Arctic Oscillation and Polar Vortex Analysis and Forecasts

January 30, 2023

Dear AO/PV blog readers:

We have shifted the public release of the Arctic Oscillation/Polar Vortex blog to Wednesday through the winter season.

For those who would like an early look on Mondays, we will be offering at a nominal price (US $50) a PDF version of the upcoming blog, and we will be rolling out access to the datasets used in the production of this blog. At present we plan to make available in comma-separated values the timeseries of the Polar Cap Height and the timeseries of the Wave Activity Flux (vertical component), though we would appreciate to hear your suggestions for additional data of interest to you all.

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. With the start of 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 but is predicted to mostly straddle neutral over the next two weeks as pressure/geopotential height anomalies across the Arctic are currently and are predicted to remain mixed. The

North Atlantic Oscillation (NAO) is currently positive and is predicted to remain positive the next two weeks as pressure/geopotential height anomalies are currently mixed but are predicted to become increasingly negative across Greenland the next two weeks.

- The next two weeks predicted troughing/negative geopotential height anomalies across Greenland will favor ridging/positive geopotential height anomalies across Northern and Western Europe with troughing/negative geopotential height anomalies across Southern and Eastern Europe This pattern will generally favor normal to above normal temperatures across Northern and Western Europe including the United Kingdom (UK) with normal to below normal temperatures across Southern and Eastern Europe including Turkey. Seems to me a fairly classic positive NAO pattern.
- The predicted general pattern the next two weeks across Asia is ridging/positive geopotential height anomalies in the Barents-Kara-Laptev Seas and centered near the Urals, which will favor troughing/negative geopotential height anomalies across Northern and Eastern Asia. This pattern favors widespread normal to above normal temperatures across Western and Southern Asia with normal to below normal temperatures across Northern and Eastern Asia.
- The general pattern predicted across North America the next two weeks is troughing/negative geopotential height anomalies across much of Alaska, Canada and the Western United States (US) with ridging/positive geopotential height anomalies across the Eastern US. This pattern favors the next two weeks normal to below normal across Alaska, Canada and the Western US with normal to above normal temperatures across the Eastern US. One exception will be the end of this week when a lobe of the tropospheric polar vortex (PV, spinning over Hudson Bay) will swing through Southeastern Canada and the Northeastern US bringing near record cold to the region at the end of the week.
- I discuss the ongoing saga with the twists and turns of the polar vortex (PV) and its potential impacts on Northern Hemisphere (NH) surface temperatures. I admittedly continue to struggle anticipating the impacts but impacts from a stretched PV continue to be most likely through February.

Plain Language Summary

The one certainty this winter is a stretched polar vortex (PV) that favors a cold pattern east of the Rockies in North America. Another stretched PV is happening this week, with the cold arriving this weekend in the Northeastern US. But otherwise, the more lasting impact will be widespread cold to Canada and the Central and Western US. But much uncertainty surrounds this event and subsequent events so my best advice continues to be “the trend is your friend” (see **Figure ii**).

Impacts

Though no mea culpas from me to kick off the blog, I did say something that has come back to haunt me. I wrote last week that "I would argue that there was a turn to more severe winter weather following those minor sudden stratospheric warmings (SSWs) with **the possible exception of 2016**. I do think the impacts from those other minor SSWs were of longer duration and more widespread, but in February 2016 there was a very brief but intense Arctic outbreak into the Northeastern US (see Weather Channel article). And sure enough, another comparable outbreak is predicted, though how cold it will actually acheive is still an open question, as I do believe that extreme cold is difficult to predict. At least here in Boston there was snow on the ground to greet the cold in 2016 and this time it is looking like bare ground, so that will likely help to prevent more extreme temperatures.

I included the polar cap geopotential height anomalies (PCHs) for the winter of 2015/16 in **Figure i** since it does show some relevant similarities to this winter. The minor SSW in February 2016 is visible around 7 February 2016. Like the current minor SSW, it resembled a stretched PV and was followed by a downward propagation (but admittedly less than robust), which reached the surface a few days later. The propagation to the surface coincided with the historic cold air outbreak into the Northeastern US and at least from the PCH plot the surface impacts were finished by 15 February 2016. But strong Ural ridging became established at the end of February that resulted in a major SSW in early March. It is not listed officially as a major SSW but rather as a Final Warming, but it was a major SSW in all but name.

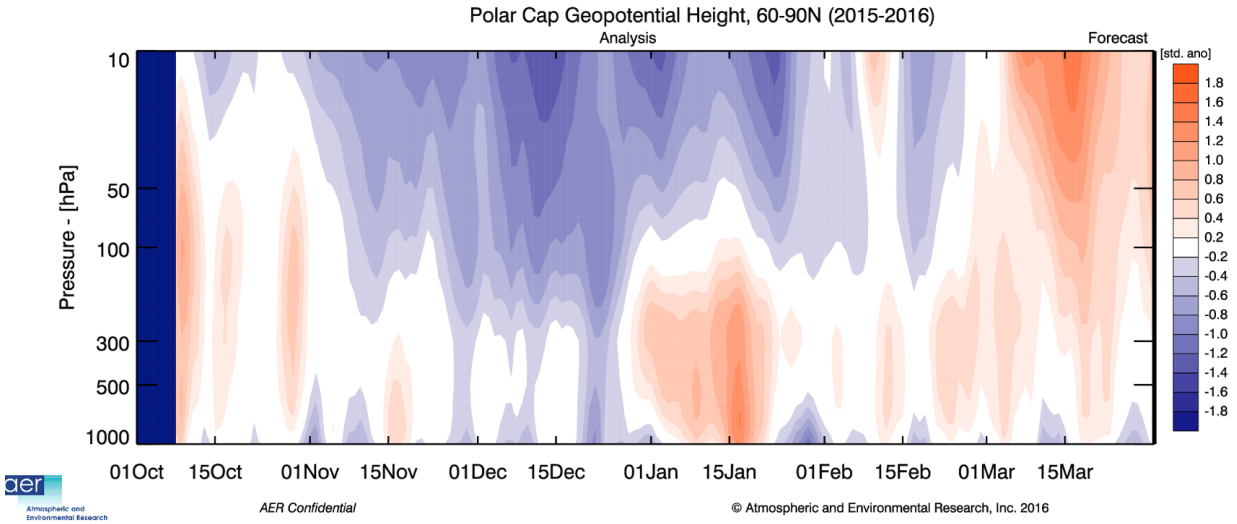

Figure i. Observed daily polar cap height (i.e., area-averaged geopotential heights poleward of 60°N) standardized anomalies from 10 October 2015 – 31 March 2016.

The predicted PCHs over the next two weeks still look very strange to me but consistent with the forecast from last week, and therefore, I will stop being skeptical of the outcome. I guess if you can ignore the inconvenient predicted cold/negative PCHs in

the lower stratosphere and upper troposphere you can convince yourself that the warm/positive PCHs in the upper stratosphere will propagate to the surface later this week resulting in the historic cold air outbreak.

The tropospheric circulation pattern is also looking more conducive for further PV disruptions. Ridging/high pressure is predicted to persist in the Laptev-Kara-Barents Seas and near the Urals and Scandinavia with downstream troughing/low pressure across Siberia into the North Pacific. So even though after this latest minor SSW the PV is predicted to strengthen and try to return to its normal perch, the North Pole I do believe further disruptions of the PV are likely.

Though to my credit I did end the *Impacts* section with "I would just add a major SSW could follow a minor SSW as happened most recently in 2016." And that can still end up being a useful insight as the chances of a major SSW are looking better relative to last week. For those who are curious I did list some weather highlights following the March 2016 Final Warming in Figure 7 from Cohen et al. (2016).

Otherwise looks like more of the same "lather, rinse and repeat" type of pattern. We have the ongoing minor SSW/stretched PV with its 36-hour cold shot to the Northeastern US. Then the PV is predicted to try to return to normal and then I feel that another stretched PV is likely. And though my tone with predicted historic cold in the Northeastern US is disparaging or belittling; similar to at least the past two winters, a stretched PV is likely to bring widespread cold to Canada and the Western US, consistent with decadal trends. If we do get another stretched PV, I would expect it to bring the cold air back into the Eastern US but no reason not to believe that it will not once again be transitory.

I didn't get into climate so that my biggest contribution to the science is to parrot "the trend is your friend," but here we are. In last week's blog (23 January 2023) I showed the February temperature trend analysis for the US from 1991 to almost the present from Brian Brettschneider. In **Figure ii** I show our own analysis of the February temperature trend for the entire Northern Hemisphere (NH) and going back to 1980 that was included in the supplementary material of Cohen et al. 2021. It shows warming temperatures in the Arctic, Alaska, the Eastern US and Europe with cooling temperatures in Siberia and the interior of Canada and the US but especially west of the Mississippi. I don't have a good reason for you as to why, but in my opinion that is as good or better than any other forecast for February 2023.

