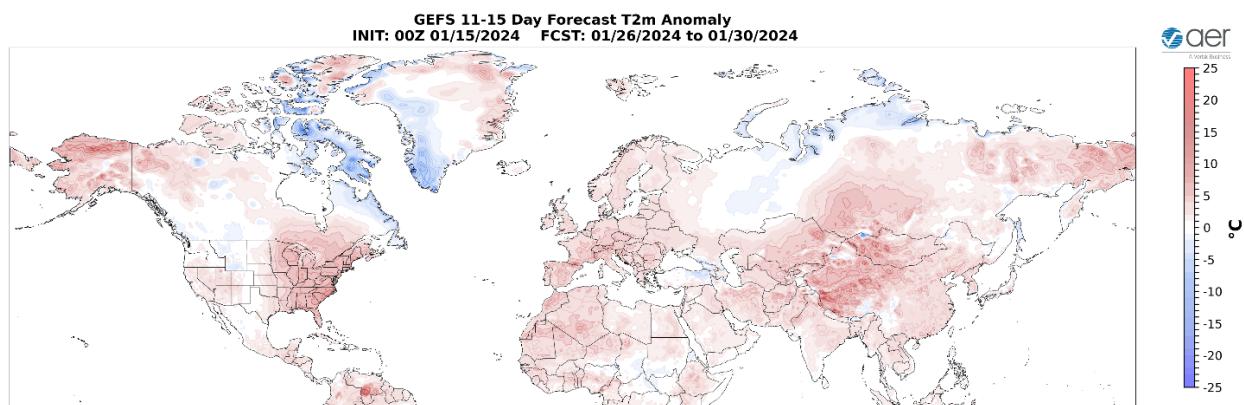
## Week Two

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



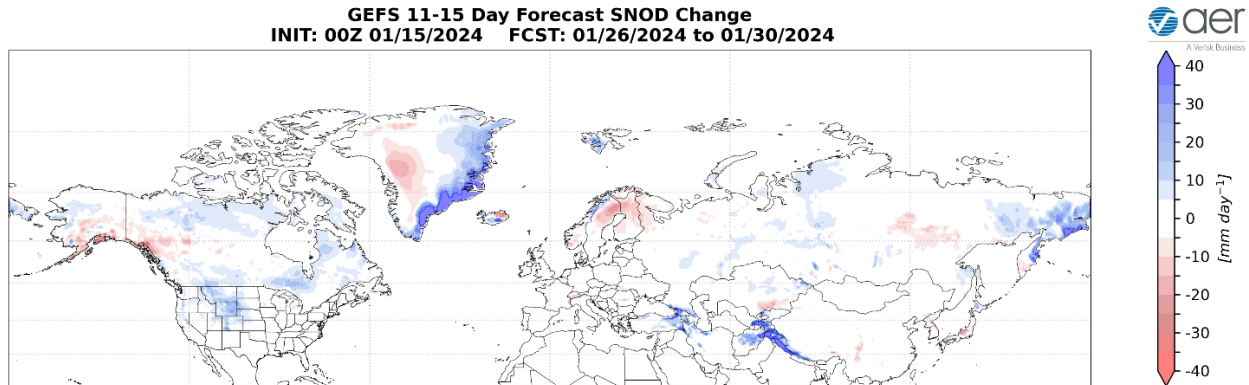
**Figure 8.** Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 26 – 30 January 2024. The forecasts are from the 00z 15 January 2024 GFS ensemble.

Predicted persistent troughing/negative geopotential height anomalies across Greenland should continue to support mostly ridging/positive geopotential height anomalies across Europe this period (**Figure 8**). This pattern should favor normal to above normal temperatures widespread across most of Europe including the UK this period (**Figures 9**). With troughing/negative geopotential height anomalies persisting across Greenland and Eastern Siberia, will continue to favor ridging/positive geopotential height anomalies widespread across Asia with troughing/negative geopotential height anomalies mostly limited to the Ural region this period (**Figure 8**). The predicted pattern favors widespread normal to above normal temperatures across Asia with normal to below normal temperatures limited to the Urals and northwestern Siberia this period (**Figure 9**).



**Figure 9.** Forecasted surface temperature anomalies (°C; shading) from 26 – 30 January 2024. The forecasts are from the 00z 15 January 2024 GFS ensemble.

