

Arctic Oscillation and Polar Vortex Analysis and Forecasts

February 26, 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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The AO/PV blog is partially supported by NSF grant AGS: 1657748.

Summary

- The Arctic Oscillation (AO) is currently positive and is predicted to remain positive this week but trend towards neutral and possibly negative as pressure/geopotential height anomalies across the Arctic are currently mostly negative and are predicted to become mixed over the next two weeks. The North Atlantic Oscillation (NAO) is currently positive with negative pressure/geopotential height anomalies across Greenland and the NAO is predicted to be positive to neutral the next two weeks as pressure/geopotential height anomalies turn more mixed and possibly positive across Greenland.
- Ridging/positive geopotential height anomalies first in the North Atlantic and then eventually across Greenland will force troughing/negative geopotential height anomalies across Western Europe with more ridging/positive geopotential height anomalies across Eastern Europe. This pattern will support normal to below normal temperatures across Western Europe including the United Kingdom (UK) with normal to above normal temperatures across Central and Eastern Europe.
- The general predicted pattern across Asia the next two weeks is ridging/positive geopotential height anomalies first centered across Northern and Western Asia then over

the Barents-Kara Seas and possibly eventually Greenland will force troughing/negative geopotential height anomalies across Southwestern Asia and East Asia. This pattern favors widespread normal to above normal temperatures across Western and Northern Asia with normal to below normal temperatures across Southwestern, Central and East Asia the next two weeks.

- The predicted pattern across North America the next two weeks is ridging/positive geopotential height anomalies centered near the Dateline forcing troughing/negative geopotential height anomalies across Alaska, Northern and Western Canada and the Western United States (US) with more ridging/positive geopotential height anomalies across Southeastern Canada and the Eastern US. This pattern favors normal to above normal temperatures across Alaska, Northern and Western Canada and the Western US with normal to above normal temperatures across Southeastern Canada and the Eastern US the next two weeks.
- In the Impacts section I discuss the rapidly weakening polar vortex (PV) and the possible impacts to Northern Hemisphere (NH) weather as winter quickly comes to an end.

Plain Language Summary

Now that we have made it to the third week of February the temperature pattern for winter 2023/24 is pretty much fully baked. In **Figure i**, I do show the anticipated surface temperature anomalies for the winter just below the AER winter forecast for comparison. I won't lie, I am proud of how well the forecast performed.

Instead, I show the anticipated surface temperature anomalies for February. Widespread warmth rules but also relatively cold in Alaska and adjacent Canada, Scandinavia, Northwest Russia, widespread across Siberia and now Eastern China (see **Figure**). These are the same places that have seen real winter weather this year.

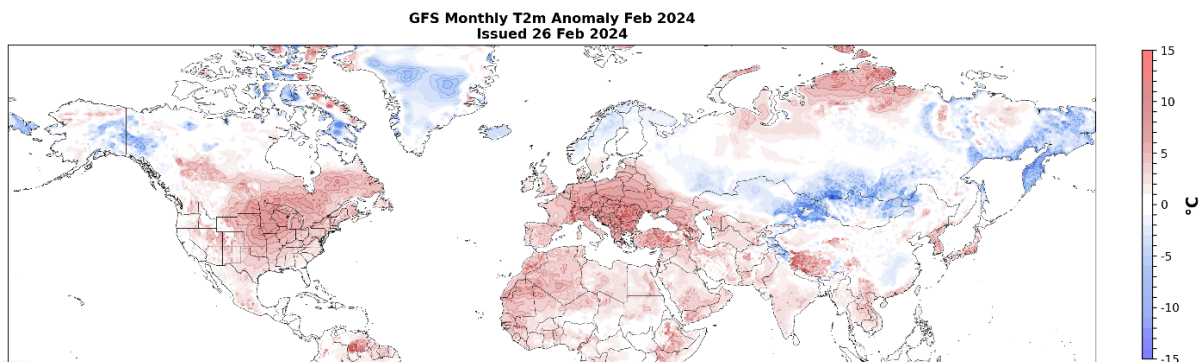


Figure. Estimate of the observed surface temperatures ($^{\circ}\text{C}$; shading) from 1 February 2024 – 26 February 2024 based on GFS initializations and the GFS forecast from the 26 February 2024 forecast.

And though for many it might seem like winter never arrived, where it was cold there was lots of snow! Below are also the snowfall anomalies since 1 November 2023 (see **Figure**). Western Russia is a real standout. But also, impressive snow in Southeastern Alaska, Scandinavia, Northern Japan and the Northern Alps so far.

ERA5 Cumulative Snowfall Anomaly Nov 2023 - Feb 2024

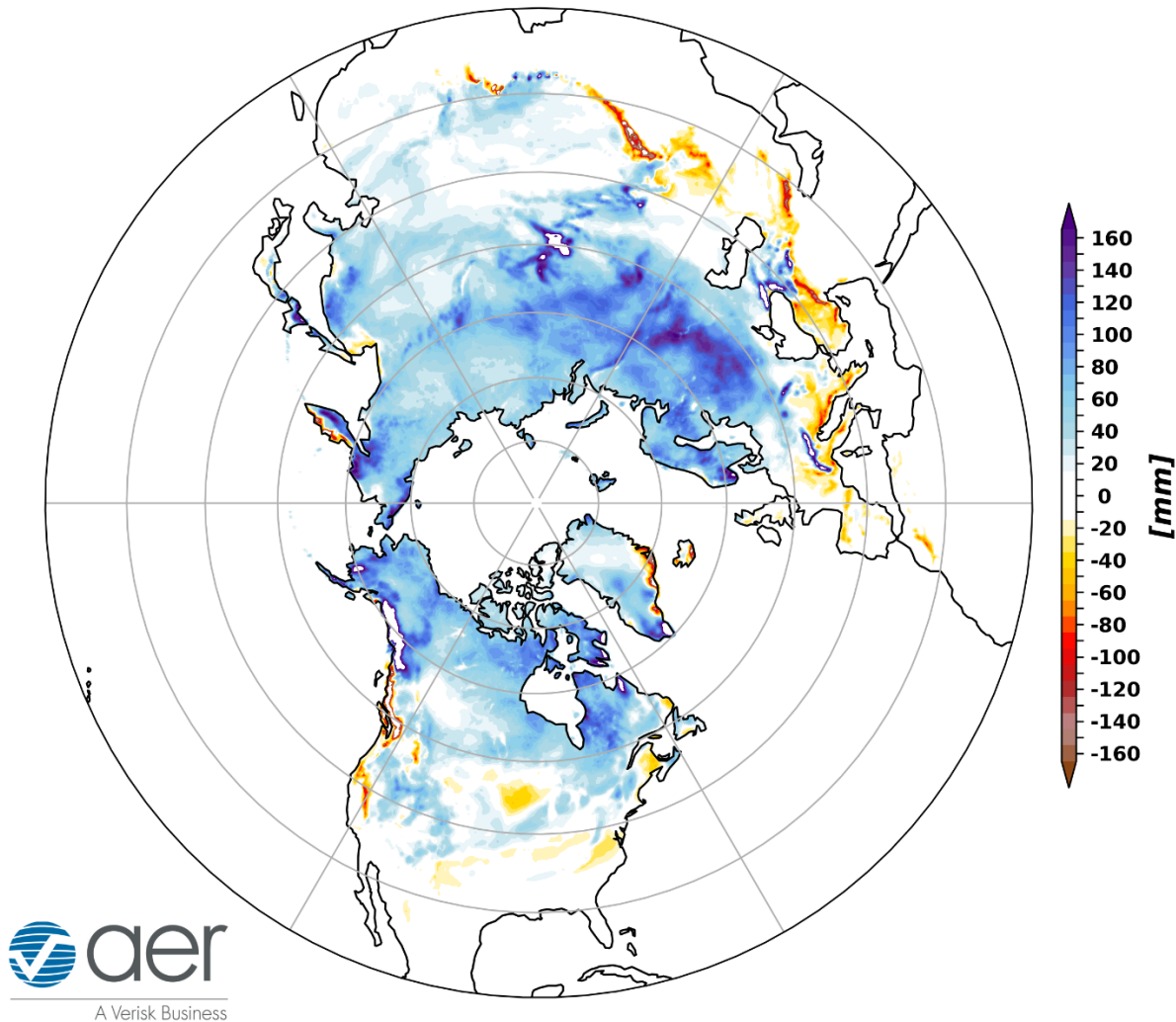


Figure. Estimate of the observed snowfall anomalies (cm shading) from 1 November 2023 – 20 February 2024 based on ERA5.

Chance of one last hurrah for winter but I am not holding my breath, as I discuss below.

Impacts

Before I get into the mess that is the forecast, I thought to provide an initial comparison of the AER Northern Hemisphere (NH) winter surface temperature anomaly forecast shown in the 27 Nov 2023 blog with anticipated observed winter NH surface temperature anomalies in **Figure i**. I used a different red-blue color scale and ocean mask to match the observations that we use. These are not the final numbers given there are a few days left in February, but the winter averages will not change much.