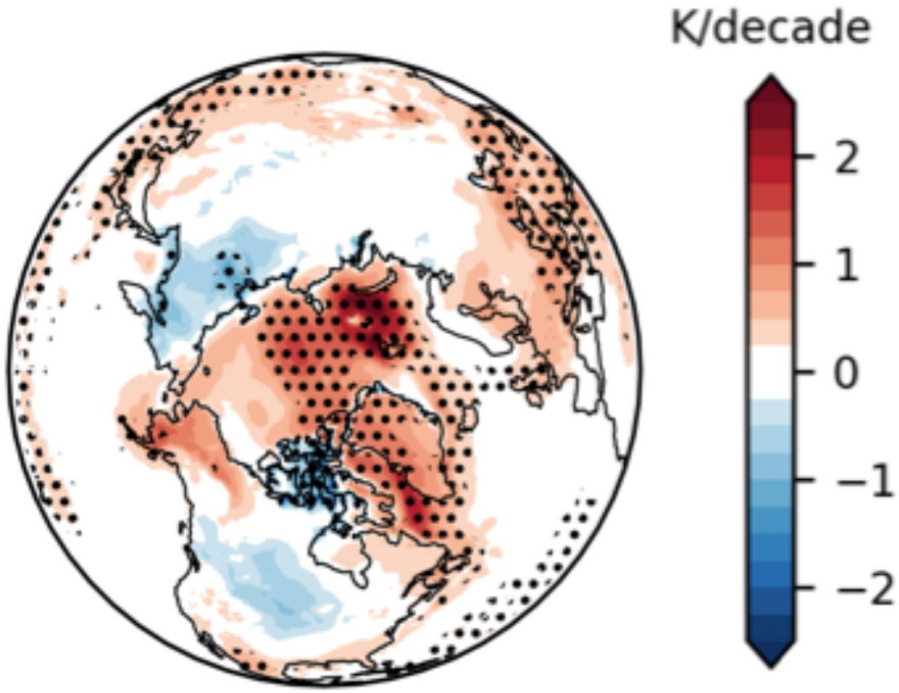

Figure ii. Observed surface temperature trend (°C; shading) for the NH based on ERA5 reanalysis data from 1980-2021. Stippling represents confidence is greater than 95% based on Student's T-test.

I would just add a major SSW could follow a minor SSW as happened most recently in 2016.

Wednesday Update

Asking for a friend, can one do a mea culpa on a mea culpa? Last week I did a mea culpa on rhetorically asking what is going to stop an SSW and that question is looking more prescient than I thought last week. Though in all seriousness, the way to properly to ask that question was to include the caveat as long as Ural/Scandinavian ridging/high pressure remains in place. When the models had robust Ural/Scandinavian ridging/high pressure in place an SSW looked likely. When the models lost the Ural/Scandinavian ridging/high pressure the PV was predicted to rapidly strengthen. And when the Ural/Scandinavian ridging/high pressure returned in the model forecasts, an SSW is once again looking very possible.

And I will say what I have said many times before, it shows that Ural/Scandinavian ridging/high pressure is the single most important feature that influences the behavior of the PV. I always thought that was true in the real world, and it does look like that is equally true in the state-of-the-art global weather models. So as long as Ural/Scandinavian ridging/high pressure remains in place coupled with downstream

troughing across Siberia into the North Pacific, the prospect for an SSW looks favorable. But I have seen this movie before, an inevitable SSW one day in the models can disappear the next.

There was a fairly dramatic change yesterday in the model temperature forecasts for Europe next week. The forecast is now for widespread relatively cold temperatures with the exception of Scandinavia (see **Figure iii** and compare to Figures 6 and 9 below). The change to colder weather has come about because European ridging/high pressure pushed far enough north to allow return/easterly flow under the high pressure tapping into cold air in Siberia and draw it west towards Europe. The pattern of relatively cold temperatures across Europe, Northern Asia, including Siberia and western North America with relatively mild temperatures in the Eastern US is the pattern often observed heading into an SSW (see Figure 4 from Kretschmer et al. 2018). So it will be interesting to see if an SSW can coincide with this pattern, though the models at least for now seem to suggest that the European cold is transient.

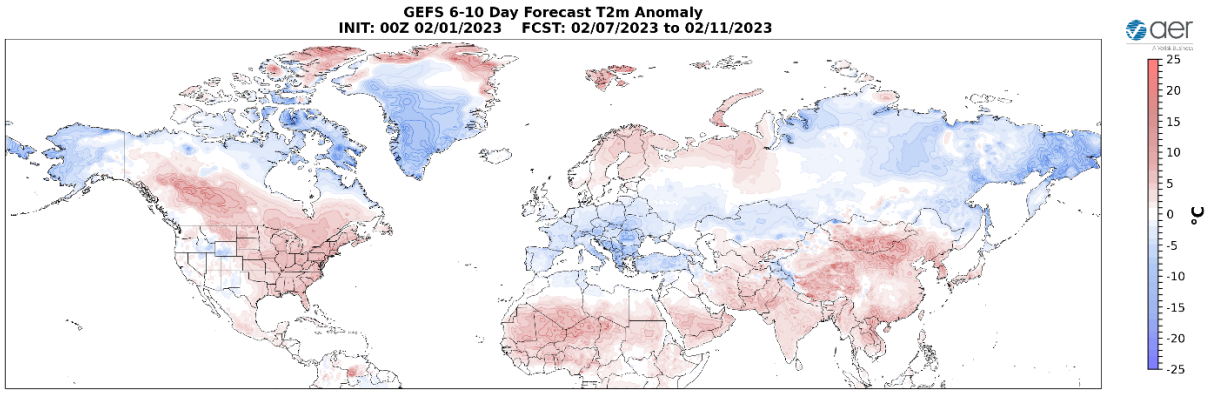

Figure iii. Forecasted surface temperature anomalies (°C; shading) from 7 – 11 February 2023. The forecast is from the 00Z 1 February 2023 GFS ensemble.

But following the SSW, if it does happen, I would expect it to turn colder in the Eastern US and/or Europe. So maybe winter finally shows up for each region in spring? Both regions have had a very mild winter so far. Maybe Europe has received more media attention for the unseasonably warm temperatures, but the warmth in the Eastern US has been impressive. When I did a TV news interview on the snowless streak in New York City (NYC, ending today), I was struck by a graphic they showed that every day in January was above normal in NYC! I have said before in the era of climate change, if it is above normal it's not just a little above normal but way above normal and certainly seems true for this winter as well. It is also crazy to me there have essentially been only two cold shots in the Eastern US this winter and both have been record cold. So we have a winter where it is either prolonged record warm or briefly record cold. Certainly, seems to fit the definition of weather whiplash.