Another stretched PV will support the return of ridging/positive geopotential height anomalies Alaska, and in Western Canada supporting developing troughing/negative geopotential height anomalies in eastern North America this period (**Figure 8**). This pattern favors widespread normal to above normal temperatures across Alaska, Western and Southern Canada and much of the US with pooling of normal to below normal temperatures across Eastern Canada this period (**Figure 9**).



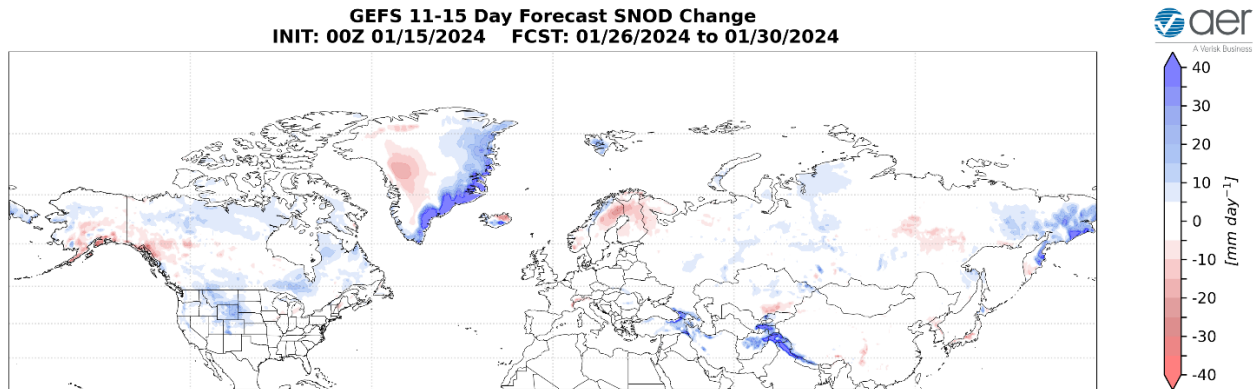
**Figure 10.** Forecasted snow depth changes (mm/day; shading) from 26 – 30 January 2024. The forecast is from the 00Z 15 January 2024 GFS ensemble.

Trouthing and/or cold temperatures will support new snowfall across Norway, scattered across Northern Asia and the Tibetan Plateau while mild temperatures will support snowmelt in Northeastern Europe, Western Russia and Central Siberia this period (**Figure 10**). Trouthing and/or cold temperatures will support new snowfall across western Alaska, Northern and Eastern Canada and the US Rockies. Mild temperatures will support snowmelt in Western Canada, the Great Lakes and New England this period (**Figure 10**).