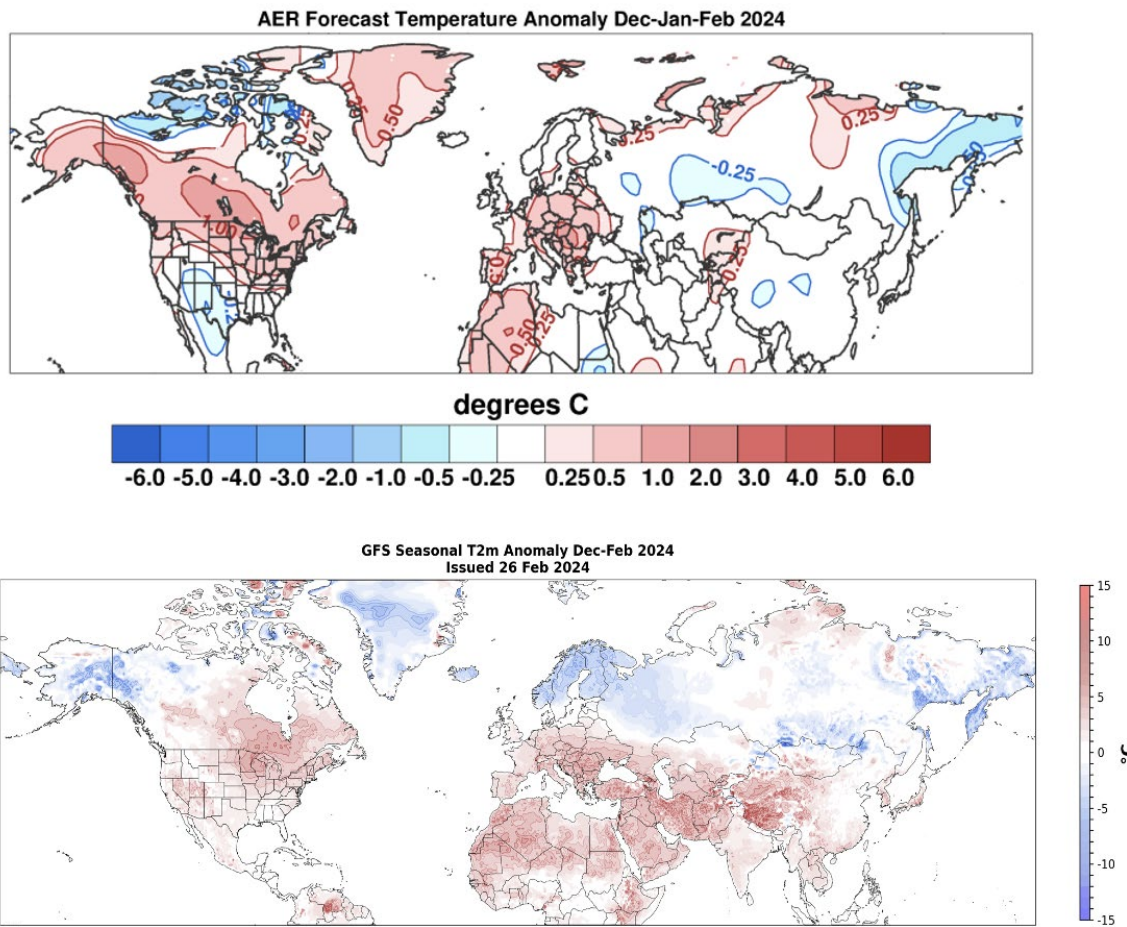


Figure. a) AER forecast of winter surface temperature anomalies ($^{\circ}\text{C}$; shading) from 1 December 2023 – 29 February 2024. b) Estimate of the observed surface temperatures ($^{\circ}\text{C}$; shading) from 1 December 2023 – 29 February 2024 based on GFS initializations and the GFS forecast from the 26 February 2024 forecast.

It is my impression that in the fall the consensus was how challenging forecasting the upcoming winter would be given so many different strong boundary forcings, the incredible warmth in the atmosphere but especially in the ocean. We also had a competing strong El Niño coupled with a strong negative Pacific Decadal Oscillation (PDO). And the weak Arctic boundary forcings compounded the challenge at least for me. Of course, during the winter, it is my impression at least we had a hyperactive polar vortex (PV) quickly pinballing from one disruption to the next

creating crisscrossing currents and intertwining PV influences and many weather extremes. We ended the winter with a wild February with the models failing spectacularly. Longer range forecasting is difficult for human and model alike but this February was still a noteworthy for the flameout from the weather models.

I can't claim to be objective and unbiased but that is a very good seasonal forecast (humbly understated) and will only look better when compared with the dynamical model forecast from the leading North American and European forecast centers included in the late November blog. Enough for now and I will discuss more once the final numbers are known.

I have to admit that emotionally I am done with winter and ready to move on to summer (a sentiment I shared last week as well). And as I prefaced with a tweet, what I right next may be best described with the metaphor as "rearranging deck chairs on the Titanic." Across the NH there was winter to be found and from **Figure i**, it is easy to pick out where but for Europe outside of Scandinavia and around the Baltics and the Eastern US, winter made at most a cameo appearance so why expect anything differently now that climatological spring begins at the end of the week?

The annoying or nagging fact is that a very large PV disruption is ongoing and the most closely associated tropospheric response to a sudden stratospheric warming or SSW (the zonal mean zonal wind at 60°N and 10hpa did reverse from westerly to easterly/from positive to negative) is Greenland blocking. In the latest North Atlantic seasonal polar cap geopotential height anomalies (PCHs), Greenland blocking is strongly suggested, (see **Figure ii**) consistent with most weather model forecasts. But seeing is believing.

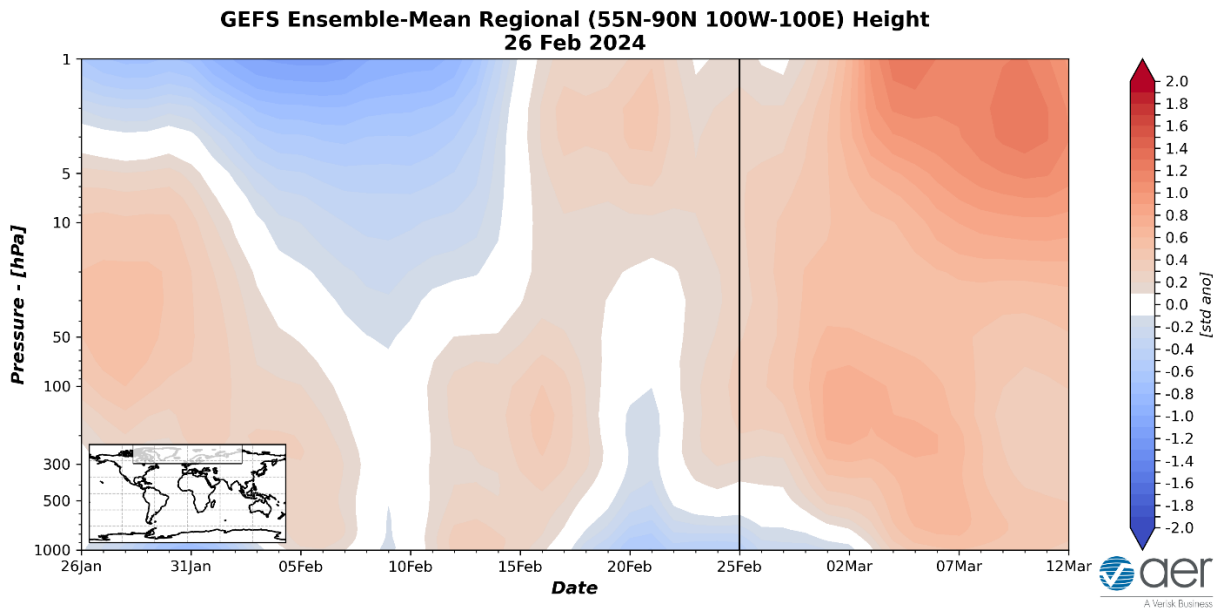


Figure ii. Observed and predicted daily polar cap height (i.e., area-averaged geopotential heights poleward of 60°N) standardized anomalies for the North Atlantic regional (see insert). The forecast is from the 00Z 26 February 2024 GFS ensemble.

Greenland blocking can support unseasonable cold weather across Northern Europe and above normal snowfall. It can also support at least seasonable cold temperatures in the Eastern US but at times blockbuster snowstorms. This seems to be especially true when the PV splits. This week the dominant wave pattern in the troposphere seems to be wave-1 (see **Figure 2**) but next week it seems to be trending more to wave-2 (see **Figure 5**) that could favor a PV split. Models seem to be schizophrenic on whether the PV will split or not and to me both scenarios seem plausible.

Also, all the models are predicting that the PV center will sink pretty far south into Europe with easterly flow across Northern Europe (e.g., **Figure 13b**). If this same flow develops in the mid-troposphere, this is when Europe typically sees its coldest weather. But this is a big if and sometimes the troposphere follows the lead of the stratosphere and sometimes it does not. And to be honest I am not sure how to accurately predict when each scenario is favored.

For the Eastern US, most models predict a cold pool over the region in the polar stratosphere. I include a pretty wild example from the latest Canadian forecast in **Figure iii**. The Canadian is predicting a most beautiful negative AO/NAO for the stratosphere, something I am not sure I have ever seen before. You have to imagine to yourself if that verifies that is very supportive of a negative surface AO/NAO. We shall see but I am very skeptical of any model forecast beyond a few days given recent history.

GEPS 10mb Temperature (°C, shaded) & Geopotential Height (dam, contour)

Init: 12z Feb 26 2024 Forecast Hour: [384] valid at 12z Wed, Mar 13 2024

TROPICALTIDBITS.COM

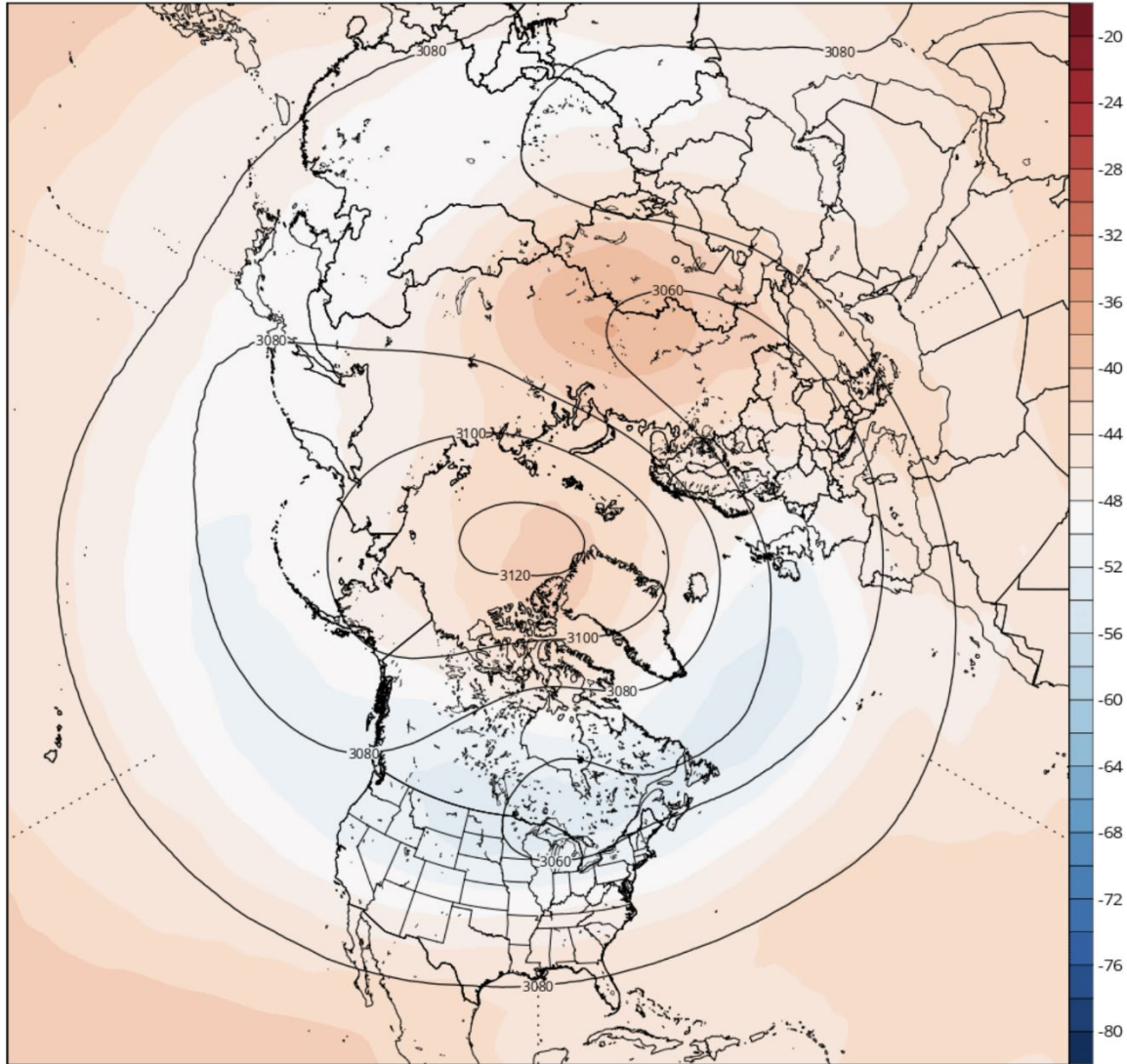


Figure iii. Forecasted average 10 mb geopotential heights (dam; contours) and temperature anomalies (°C; shading) across the Northern Hemisphere for 13 March 2024. The forecasts are from the 12z 26 February 2024 Canadian ensemble. Plot taken from <https://www.tropicaltidbits.com/analysis/models/>.