Recent and Very Near Term Conditions

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

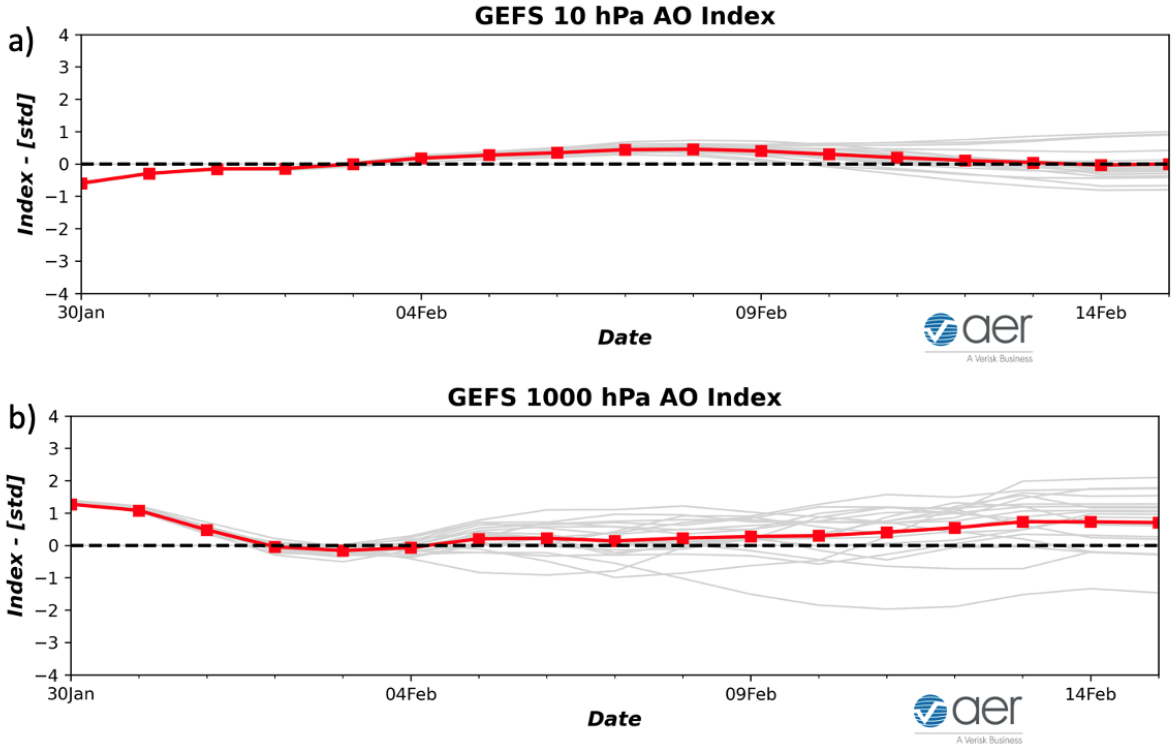

Figure 1. (a) The predicted daily-mean AO at 1000 hPa from the 00Z 30 January 2023 GFS ensemble. (b)The predicted daily-mean near-surface AO from the 00Z 30 January 2023 GFS ensemble. Gray lines indicate the AO index from each individual ensemble member, with the ensemble-mean AO index given by the red line with squares.

Predicted mostly troughing/negative geopotential height anomalies across Greenland will favor strengthening ridging/positive geopotential height anomalies across Northwestern Europe with troughing/negative geopotential height anomalies across Eastern Europe this period (**Figure 2).** This pattern will favor normal to above normal temperatures across much of Europe including the UK with normal to below normal temperatures limited to parts of Scandinavia and Southeastern Europe including Turkey (**Figure 3**). Ridging/positive geopotential height anomalies centered in the Laptev Sea and across the Urals will favor troughing/negative geopotential height anomalies across Siberia and Eastern Asia with more ridging/positive geopotential height anomalies across Southern Asia (**Figure 2**). This pattern favors normal to below normal

temperatures across Western and Central Siberia and parts of Central and Northeastern Asia with normal to above normal temperatures across Western and Southern Asia and Eastern Siberia **(Figure 3**).

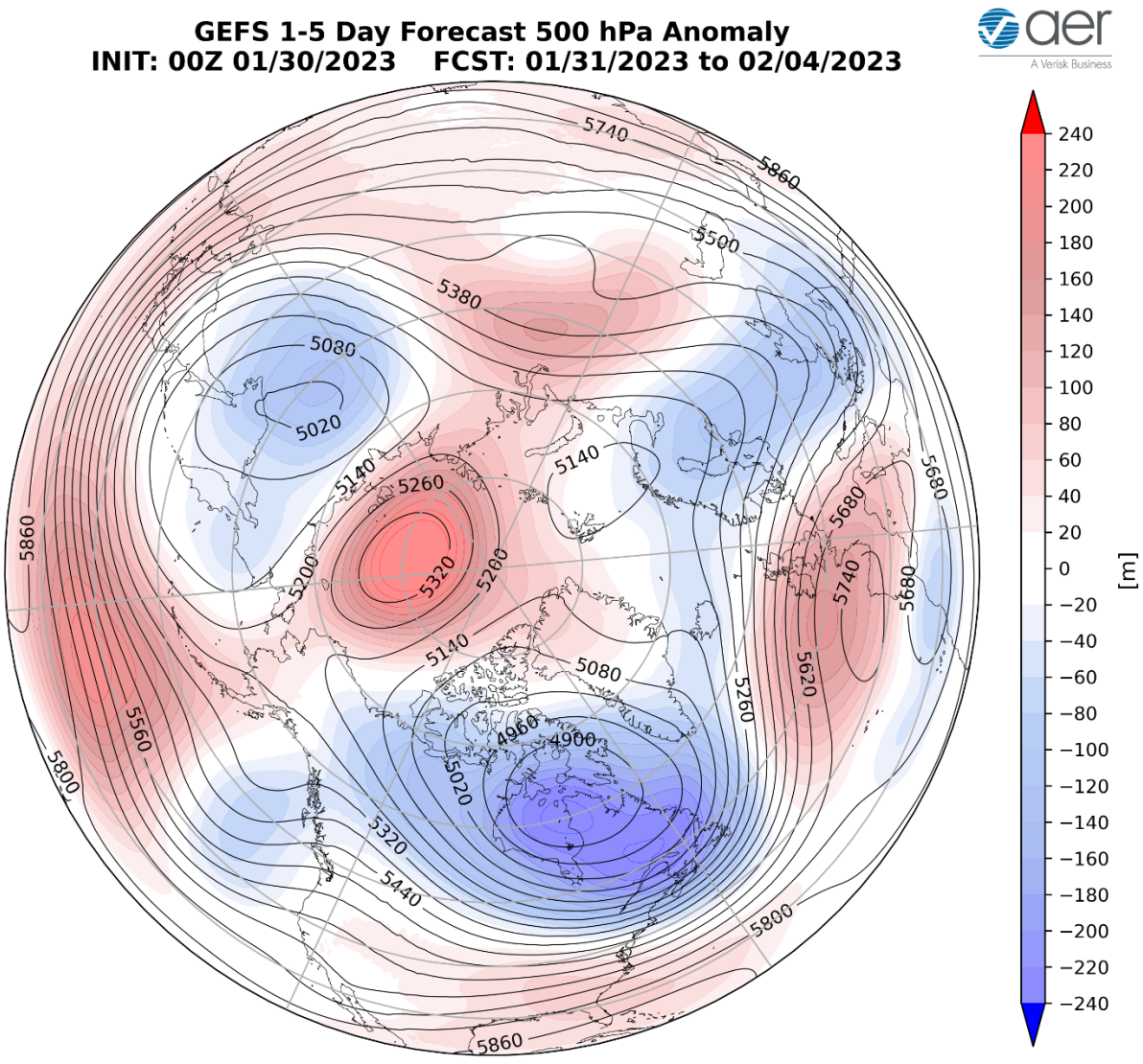

Figure 2. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 31 January – 4 February 2023. The forecasts are from the 00z 30 January 2023 GFS ensemble.

Ridging/positive geopotential height anomalies centered in the Laptev Sea and south of the Aleutians will force deep troughing/negative geopotential height anomalies across the much of Canada and the Northeastern US with more ridging/positive geopotential height anomalies across the Southeastern US **(Figure 2).** The pattern will favor normal to below normal temperatures across parts of Alaska, much of Canada and the US with

normal to below normal temperatures limited to the West Coast of Canada and the Southeastern US **(Figure 3).**

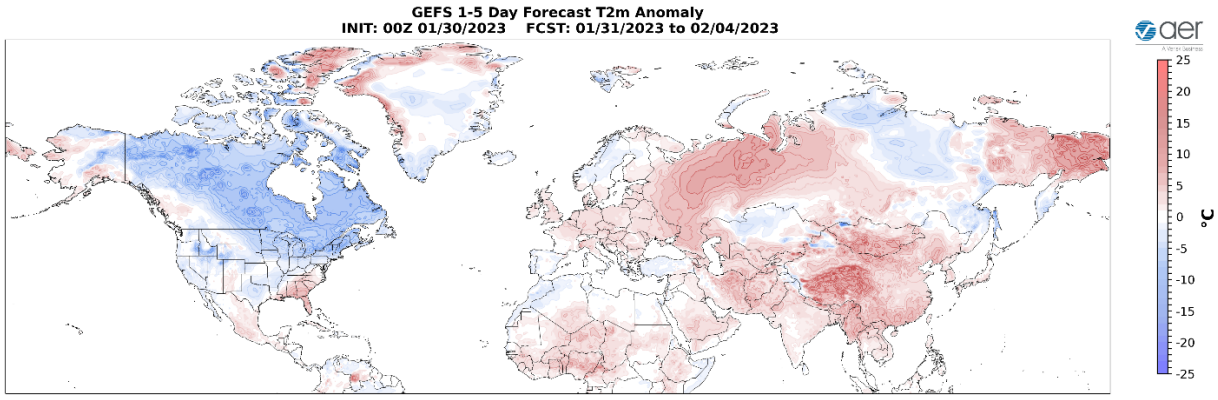

Figure 3. Forecasted surface temperature anomalies (°C; shading) from 31 January – 4 February 2023. The forecast is from the 00Z 30 January 2023 GFS ensemble.