## Longer Term

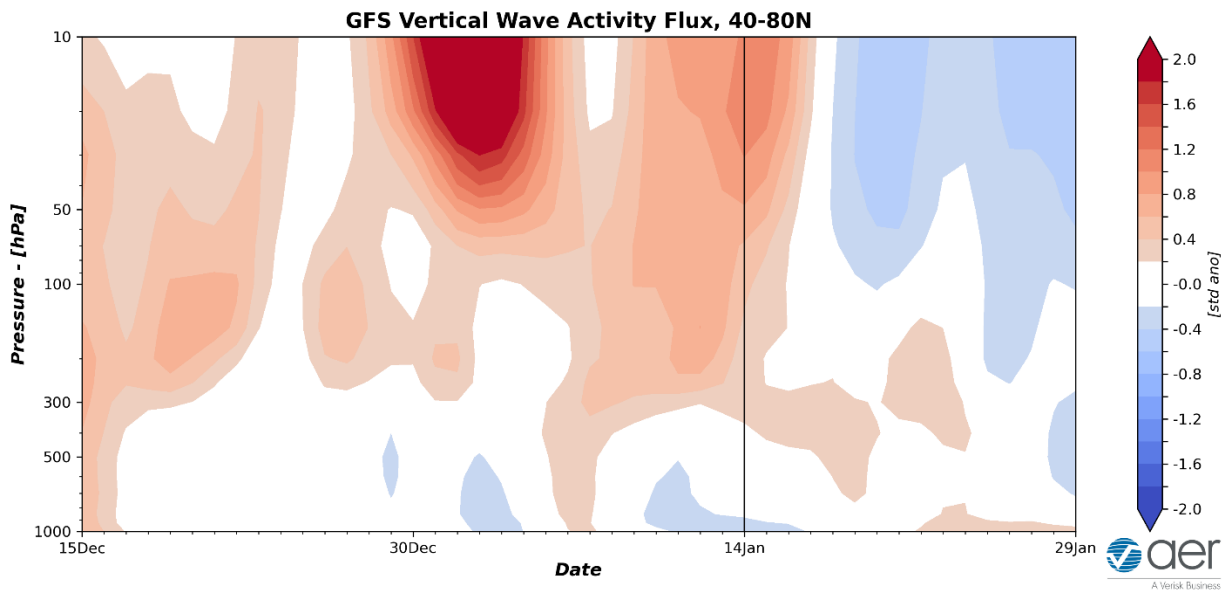
### *30-day*

The latest plot of the polar cap geopotential height anomalies (PCHs) currently shows warm/positive PCHs throughout the stratosphere and the troposphere (**Figure 11**). Warm/positive in the mid-stratosphere will peak later this week and a major warming may yet be achieved. Yet, next week PCHs in the troposphere are predicted to become increasingly cold/negative as the downward influence associated with a sudden stratospheric warming pause at least temporarily (**Figure 11**). But tropospheric PCHs are predicted to reverse yet again to warm/positive before the end of the month as yet another drip makes its way down from the mid-stratosphere to the troposphere, though as I discussed in the Impacts section, it is unlikely to be a traditional drip.



**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 15 January 2024 GFS ensemble.

The predicted warm/positive PCHs in the lower troposphere this week (**Figure 11**) are consistent with the predicted mostly negative surface AO this week (**Figure 1**). Then next week the predicted cold/negative PCHs in the lower troposphere (**Figure 11**) are consistent with the predicted positive surface AO.



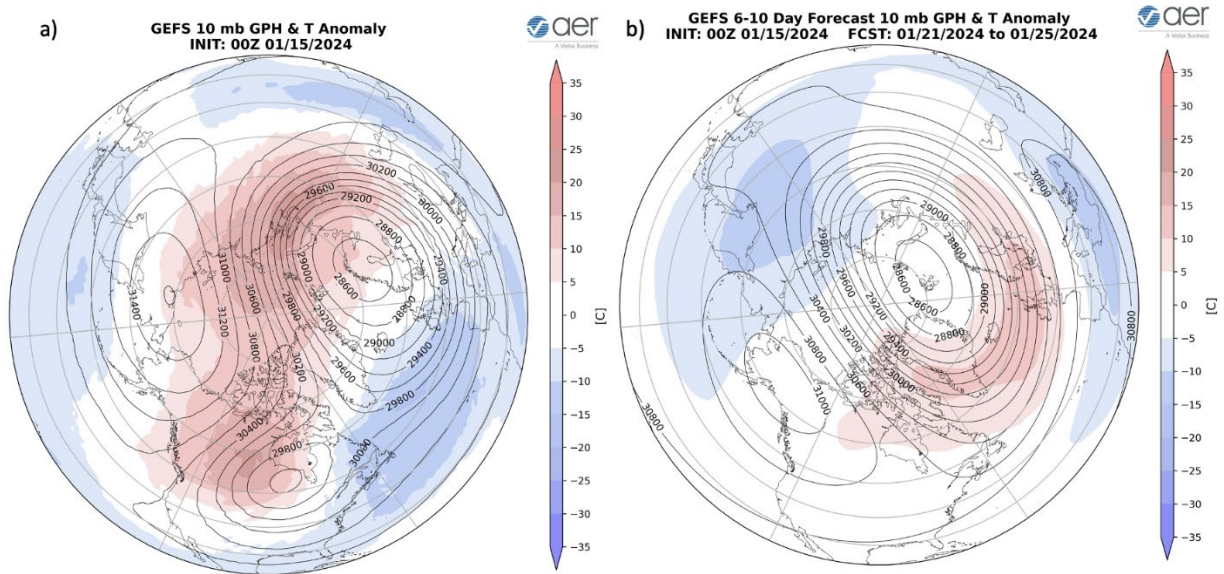
**Figure 12.** Observed and predicted daily vertical component of the wave activity flux (WAFz) standardized anomalies, averaged poleward of 40-80°N. The forecast is from the 00Z 15 January 2024 GFS ensemble.