But I do have to caution any expectations that winter is leaving in a blaze of glory or fireworks. The last two February SSWs that had a large impact on the weather in Europe and/or the eastern US were 2010 and 2018. Those SSWs occurred in the first half of February. Large SSWs were observed last year in late February and in early March 2016. So, the timing is closer to this still evolving SSW and at least I can't recall much notable winter weather other than a cool and/or wet spring. Though for the Upper Midwest and Northern Europe snowstorms are more likely even into April.

Other arguments against true winter like weather are the depleted snow cover in both Europe and the US. Always hard to get unseasonable cold without snow on the ground but that could change. For Europe the source of cold air in Siberia is depleted after dumping into East Asia, so that would likely need to replenish first. Somewhat stealthily the extent of cold air across North America is quite impressive with most of Alaska and Canada experiencing below normal temperatures. So, for the Eastern US a source of cold air is readily available if a favorable atmospheric circulation develops.

I have discussed in recent blogs that an SSW is supportive of stretched PVs/wave reflection. From our energy diagnostics it does seem that wave reflection is occurring and contributing to the expanse of cold across North America. In **Figure iv** you can observe the iconic upward and eastward Wave Activity Flux (WAF) vectors over Asia but downward and eastward over North America. However, the wave reflection is more west than typical directed at western rather than eastern North America. And though I see no evidence of it in the weather model forecasts, our own analysis does suggest that this can transition to wave reflection directed more eastward bringing the old air east of the Rockies.

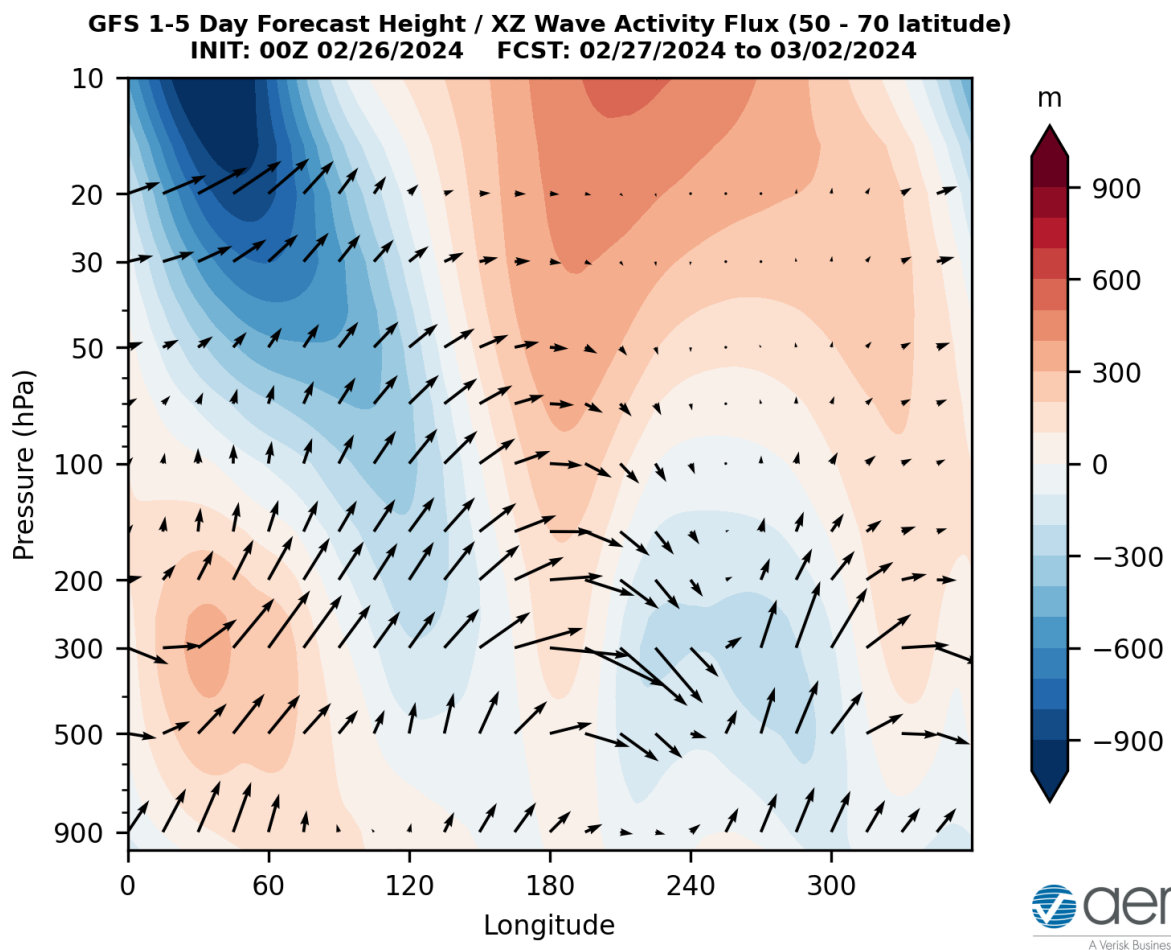


Figure iv. Latitude-height cross section of zonal mean zonal wind (shading) and wave activity flux (vectors) forecasted for 27 February – 2 March 2024. The forecast is from the 00Z 26 February 2024 GFS ensemble.

The models began February predicting what I called the trifecta of high-latitude high pressure blocking over the Urals, Alaska and Greenland that quickly fizzled (see **Figure v**). The Urals blocking did materialize but was shifted eastward into Western Siberia (where it was not optimal for a major SSW). But the Greenland and Alaskan blocking turned out to be mostly phantoms with the most impressive high pressure in the North Pacific. The North Pacific high pressure is now in beast mode right at the Dateline (see **Figure 2**; I think at least partially supported by the wave reflection shown in **Figure iv**). Ridging near the Dateline is consistent with the predicted MJO phases the next two weeks and therefore the MJO could also be making a large contribution to this pattern. That ridging needs to make its way over towards Alaska, the Gulf of Alaska and on to the West Coast for any meaningful cold to make it to the Eastern US.

**GFS Monthly SLP Anomaly Feb 2024
Issued 26 Feb 2024**

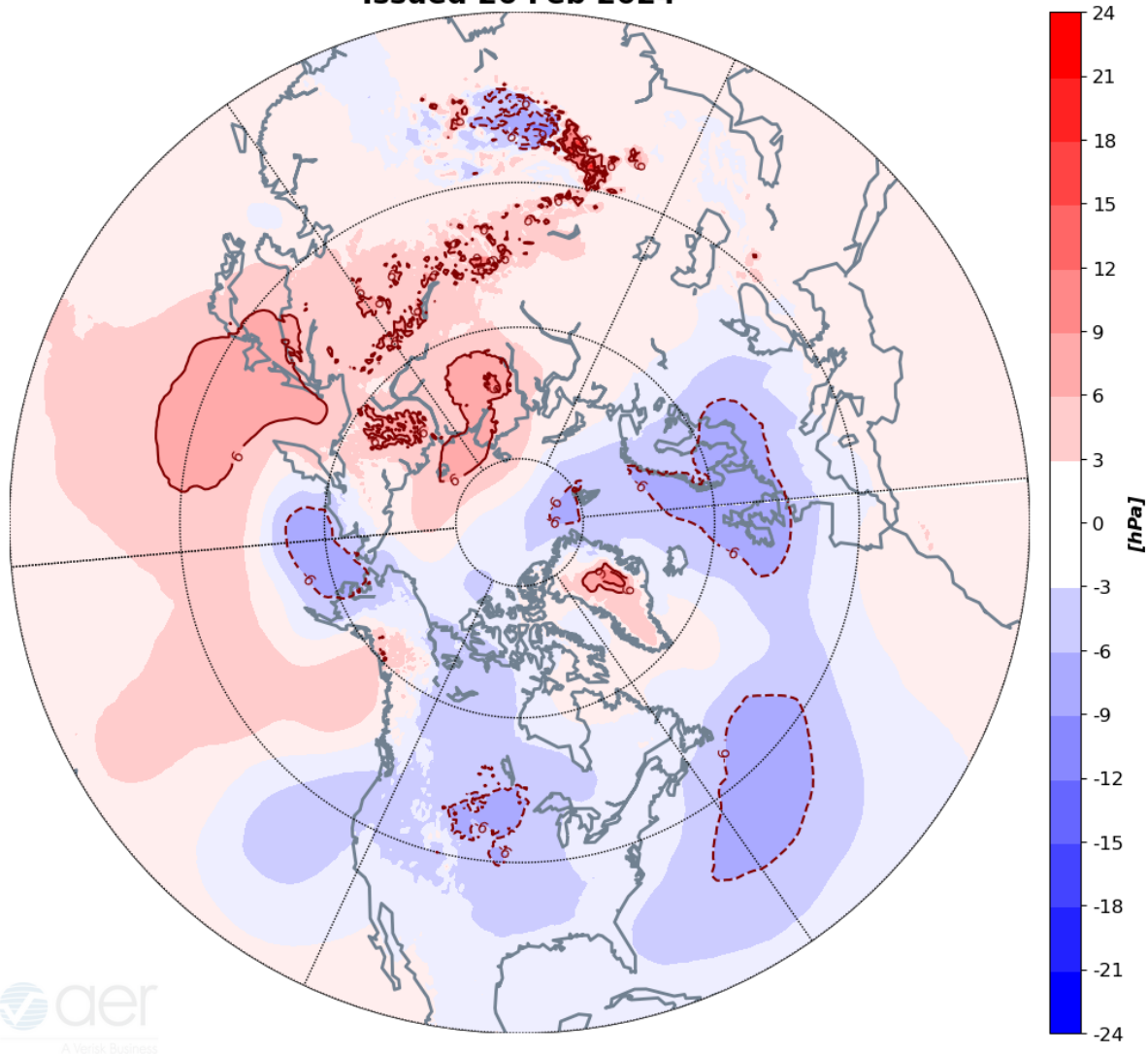


Figure v. Observed and predicted sea level pressure anomalies (hPa shading) from 1 February 2024 – 26 February 2024 based on GFS initializations and the GFS forecast from the 26 February 2024 forecast.