Troughing and/or cold temperatures will support new snowfall to Norway, the Baltic States, the Alps, the Balkans, Turkey, Siberia, Central and Northeast Asia while mild temperatures will support snowmelt across the Pyrenes, Northwestern Russia, Kamchatka Peninsula, and the Tibetan Plateau (**Figure 4**). Troughing and/or cold temperatures will support new snowfall across Western Canada and the Canadian Maritimes while mild temperatures will support snowmelt across the Western US and New England (**Figure 4**).

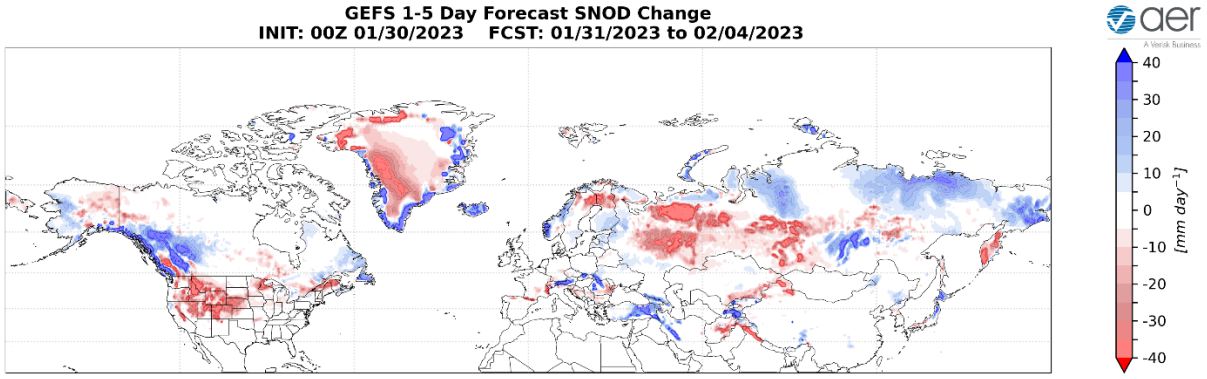

Figure 4. Forecasted snow depth changes (mm/day; shading) from 31 January – 4 February 2023. The forecast is from the 00Z 30 January 2023 GFS ensemble.

Near-Term

1-2 week

The AO is predicted to remain close to neutral this period **(Figure 1**) as geopotential height anomalies continue to be mixed across the Arctic and mixed across the mid-latitudes (**Figure 5**). With mostly negative geopotential height anomalies across Greenland (**Figure 5**), the NAO is predicted to remain positive this period.

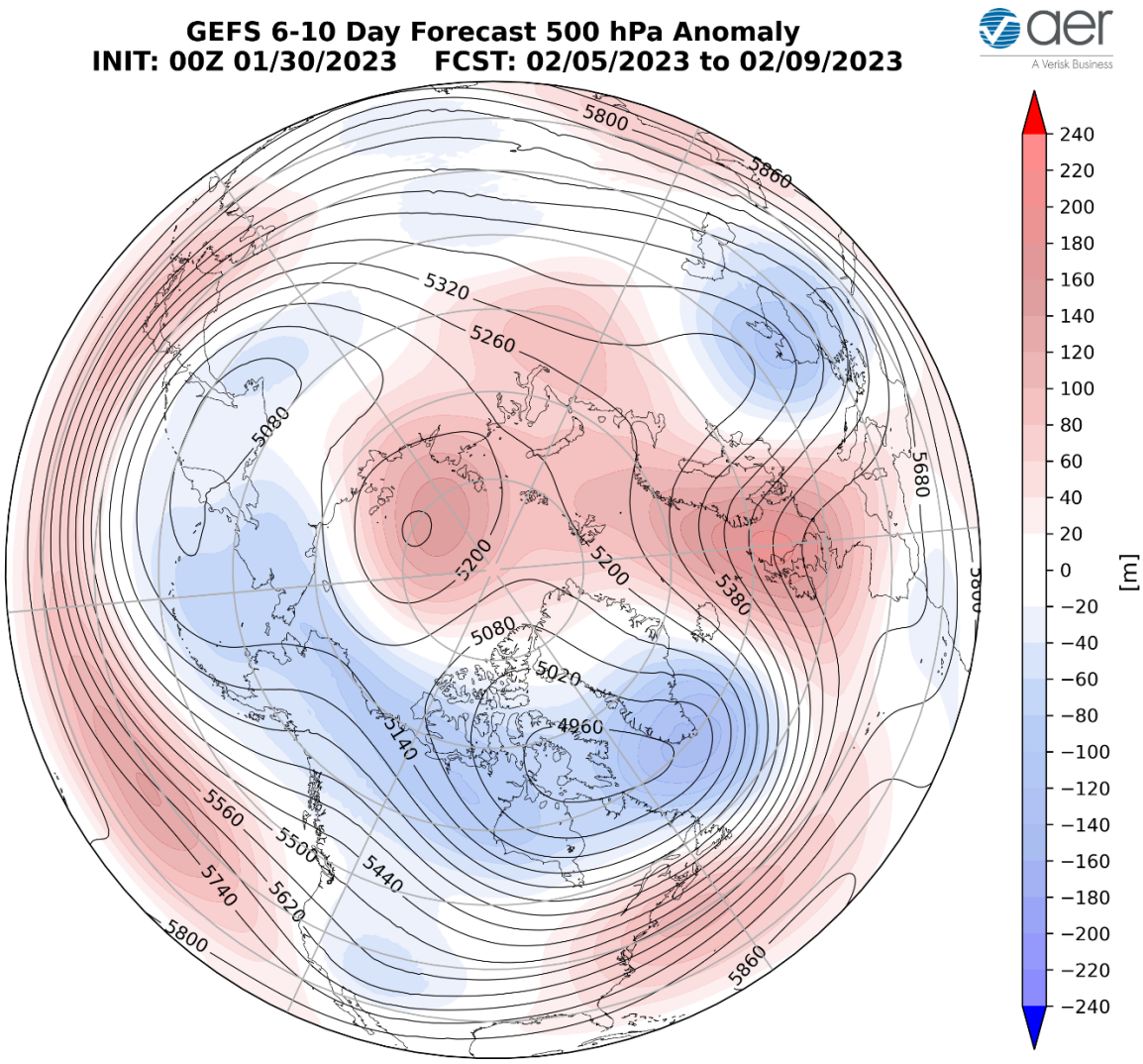

Figure 5. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 5 – 9 February 2023. The forecasts are from the 00z 30 January 2023 GFS ensemble.

Persistent troughing/negative geopotential height anomalies centered over Greenland will support ridging/positive geopotential height anomalies over Northern Europe with troughing/negative geopotential height anomalies across Eastern Europe centered on the Black Sea (**Figures 5).** **T**his pattern favors normal to above normal temperatures across Northern and Western Europe including the UK with normal to below normal temperatures across Southern and Eastern Europe including Turkey (**Figure**

6). Persistent ridging/positive geopotential height anomalies centered in the Laptev Sea and across the Urals will anchor troughing/negative geopotential height anomalies across Siberia and Northeastern Asia that extends southwestward into Central Asia with more ridging/positive geopotential height anomalies across Southeastern Asia this period (**Figure 5**). This pattern favors normal to below normal temperatures across much of Siberia, Northeastern and Central Asia with normal to above normal temperatures across Western and Southern Asia **(Figure 6**).

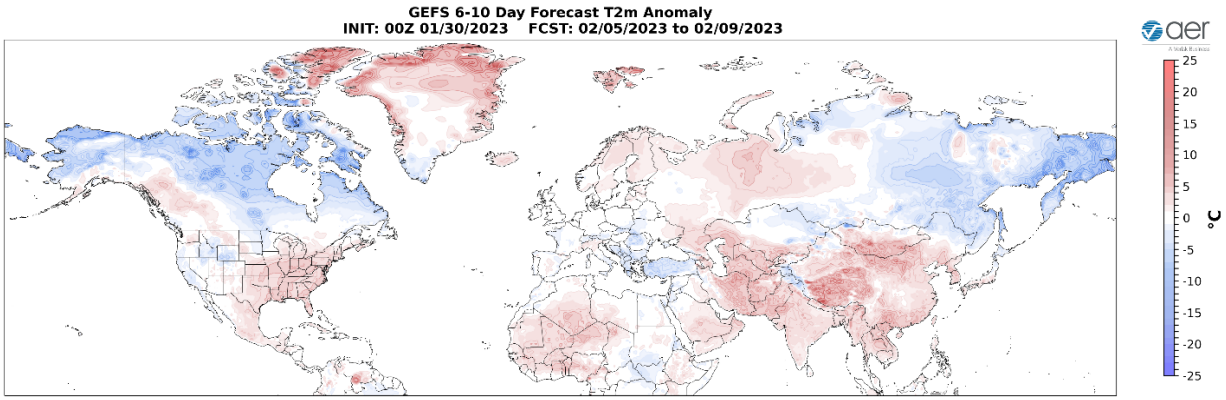

Figure 6. Forecasted surface temperature anomalies (°C; shading) from 5 – 9 February 2023. The forecast is from the 00Z 30 January 2023 GFS ensemble.