Also shown in **Figure 1** is the stratospheric AO. The stratospheric AO is currently negative and is predicted to dip further negative this week before trending towards neutral. This is consistent



with increasingly warm/positive stratospheric PCHs in the mid-stratosphere. The forecast of cooling PCHs in the upper stratosphere likely signals an increasing likelihood of a strengthening PV.

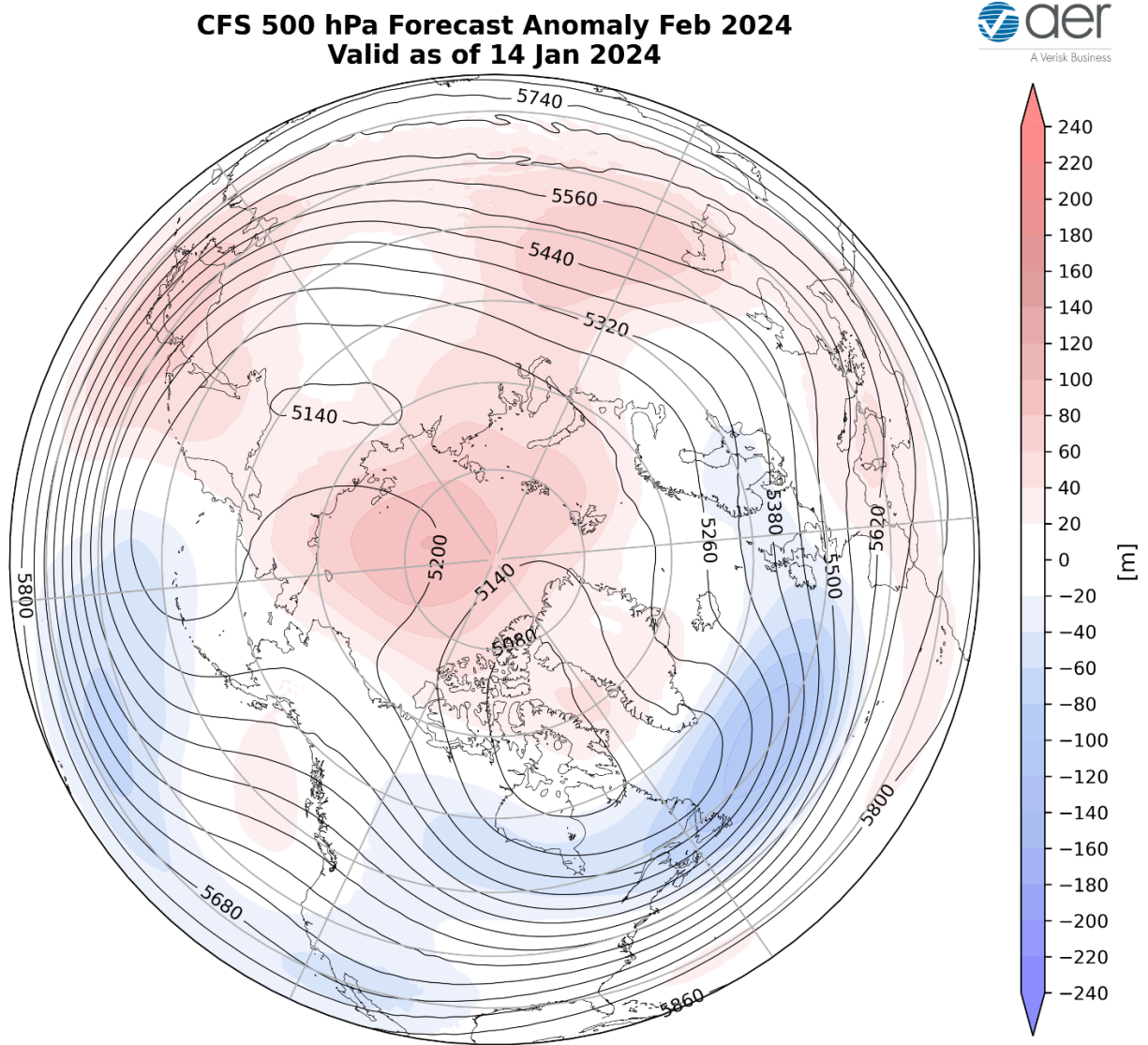
Vertical Wave Activity Flux (WAFz) from the troposphere to the stratosphere or poleward heat transport in the stratosphere has been active since mid-November and likely peaked the first week of January (**Figure 12**). However, one more predicted pulse this week could finally drag the SSW into major warming territory (**Figure 12**) accompanied by a bottoming out of the stratospheric AO (**Figure 1**). The predicted quieter WAFz activity next week (**Figure 12**), should result in a strengthening PV, at least temporarily.