In summary, in isolation there are many good arguments for winter to leave with a bang rather than a whimper in the Eastern US and/or Northern Europe based on the large SSW anticipated. However, based on what has transpired this winter so far, such a scenario is hard to imagine. Also, with a rapidly strengthening sun the circulation needs to be nearly perfect and snow cover needs to be present. It could happen, but a healthy dose of skepticism is justified.

Near-Term

This week

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

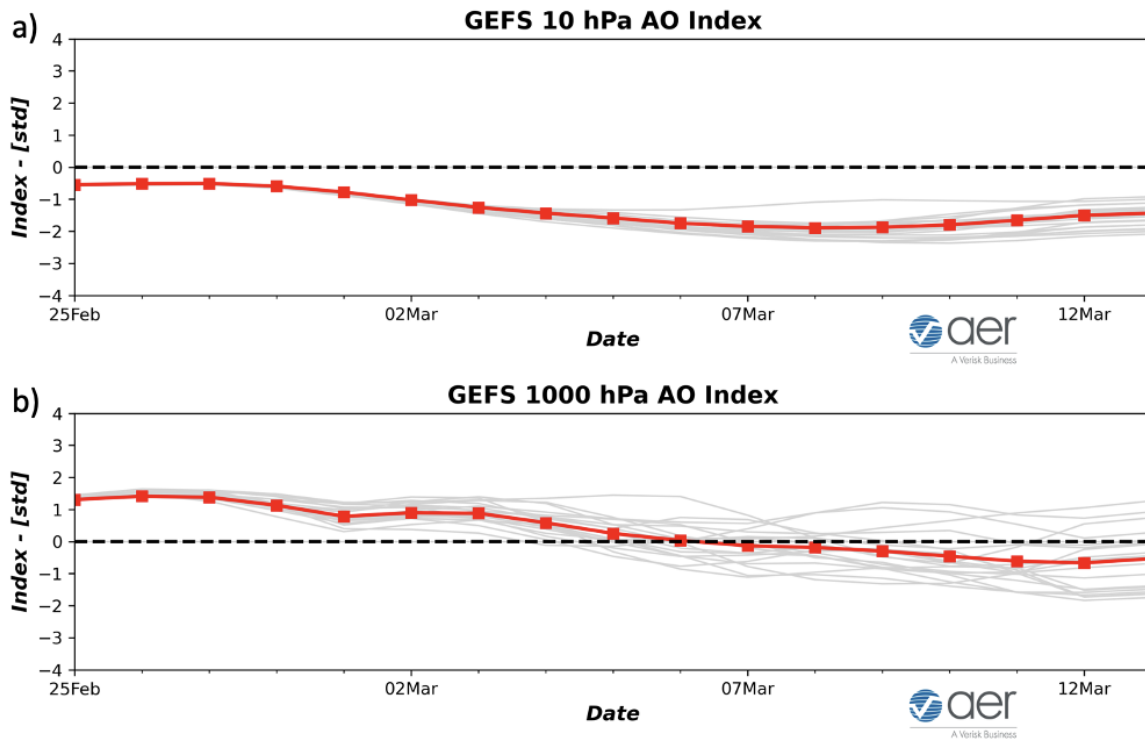


Figure 1. (a) The predicted daily-mean AO at 1000 hPa from the 00Z 26 February 2024 GFS ensemble. (b) The predicted daily-mean near-surface AO from the 00Z 26 February 2024 GFS ensemble. Gray lines indicate the AO index from each individual ensemble member, with the ensemble-mean AO index given by the red line with squares.

This week, ridging/positive geopotential height anomalies centered in the North Atlantic south of Iceland and Greenland forcing troughing/negative geopotential height anomalies across Western Europe with more ridging/positive geopotential height anomalies across Central and Eastern Europe (**Figures 2**). This pattern favors normal to below normal temperatures across Western Europe including the UK with normal to above normal temperatures across Central and Eastern Europe (**Figure 3**). Predicted ridging/positive geopotential height anomalies centered in Eastern Europe and Northern and Western Russia will support troughing/negative geopotential height anomalies across Southwestern and Eastern Asia with more ridging/positive geopotential height anomalies across Southern Asia this period (**Figure 2**). This pattern favors widespread normal to above normal temperatures across far Northern and Western Asia with normal to below normal temperatures across Southwestern, Central and Eastern Asia (**Figure 3**).

GEFS 1-5 Day Forecast 500 hPa Anomaly
INIT: 00Z 02/26/2024 FCST: 02/27/2024 to 03/02/2024

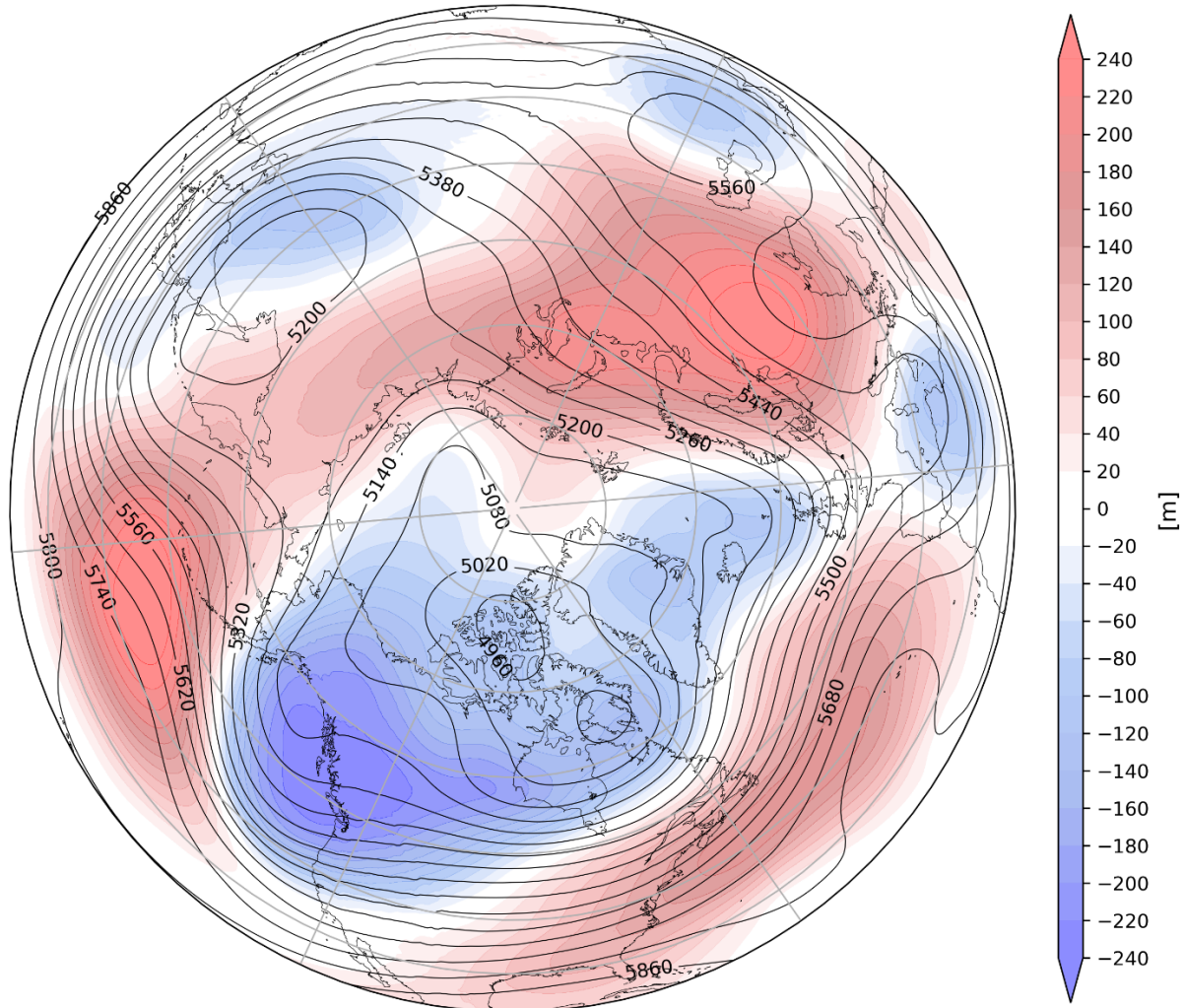


Figure 2. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 27 February – 2 March 2024. The forecasts are from the 00z 26 February 2024 GFS ensemble.

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

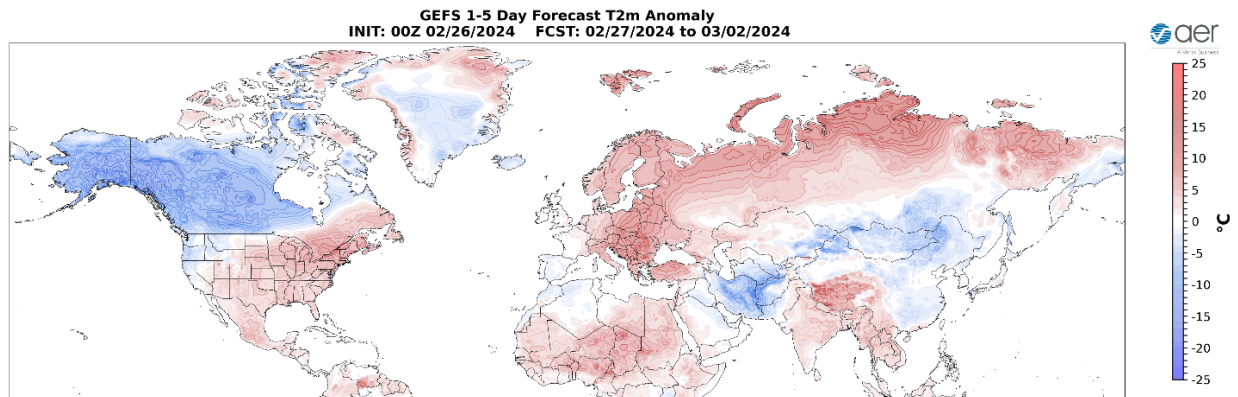


Figure 3. Forecasted surface temperature anomalies (°C; shading) from 27 February – 2 March 2024. The forecast is from the 00Z 26 February 2024 GFS ensemble.

Trouging and/or cold temperatures will support new snowfall across Eastern Siberia, the Tibetan Plateau and East Asia while mild temperatures will support snowmelt across Scandinavia, the Pyrenees, the Alps, Western Russia and parts of Siberia this week (**Figure 4**). Trouging and/or cold temperatures will support new snowfall across Western and Central Canada and the Western US while mild temperatures will support snowmelt across Southeastern Canada, the US Rockies and the Northeastern US this week (**Figure 4**).