Persistent ridging/positive geopotential height anomalies centered in the Laptev Sea and south of the Aleutians will force troughing/negative geopotential height anomalies across Alaska, Canada and the Western US with more ridging/positive geopotential height anomalies centered along US East Coast this period **(Figure 5).** This pattern will favor normal to below normal temperatures across Alaska, Central and Eastern Canada and the Western US with normal to above normal temperatures across Western Canada and the Eastern US **(Figure 6).**

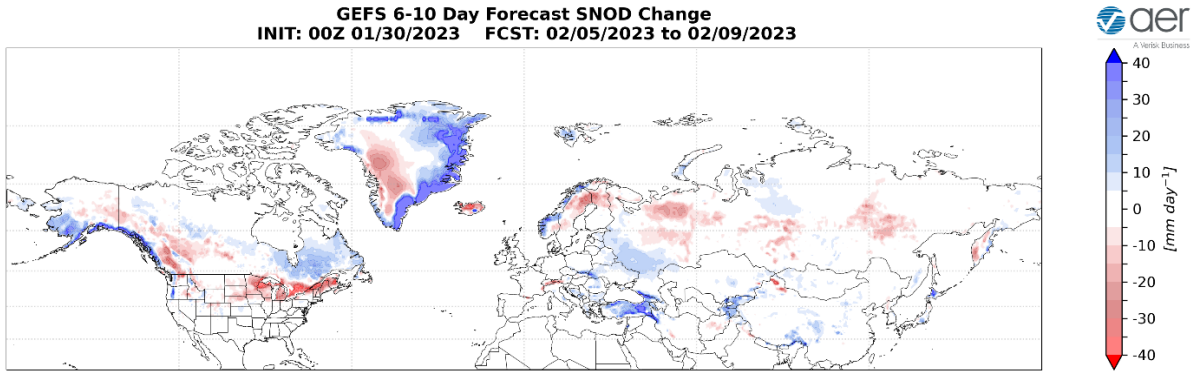

Figure 7. Forecasted snow depth changes (mm/day; shading) from 5 – 9 February 2023. The forecast is from the 00Z 30 January 2023 GFS ensemble.

Troughing and/or cold temperatures will support new snowfall across Norway, Eastern Europe, Turkey, Eastern Siberia and parts of Central Asia while mild temperatures will support snowmelt in Sweden and parts of Western Russia and Central Asia (**Figure 7**). Troughing and/or cold temperatures will support new snowfall across southern Alaska, the West Coast of Canada, Southeastern Canada and the Northwestern US while mild temperatures will support snowmelt in the Great Lakes and New England (**Figure 7**).

3-4 week

With continued mixed to negative geopotential height anomalies across the Arctic and with mixed geopotential height anomalies across the mid-latitudes this period (**Figure 8**), the AO should remain close to neutral this period (**Figure 1**). With negative pressure/geopotential height anomalies across Greenland (**Figure 8**), the NAO will remain positive this period.

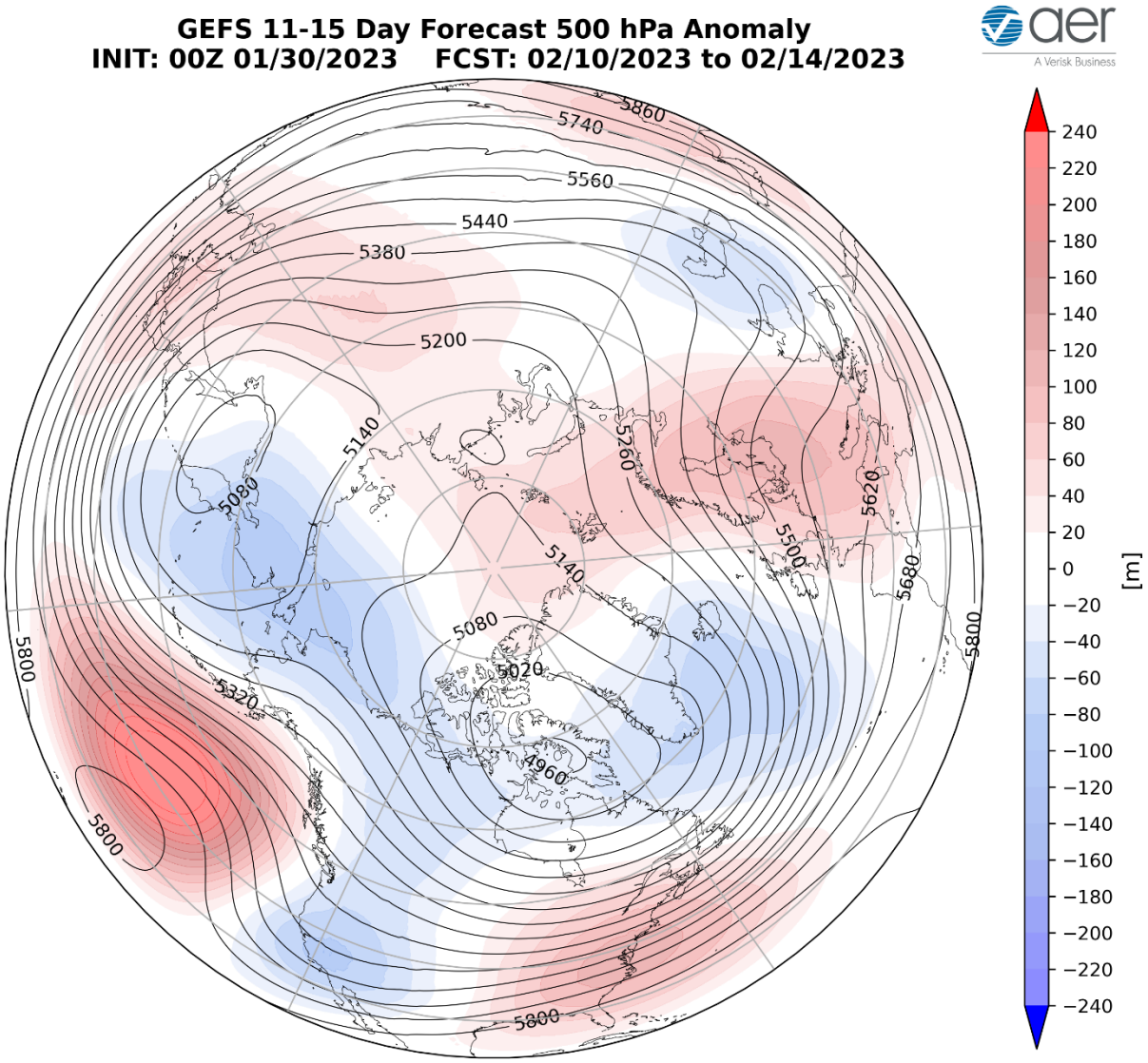

Figure 8. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 10 – 14 February 2023. The forecasts are from the 00z 30 January 2023 GFS ensemble.

Persistent troughing/negative geopotential height anomalies across Greenland will anchor ridging/positive geopotential height anomalies across Northern Europe with some residual troughing/negative geopotential height anomalies in Southeastern Europe this period (**Figure 8**). This pattern favors normal to above normal temperatures across much of Europe including the UK with normal to below normal temperatures across Southeastern Europe including Turkey (**Figures 9**). Persistent ridging/positive geopotential height anomalies across the Laptev Sea will slide westward into the Barents-Kara Seas and are predicted to anchor troughing/negative geopotential height anomalies across Eastern and Western Asia with more ridging/positive geopotential height anomalies across Central Asia (**Figure 8**). This pattern favors widespread normal to below normal temperatures across much of Eastern and Western Asia with normal to above normal temperatures across Central Asia (**Figure 9**).