**Figure 13.** (a) Initialized 10 mb geopotential heights (dam; contours) and temperature anomalies ( $^{\circ}\text{C}$ ; shading) across the Northern Hemisphere for 15 January 2024 . (b) Same as (a) except forecasted averaged from 21 – 25 January 2024. The forecasts are from the 00Z 15 January 2024 GFS model ensemble.

This week the polar vortex (PV) is elongated in shape with the PV center shifted south of the North Pole over Northern Scandinavia and another lobe of low heights over Hudson Bay (**Figure 13a**). The lobe over Hudson Bay has formed from a distinct second PV center just today. This elongated PV configuration is predicted to be oriented along an axis from Western Siberia to Eastern Canada. Ridging in the polar stratosphere is predicted to be centered over Eastern Siberia with the strongest warming aimed into the Central Arctic. This PV configuration is consistent with a stretched PV that favors colder temperatures across Siberia and eastern North America. However, the warming in the Arctic is also a sign of an SSW in tandem of the stretched PV and could yet achieve major warming status this week. This configuration of the PV is predicted to persist into next week with the PV center sliding closer to Svalbard with an elongated

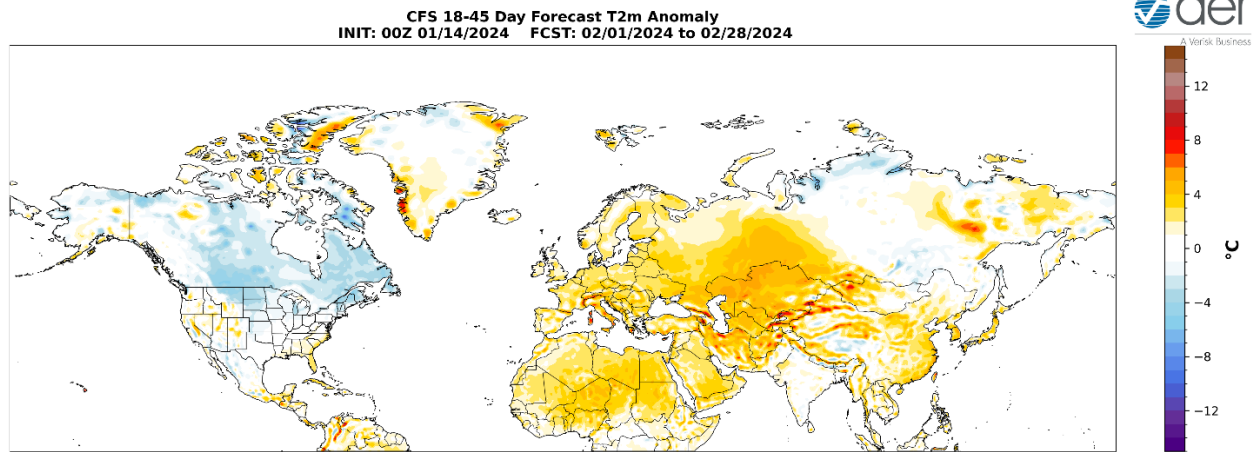
shape still oriented from Western Siberia towards Eastern Canada coupled with a ridge centered on Alaska and warming focused across Northeastern Canada (**Figure 13b**).



**Figure 14.** Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere for February 2024. The forecasts are from the 00Z 14 January 2024 CFS.

I include in this week's blog the monthly 500 hPa geopotential heights (**Figure 14**) and surface temperatures for February (**Figure 15**) from the Climate Forecast System (CFS; the plots represent yesterday's four ensemble members). The forecast for the troposphere is ridging stretching across the Central Arctic, Greenland, the Urals, Alaska and the Gulf of Alaska with troughing in Northern Europe, Northeast Asia, the Aleutians and Eastern Canada (**Figure 14**). This pattern favors seasonable to relatively warm temperatures across Europe, Western