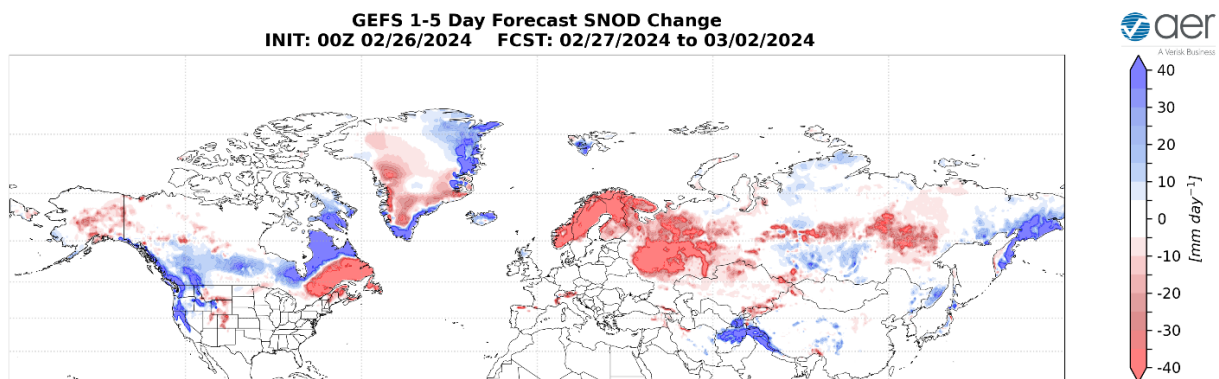


Figure 4. Forecasted snow depth changes (mm/day; shading) from 27 February – 2 March 2024. The forecast is from the 00Z 26 February 2024 GFS ensemble.

Near-Mid Term

Next week

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

Greenland also turning more mixed (**Figure 5**), the NAO will be positive to neutral as well this period.

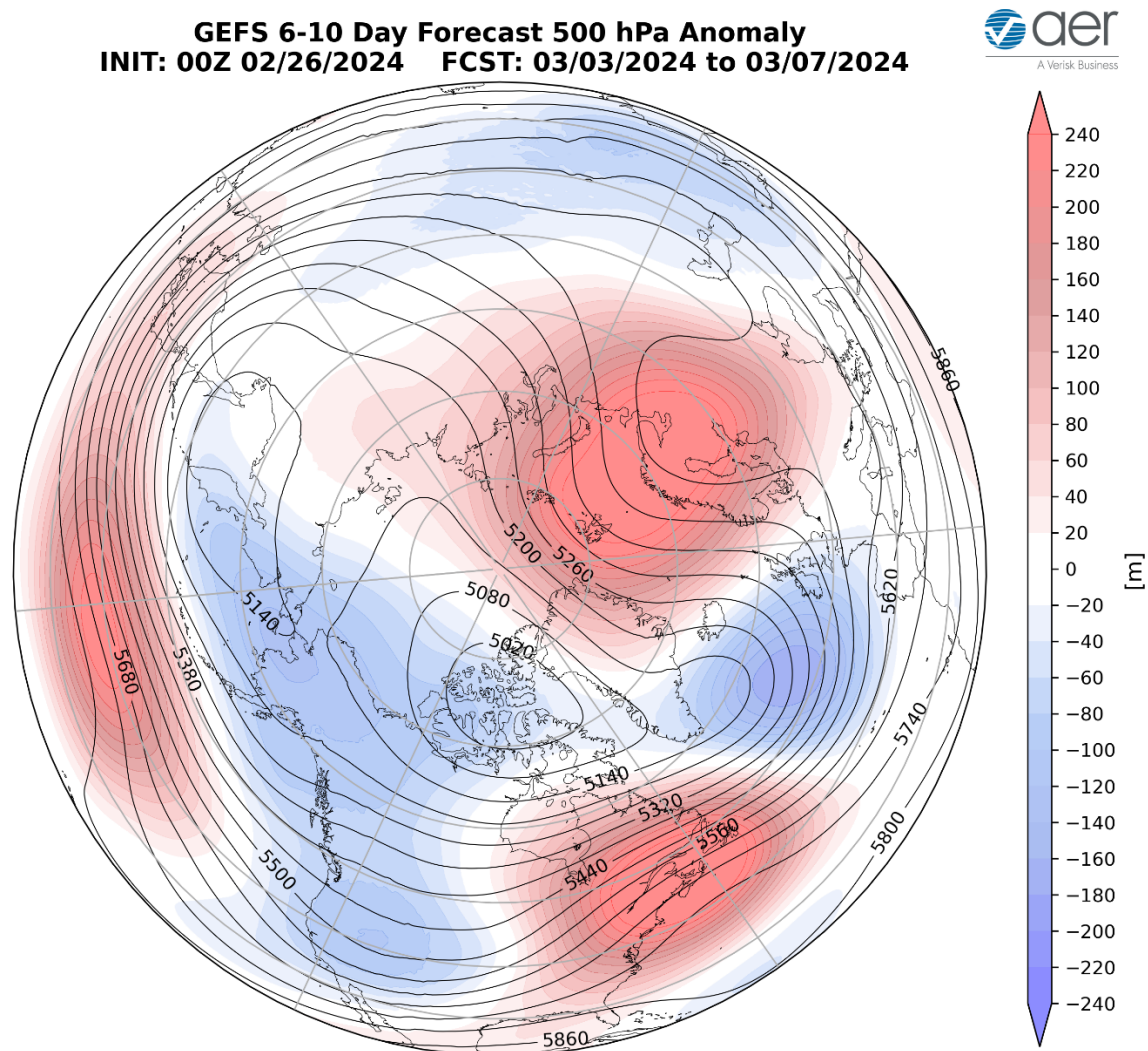


Figure 5. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 3 – 7 March 2024. The forecasts are from the 00z 26 February 2024 GFS ensemble.

Increasing ridging/positive geopotential height anomalies in the Barents-Kara Seas and the northern North Atlantic will support deepening troughing/negative geopotential height anomalies across Western Europe with more ridging/positive geopotential height anomalies across Eastern Europe this period (**Figure 5**). This pattern will favor widespread normal to above normal temperatures across Central and Eastern Europe with normal to below normal temperatures persisting across Western Europe including the UK (**Figures 6**). Predicted ridging/positive geopotential height anomalies centered in the Barents-Kara Seas will support troughing/negative geopotential height anomalies across Southwestern and East Asia with more ridging/positive geopotential height anomalies across Southeastern Asia this period (**Figure 5**).

This pattern favors widespread normal to above normal temperatures across Northern and Western Asia with normal to below normal temperatures in Central and East Asia this period (**Figure 6**).

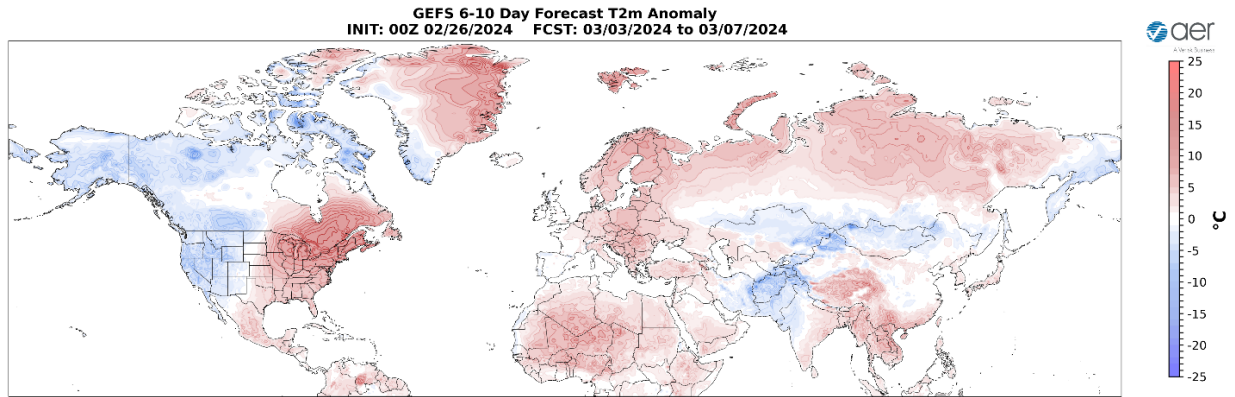


Figure 6. Forecasted surface temperature anomalies ($^{\circ}\text{C}$; shading) from 3 – 7 March 2024. The forecasts are from the 00z 26 February 2024 GFS ensemble.

Predicted persistent ridging/positive geopotential height anomalies near the Dateline will support troughing/negative geopotential height anomalies across Alaska, Northern and Western Canada and the Western US with more ridging/positive geopotential height anomalies across Southeastern Canada and the Eastern US this period (**Figure 5**). This favors normal to below normal temperatures across Alaska, Northern and Western Canada and the Western US with normal to above normal temperatures across Southeastern Canada and the US east of the Rockies (**Figure 6**).

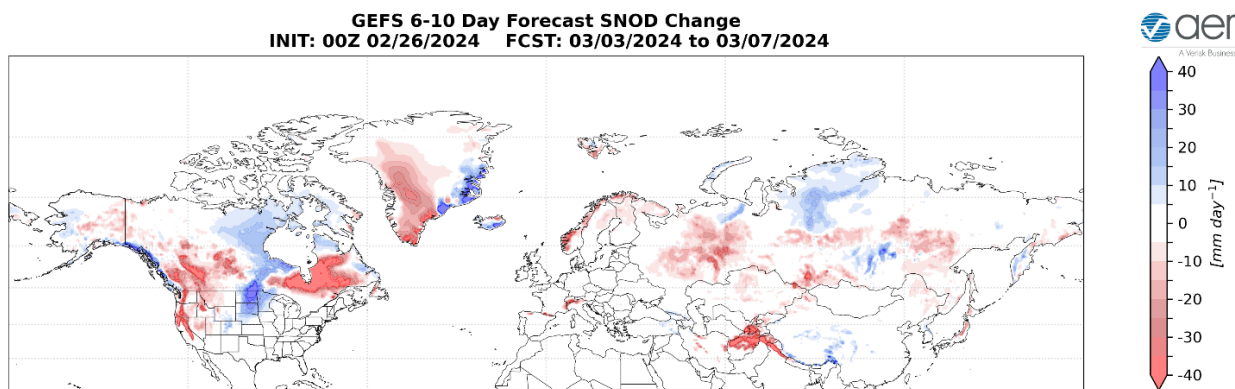


Figure 7. Forecasted snow depth changes (mm/day; shading) from 3 – 7 March 2024. The forecast is from the 00Z 26 February 2024 GFS ensemble.

Troughing and/or cold temperatures will support new snowfall across parts of Siberia while mild temperatures will support snowmelt in Scandinavia, Northwestern Russia, and parts of Siberia,

the Tibetan Plateau and East Asia this period (**Figure 7**). Troughing and/or cold temperatures will support new snowfall along the West coast of Canada, Central Canada and the US Upper Midwest while mild temperatures will support snowmelt in across Western and Southeastern Canada and the Western US this period (**Figure 7**).

Mid Term

Week Two

With predicted positive geopotential height anomalies across the North Atlantic side of the Arctic, negative geopotential height anomalies across the North Pacific side of the Arctic and mixed geopotential height anomalies across the mid-latitudes this period (**Figure 8**), the AO will likely be neutral to negative this period (**Figure 1**). With increasingly positive pressure/geopotential height anomalies across Greenland (**Figure 8**), the NAO should be neutral to negative as well this period.