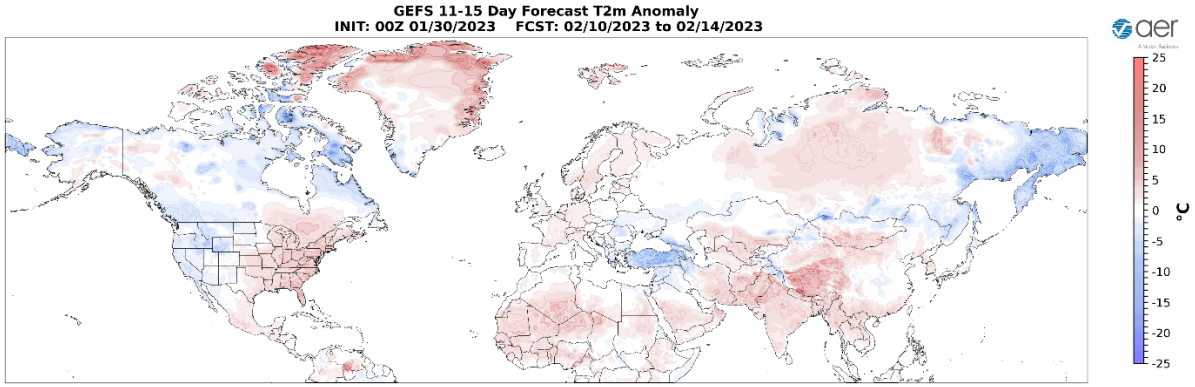

Figure 9. Forecasted surface temperature anomalies (°C; shading) from 10 – 14 February 2023. The forecast is from the 00Z 30 January 2023 GFS ensemble.

Predicted persistent ridging/positive geopotential height anomalies previously south of the Aleutians and in the Barents-Kara Seas will anchor troughing/negative geopotential height anomalies across much of Canada and the Western US with more ridging/positive geopotential height anomalies centered in the Eastern US this period (**Figure 8**). This pattern favors widespread normal to below normal temperatures across Alaska, Canada and the Western US with normal to above normal temperatures limited to the Eastern US (**Figure 9**).

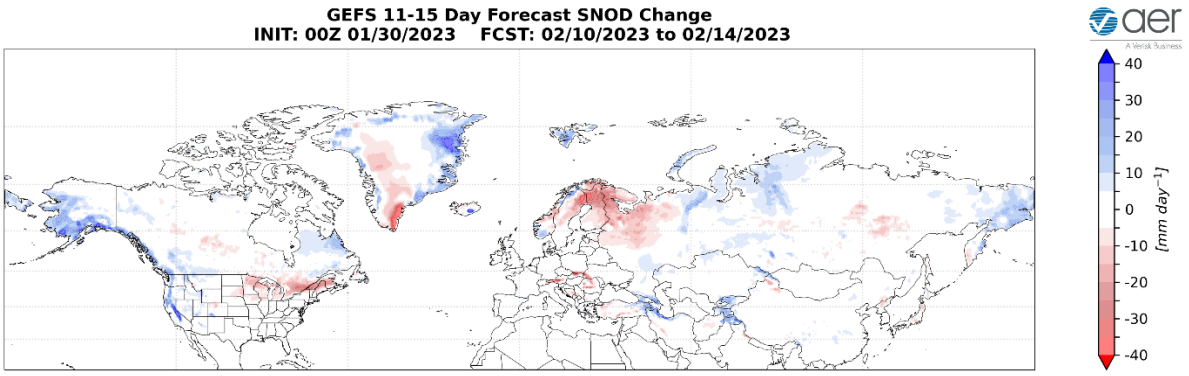

Figure 10. Forecasted snow depth changes (mm/day; shading) from 10 – 14 February 2023. The forecast is from the 00Z 30 January 2023 GFS ensemble.

Troughing and/or cold temperatures will support new snowfall across Siberia and Central Asia while mild temperatures will support snowmelt in Scandinavia and the Baltics (**Figure 10**). Troughing and/or cold temperatures will support new snowfall across western Alaska, Quebec, the Cascades and the Western US while mild temperatures will support snowmelt in the Great Lakes and New England (**Figure 10**).

Longer Term

30–day

The latest plot of the polar cap geopotential height anomalies (PCHs) currently shows normal to warm/positive PCHs throughout the stratosphere and the troposphere (**Figure 11**). However, the warm/positive PCHS in the stratosphere are predicted to turn cold/negative later this week while the normal to warm/positive PCHs in the troposphere are predicted to strengthen and persist the next two weeks (**Figure 11**). The current warm/positive PCHs in the stratosphere are a result of a minor sudden stratospheric warming (SSW).

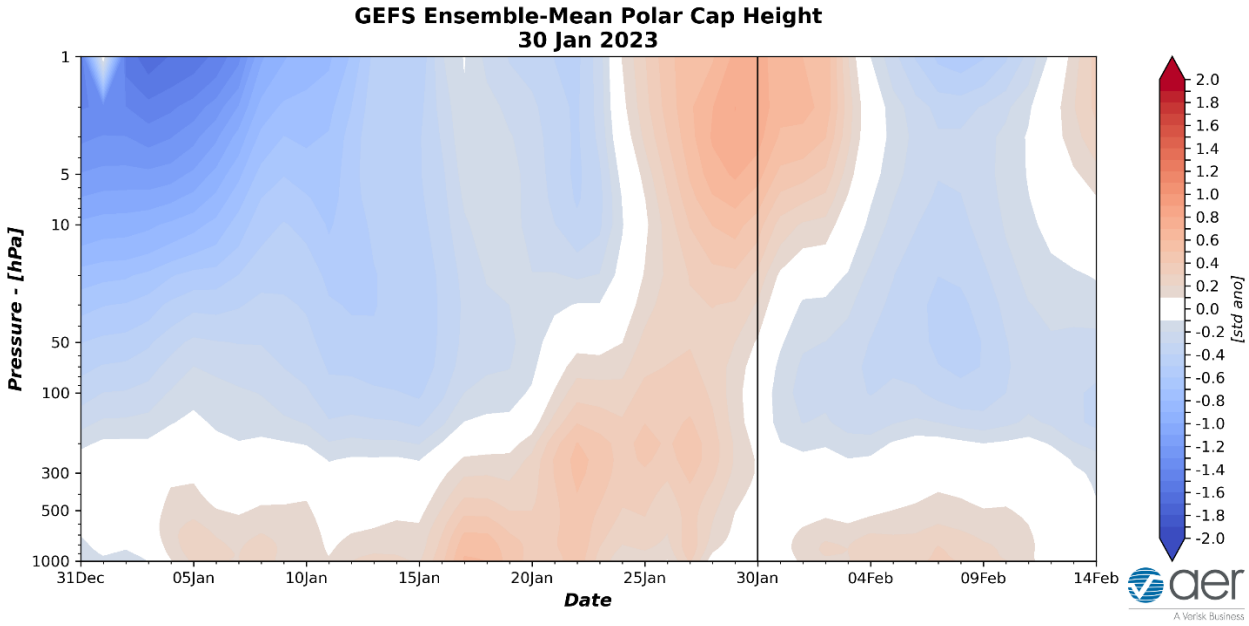

Figure 11. Observed and predicted daily polar cap height (i.e., area-averaged geopotential heights poleward of 60°N) standardized anomalies. The forecast is from the 00Z 30 January 2023 GFS ensemble.

The mostly warm/positive PCHs in the lower troposphere over the next two weeks (**Figure 11**) are consistent with the predicted near neutral surface AO (**Figure 1**). However, the second week of February when the warm/positive PCHs in the lower troposphere are predicted to weaken (**Figure 11**), the AO could become positive (**Figure 1**).

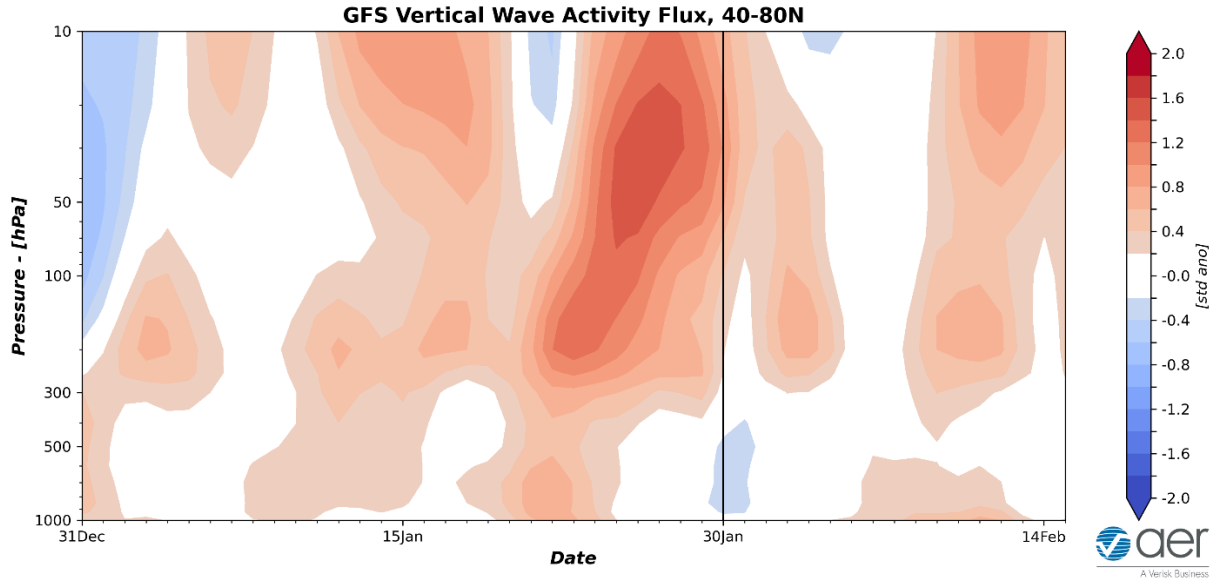

Figure 12. Observed and predicted daily vertical component of the wave activity flux (WAFz) standardized anomalies, averaged poleward of 40-80°N. The forecast is from the 00Z 30 January 2023 GFS ensemble.