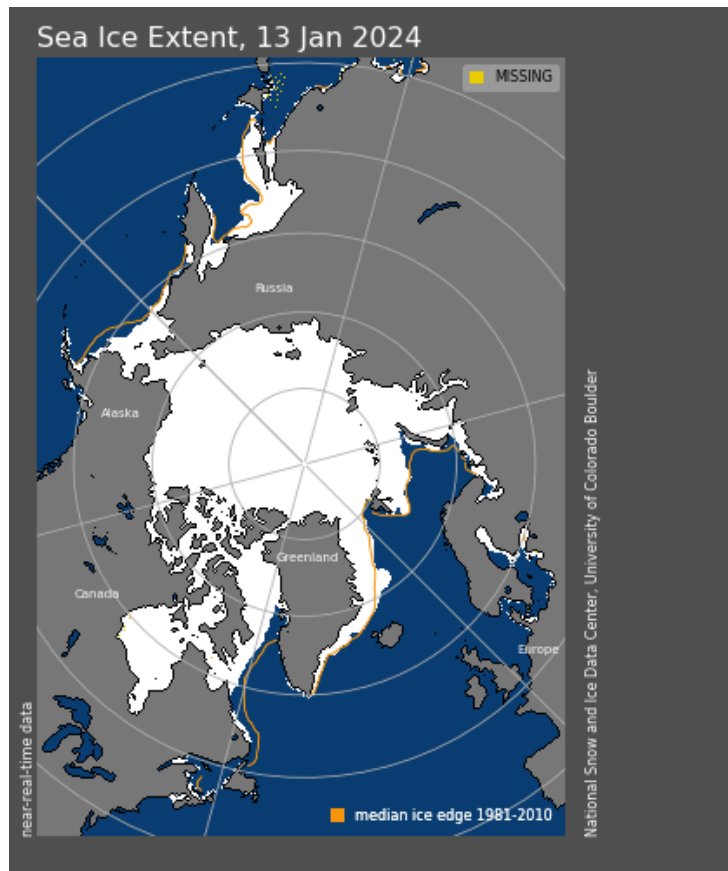
and Southern Asia, Eastern Siberia, Alaska, Western Canada and the Western and Southern US with seasonable to relatively cold temperatures across Scandinavia, Siberia, Northeast Asia, Central and Eastern Canada and the Northern and Eastern US (**Figure 15**).



**Figure 15.** Forecasted average surface temperature anomalies ( $^{\circ}\text{C}$ ; shading) across the Northern Hemisphere for February 2024. The forecasts are from the 00Z 14 January 2024 CFS.

#### *Arctic sea ice extent*

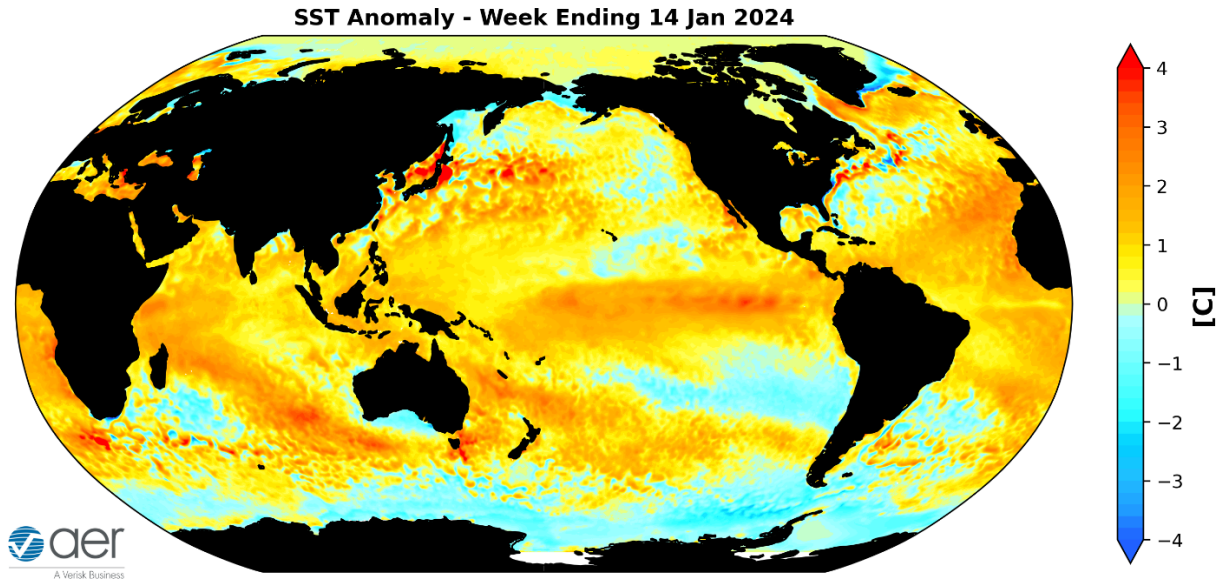
Arctic sea ice extent continued normally growing this week and is actually close to a range that can be considered normal! I continue to expect that the negative sea ice anomalies will become more focused in the North Atlantic sector, which is currently the case. Blocking in the Barents-Kara sea region is critical for weakening the PV that favorable for widespread and meaningful cold in Northern Eurasia and eastern North America, which can persist for weeks.