GEFS 11-15 Day Forecast 500 hPa Anomaly
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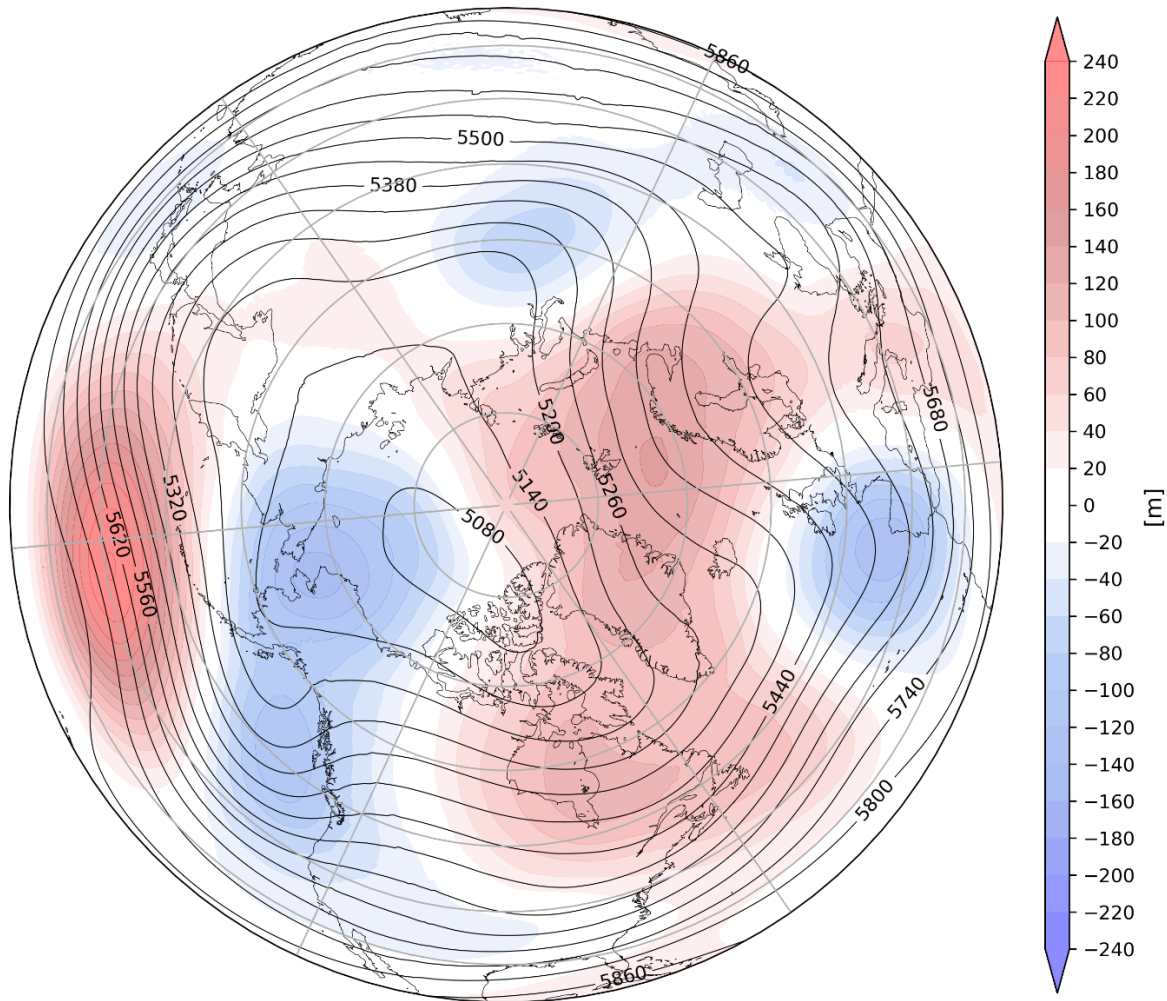


Figure 8. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 8 – 12 March 2024. The forecasts are from the 00z 26 February 2024 GFS ensemble.

Persistent ridging/positive geopotential height anomalies across the northern North Atlantic possibly including Greenland will continue to support troughing/negative geopotential height anomalies across Western Europe with more ridging/positive geopotential height anomalies across Eastern Europe this period (**Figure 8**). This pattern should favor normal to below normal temperatures across Western Europe including the UK with normal to above normal temperatures across Central and Eastern Europe this period (**Figures 9**). Ridging/positive geopotential height anomalies stretching from Greenland to the Barents-Kara Seas will continue to support troughing/negative geopotential height anomalies across Northern and Eastern Asia with more ridging/positive geopotential height anomalies across Southern Asia this period (**Figure 8**). The predicted pattern favors widespread normal to above normal temperatures

across Southern Asia with normal to below normal possibly becoming more widespread across Northern Asia this period (**Figure 9**).

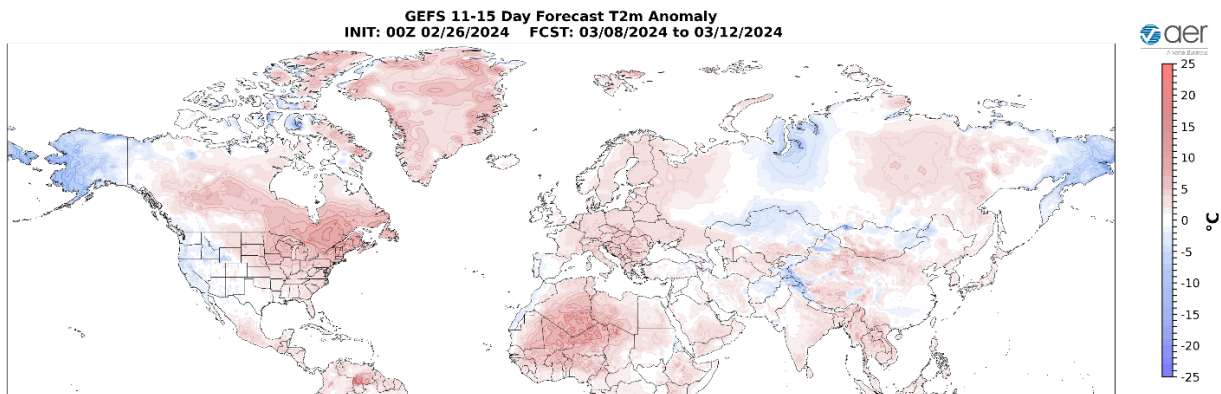


Figure 9. Forecasted surface temperature anomalies ($^{\circ}\text{C}$; shading) from 8 – 12 March 2024. The forecasts are from the 00z 26 February 2024 GFS ensemble.

Ridging/positive geopotential height anomalies anchored near the Dateline will support troughing/negative geopotential height anomalies across Alaska, Western Canada and the Western US with more ridging/positive geopotential height anomalies across eastern North America this period (**Figure 8**). This pattern favors normal to below normal temperatures across Alaska, Northern and Western Canada and the Western US with normal to above normal temperatures across Eastern Canada and the Eastern US this period (**Figure 9**).

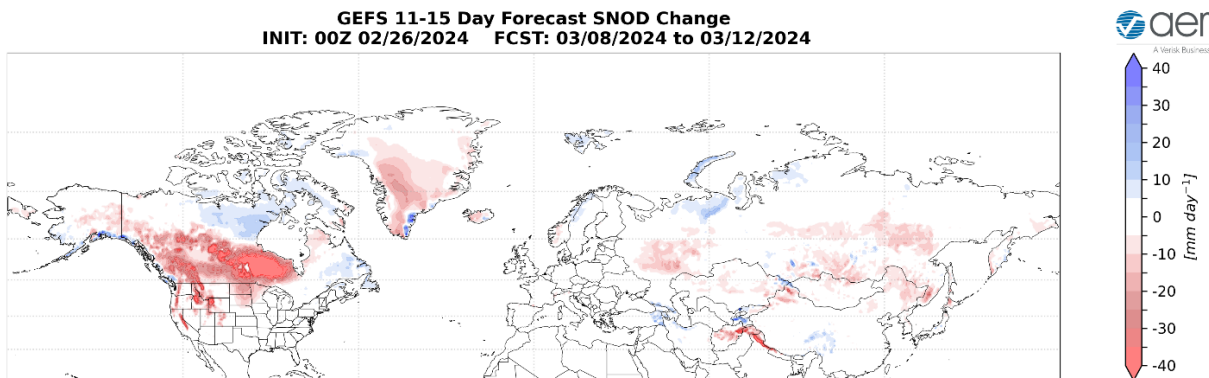


Figure 10. Forecasted snow depth changes (mm/day ; shading) from 8 – 12 March 2024. The forecast is from the 00Z 26 February 2024 GFS ensemble.

Troughing and/or cold temperatures will support new snowfall across parts of Siberia while mild temperatures will support snowmelt in Scandinavia, Siberia and the Tibetan Plateau this period (**Figure 10**). Troughing and/or cold temperatures will support new snowfall across West Coast of Canada and Northern Canada. Mild temperatures will support snowmelt Southern Canada and the higher elevations of the Western 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 mid and lower troposphere with warm/positive PCHs in the stratosphere and upper troposphere (**Figure 11**). However, for much of the next two weeks warm/positive PCHs will dominate both the stratosphere and troposphere (**Figure 11**). The increasing warm/positive throughout the stratosphere (**Figure 11**) is related to the PV becoming increasingly disrupted while warming/positive PCHs in the troposphere are associated with descent of the warm/positive PCHs associated with the PV disruption in the stratosphere.

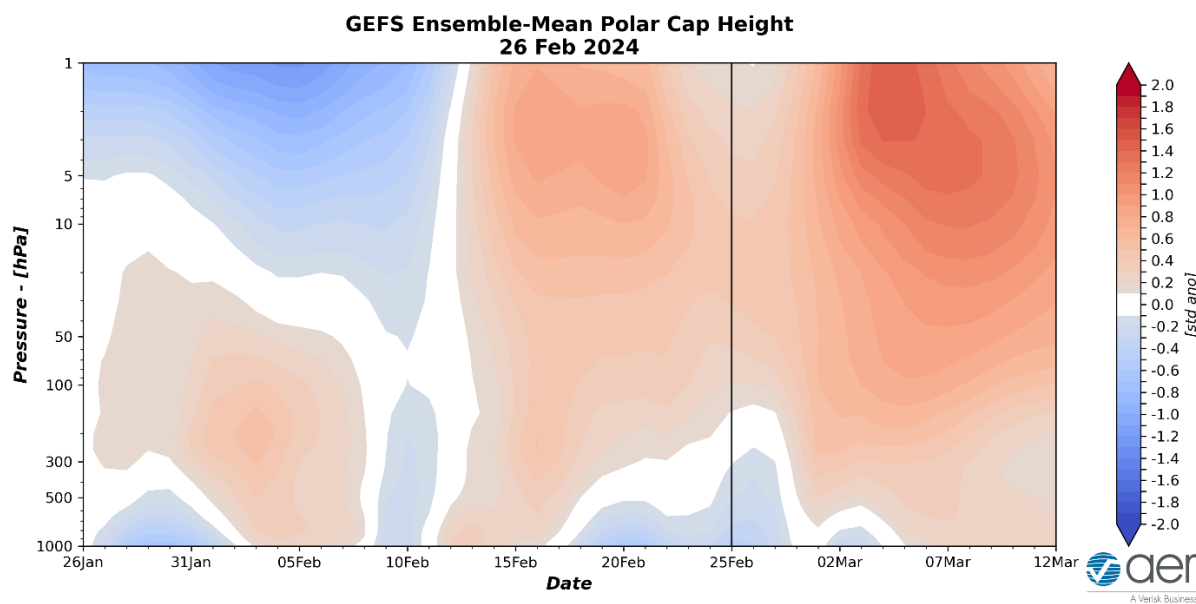


Figure 11. Observed and predicted daily polar cap height (i.e., area-averaged geopotential heights poleward of 60°N) standardized anomalies. The forecast is from the 00Z 26 February 2024 GFS ensemble.