Vertical Wave Activity Flux (WAFz) from the troposphere to the stratosphere or poleward heat transport in the stratosphere was very active last week but is currently winding down (**Figure 12**) which has resulted in warming of the polar stratosphere (**Figure 11**). The GFS is predicting that the WAFz will become active again the second week of February (**Figure 12**), resulting in warming of the stratospheric in mid-February (**Figure 11**) and could lead to another SSW minor or major.

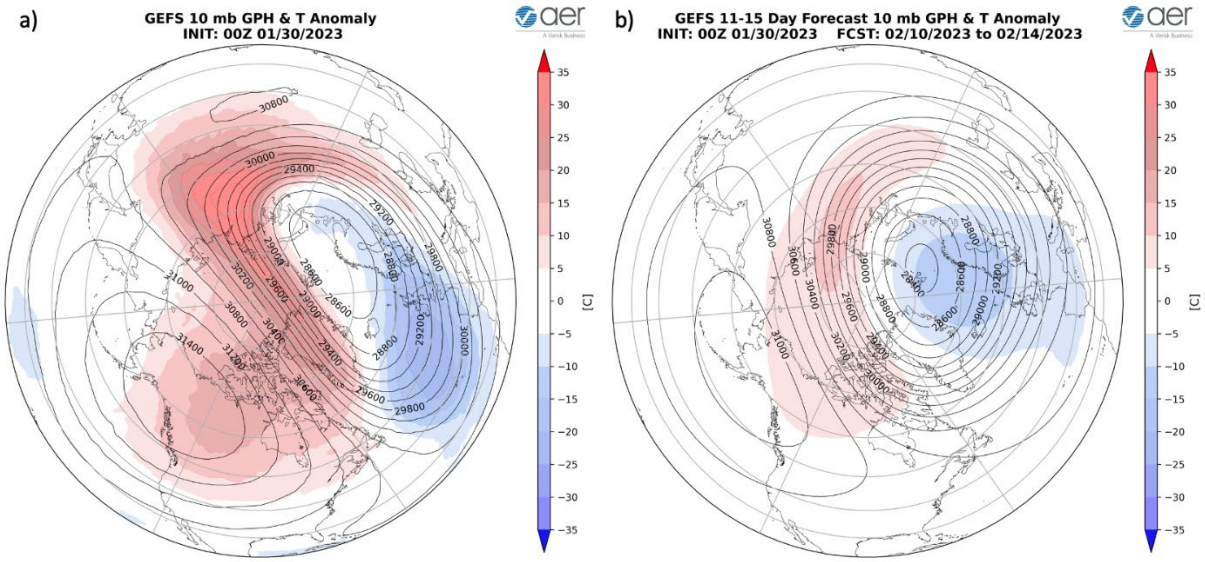

Figure 13. (a) Initialized 10 mb geopotential heights (dam; contours) and temperature anomalies (°C; shading) across the Northern Hemisphere for 30 January 2023. (b) Same as (a) except forecasted averaged from 10 – 14 February 2023. The forecasts are from the 00Z 30 January 2023 GFS model ensemble.

The more active WAFz has shifted the still strong stratospheric PV center over towards Scandinavia and has caused it to stretch or elongate **(Figure 13**) with the coldest temperature anomalies in the eastern North Atlantic and Europe. Coupled with the elongated PV is ridging and warming centered over Alaska and the Western Arctic in the polar stratosphere (see **Figure 13**). The return to normal WAFz predicted for the next week to ten days will allow the PV to strengthen, with the PV shape becoming more circular and shifted into the Barents-Kara Seas with the coldest relative temperatures remaining close to the PV center (not shown). However, with the WAFz turning more active again second week of February, warming is predicted to return to the Central Arctic with the PV center shifted towards the Barents-Kara Seas and Northern Europe (see **Figure 13**). With the rapid changes in the PV, the stratospheric AO is predicted to remain near neutral the next two weeks **(Figure 13**).

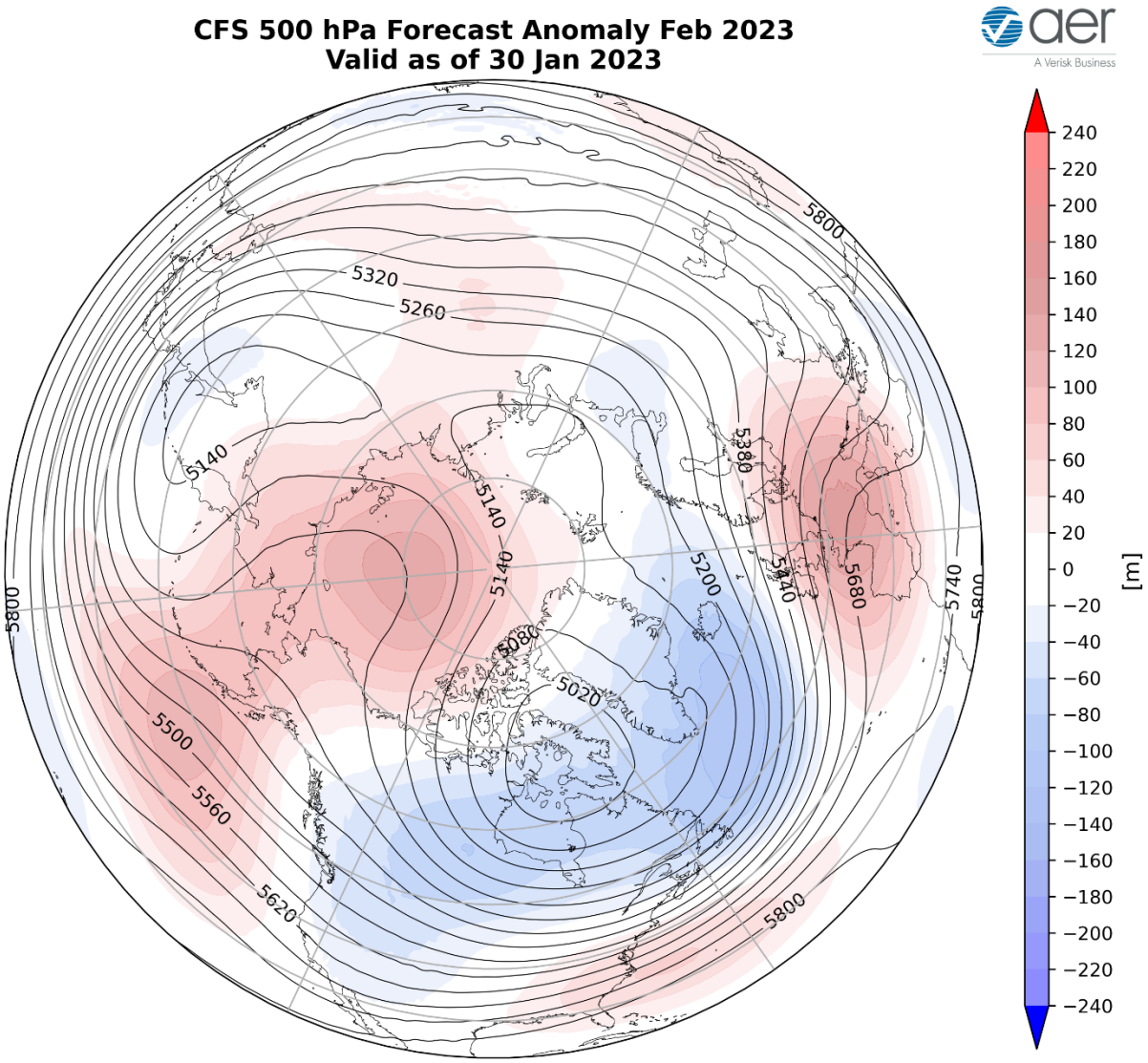

Figure 14. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere for February 2023. The forecasts are from the 00Z 30 January 2023 CFS.