**Figure 16.** Observed Arctic sea ice extent on 13 January 2024 (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*

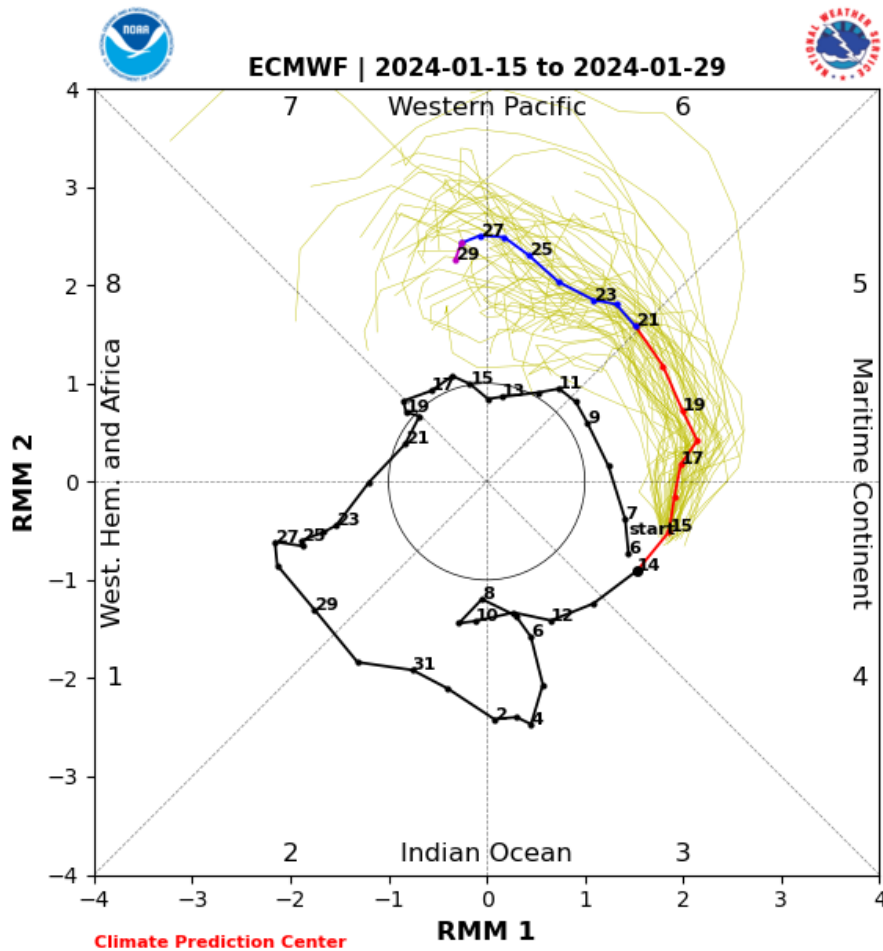
Equatorial Pacific sea surface temperatures (SSTs) anomalies are well above normal, especially along the South America coast, indicating that and El Niño is pretty much a sure thing (**Figure 17**) and El Niño conditions are expected through the winter. Observed SSTs across the NH remain well above normal 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 14 January 2024). Data from NOAA OI High-Resolution dataset.

### *Madden Julian Oscillation*

Currently the Madden Julian Oscillation (MJO) is in phase four (**Figure 18**). The forecasts are for the MJO to move rapidly into phases five through seven. Phases four through seven favor ridging near the Aleutians forcing troughing in western North America with ridging in the Eastern US. Therefore it seems that the MJO is having little influence on North American weather this week but not 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 8 January 2024 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](https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CLIVAR/clivar_wh.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 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.

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!