The predicted cold/negative PCHs in the lower troposphere for this week (**Figure 11**) are consistent with the predicted positive surface AO this week (**Figure 1**). However, as the warm/positive PCHs begin to descend from the stratosphere to the troposphere the AO is more likely to dip into negative territory.

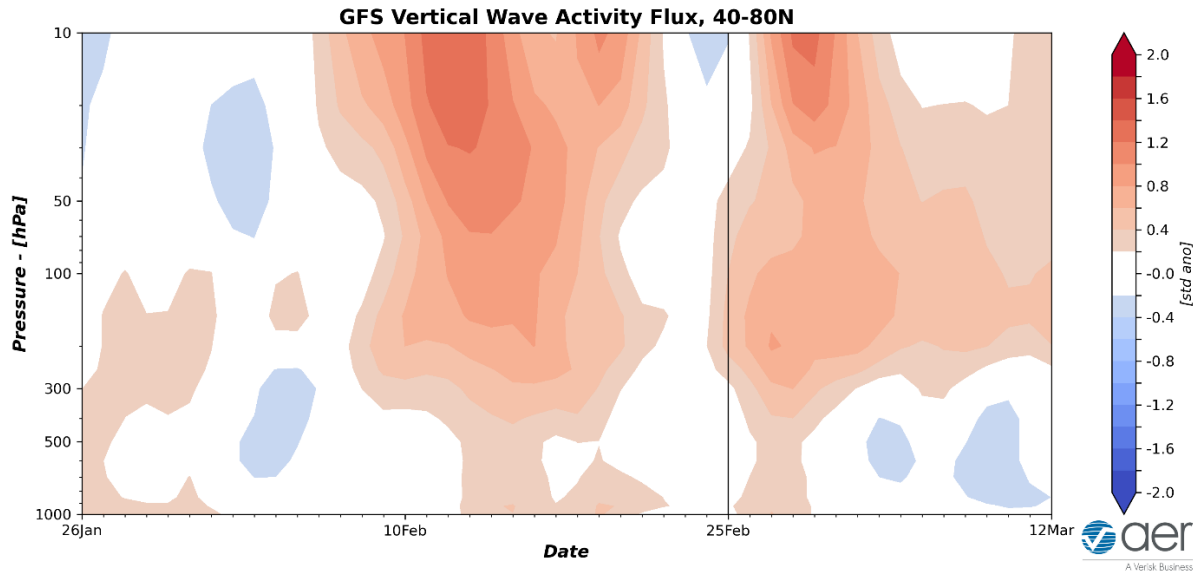


Figure 12. Observed and predicted daily vertical component of the wave activity flux (WAFz) standardized anomalies, averaged poleward of 40-80°N. The forecast is from the 00Z 26 February 2024 GFS ensemble.

Also shown in **Figure 1** is the stratospheric AO. The stratospheric AO is currently negative and is predicted to be negative to possibly strongly negative for the next two weeks. This is consistent with increasingly warm/positive stratospheric PCHs in the mid-stratosphere associated with a weakening PV that is dynamically consistent with a sudden stratospheric warming.

Vertical Wave Activity Flux (WAFz) from the troposphere to the stratosphere or poleward heat transport in the stratosphere was relatively quiet from mid-January to early February (**Figure 12**). However, the quieter WAFz ended the second week of February and is continuing into this week and even next week (**Figure 12**). This should result in a weakening PV. The strongest pulse of WAFz likely occurred in mid-February but the predicted WAFz pulses should be sufficient to continue to weaken the PV into next week.

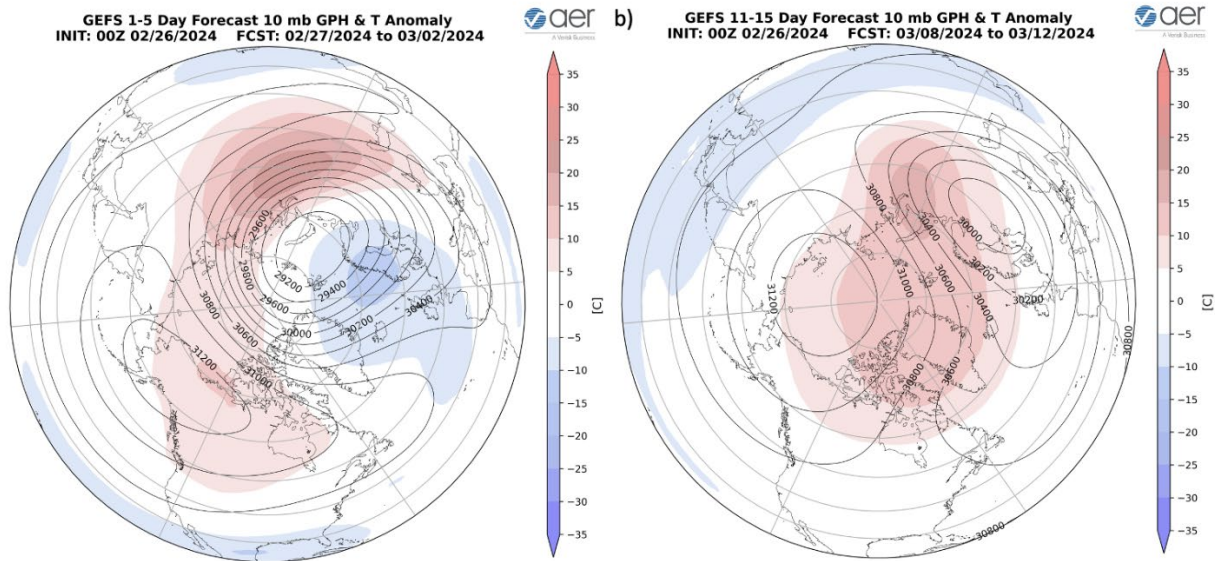


Figure 13. (a) Forecasted 10 mb geopotential heights (dam; contours) and temperature anomalies ($^{\circ}\text{C}$; shading) across the Northern Hemisphere from 27 February – 2 March 2024 . (b) Same as (a) except forecasted averaged from 8 – 12 March 2024. The forecasts are from the 00Z 26 February 2024 GFS model ensemble.

This week the polar vortex (PV) is predicted to be shifted south of the North Pole centered over the Barents-Kara Seas though mostly circular in shape (**Figure 13a**). The ridging in the polar stratosphere is centered over Alaska with the greatest warming aimed at the North Pole. This is consistent with an evolving SSW. For the second week of March the PV center is predicted to drift even further south centered over the Baltics, the ridging is predicted to shift northward to the Beaufort Sea and with more warming aimed at the North Pole (**Figure 13b**).

**CFS 500 hPa Forecast Anomaly Mar 2024
Valid as of 26 Feb 2024**

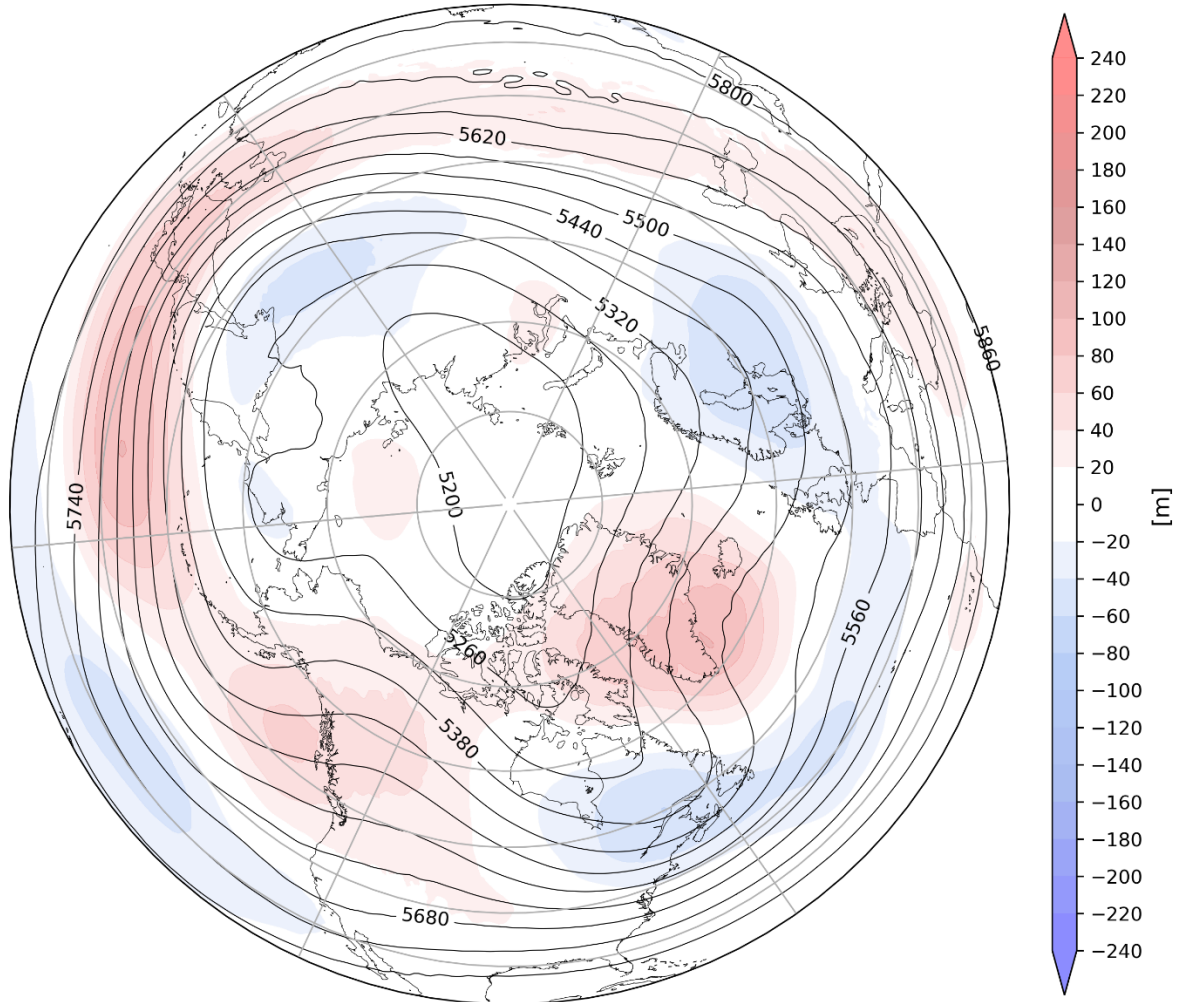


Figure 14. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere for March 2024. The forecasts are from the 00Z 26 February 2024 CFS.

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

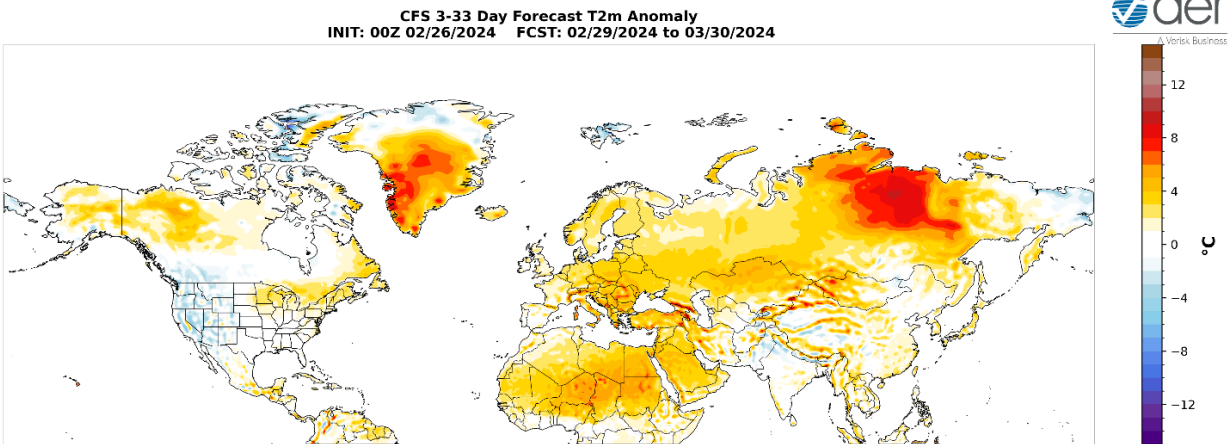


Figure 15. Forecasted average surface temperature anomalies (°C; shading) across the Northern Hemisphere for March 2024. The forecasts are from the 00Z 26 February 2024 CFS.

Arctic sea ice extent

Arctic sea ice extent grew again slowly this week. I continue to expect that the negative sea ice anomalies will remain focused in the North Atlantic sector, which is currently more so than previously this winter. Blocking in the Barents-Kara sea region is critical for weakening the PV that is favorable for widespread and meaningful cold in Northern Eurasia and eastern North America, which can persist for weeks.

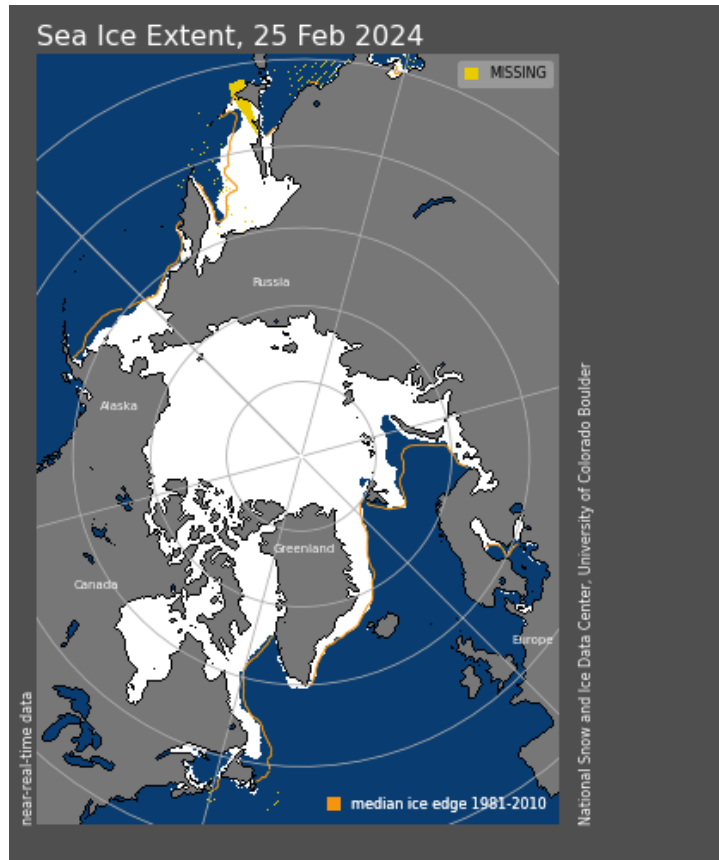


Figure 16. Observed Arctic sea ice extent on 25 February 2024 (white). Orange line shows climatological extent of sea ice based on the years 1981-2010. Image courtesy of National Snow and Ice Data Center (NSIDC). Snow and Ice Data Center (NSIDC).

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 remains strong (**Figure 17**) and El Niño conditions are expected through the end of 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.

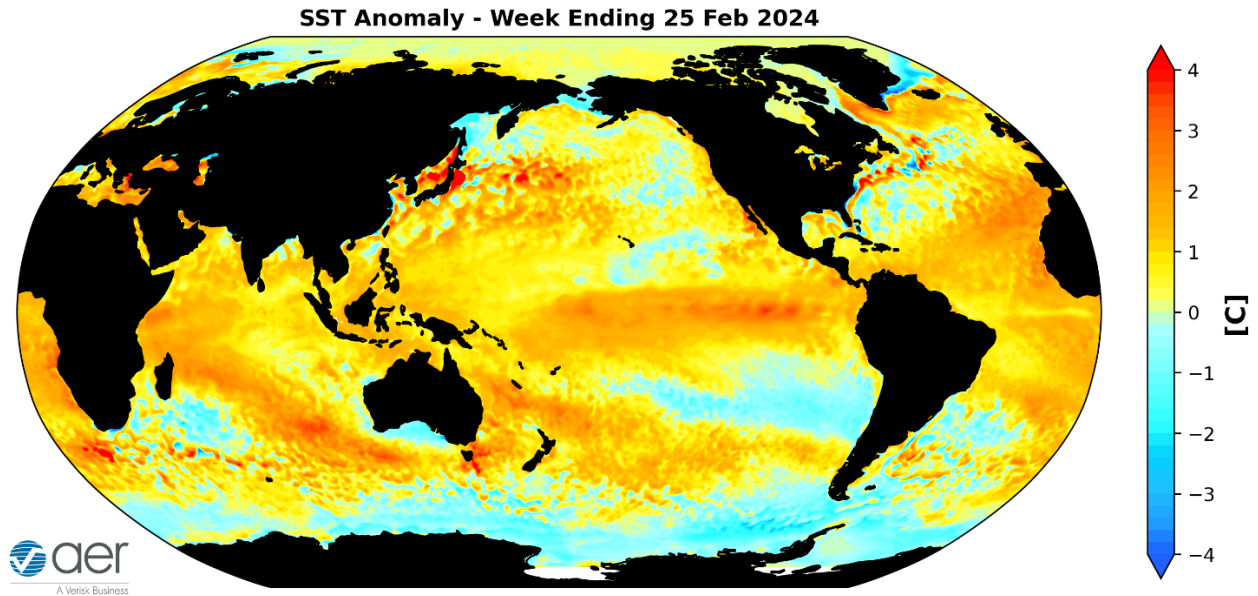


Figure 17. The latest weekly-mean global SST anomalies (ending 25 February 2024). Data from NOAA OI High-Resolution dataset.

Madden Julian Oscillation

Currently the Madden Julian Oscillation (MJO) is weak where no phase is favored (**Figure 18**). The forecasts are for the MJO to emerge into phases three, four and five. Phase three through five favor ridging near the Dateline with troughin in Alaska, Western Canada and the Western US with more ridging in the Eastern US. Therefore the MJO could be having a strong influence on the weather across North America weather this week and next week. But admittedly this is outside of my expertise.

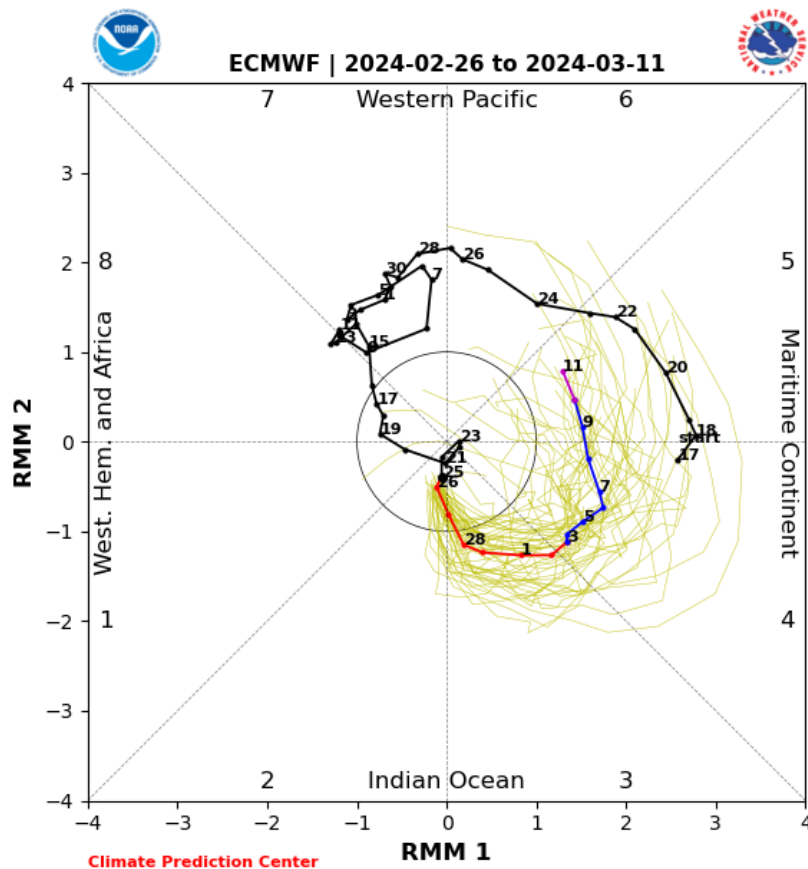


Figure 18. Past and forecast values of the MJO index. Forecast values from the 00Z 26 February 2024 ECMWF model. Yellow lines indicate individual ensemble-member forecasts, with the green line showing the ensemble-mean. A measure of the model “spread” is denoted by the gray shading. Sector numbers indicate 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

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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.

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!