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 across Europe and stretching from the south of the Aleutians, across Alaska and Eastern Siberia and into the Beaufort Sea and off the US East Coast with troughing across the Baltics, the Eastern Mediterranean, Northern and Eastern Asia, much of Canada and the Western US (**Figure 14).** This pattern favors seasonable to relatively warm temperatures across much of Europe and Asia, Alaska and the Southeastern US with seasonable to relatively cold temperatures across Turkey, Northeastern Asia, much of Canada and the Western US (**Figure 15**).

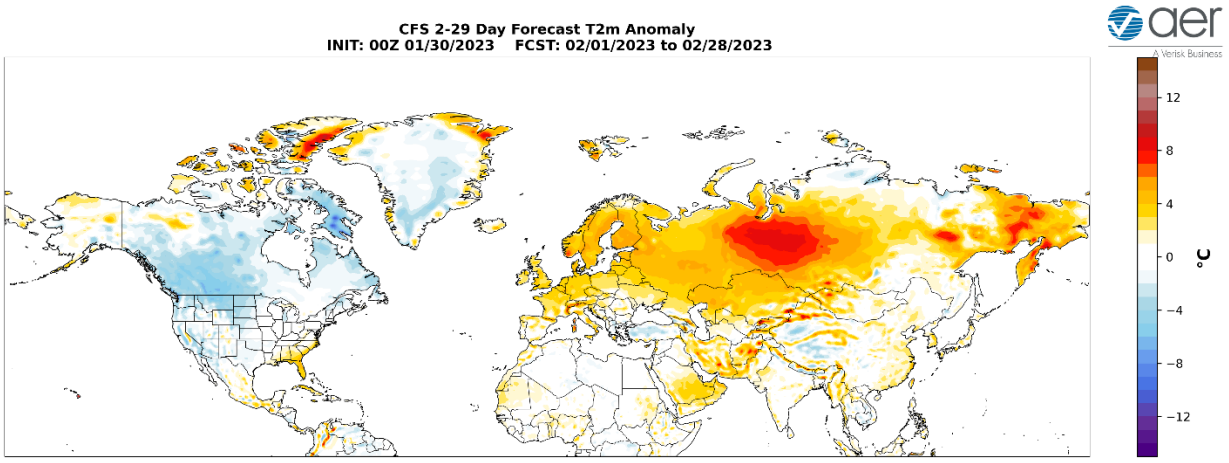

Figure 15. Forecasted average surface temperature anomalies (°C; shading) across the Northern Hemisphere for February 2023. The forecasts are from the 00Z 30 January 2023 CFS.

Boundary Forcings

Arctic Sea Ice

Arctic sea ice, which as expected is below normal (see **Figure 16**) but the regional anomalies have been more extensive than in recent years. The greatest concentration of below normal remains in the Barents-Kara Seas, which I believe favors high latitude blocking. So it could be Arctic sea ice is increasingly favoring high latitude blocking in the Barents-Kara Seas region and PV disruptions.

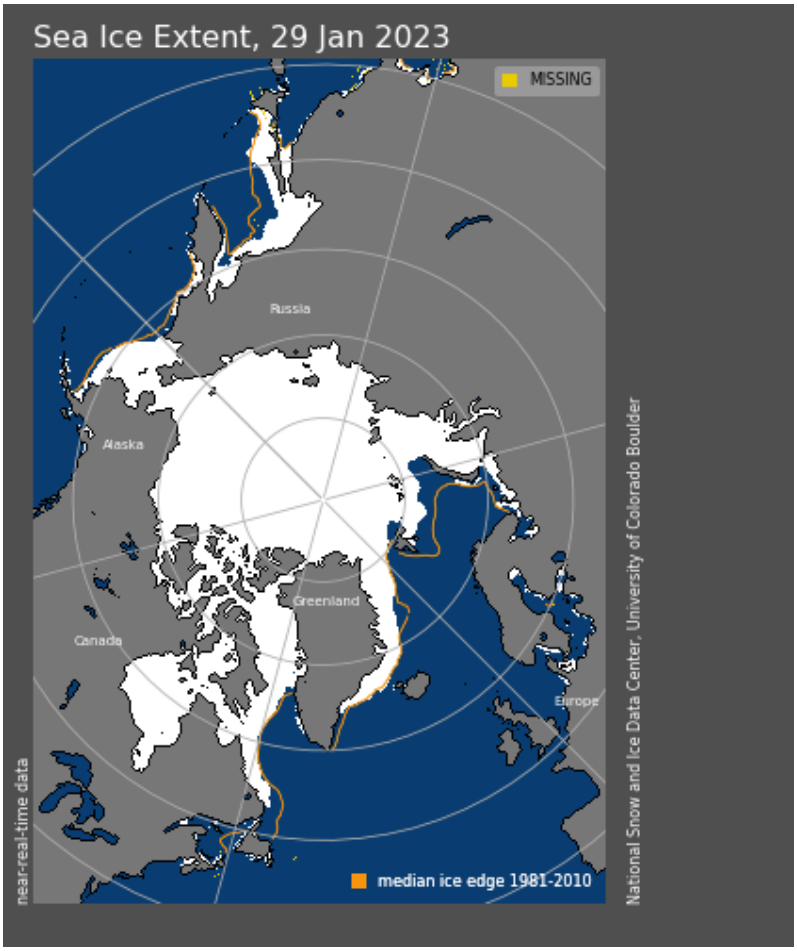

Figure 16. Observed Arctic sea ice extent on 29 January 2023 (white). Orange line shows climatological extent of sea ice based on the years 1981-2010. Image from the National Snow and Ice Data Center (NSIDC).

SSTs/El Niño/Southern Oscillation

Equatorial Pacific sea surface temperatures (SSTs) anomalies are below normal and we continue to observe weak La Niña conditions (**Figure 17)** and La Niña conditions are expected through the spring. Observed SSTs across the NH remain well above normal especially in the central North Pacific (west of recent years), the western North Pacific and offshore of eastern North America though below normal SSTs exist regionally especially in the South Pacific.

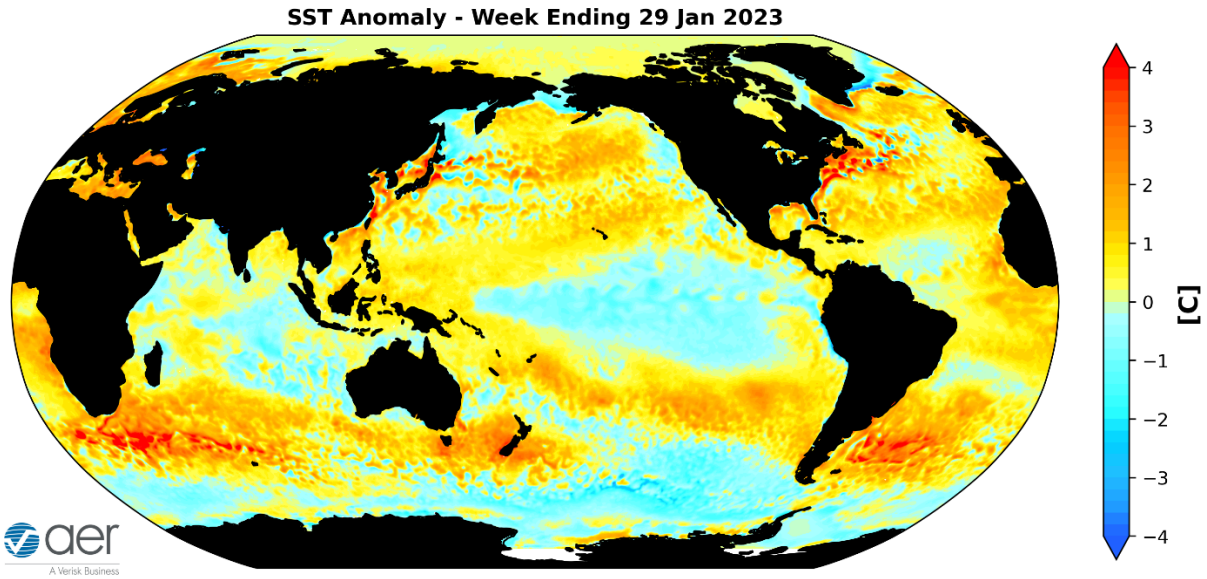

Figure 17. The latest weekly-mean global SST anomalies (ending 29 January 2023). Data from NOAA OI High-Resolution dataset.

Madden Julian Oscillation

Currently the Madden Julian Oscillation (MJO) is in phase three (**Figure 18**). The forecasts are for the MJO to quickly rifle through phases 3, 4, 5 and 6. Phases three through six favor troughing over Alaska, Canada, and the Western US with ridging across eastern North America. Seems that the MJO is having an influence and possibly strong influence on the weather across North America in the short term. But admittedly this is outside of my expertise.

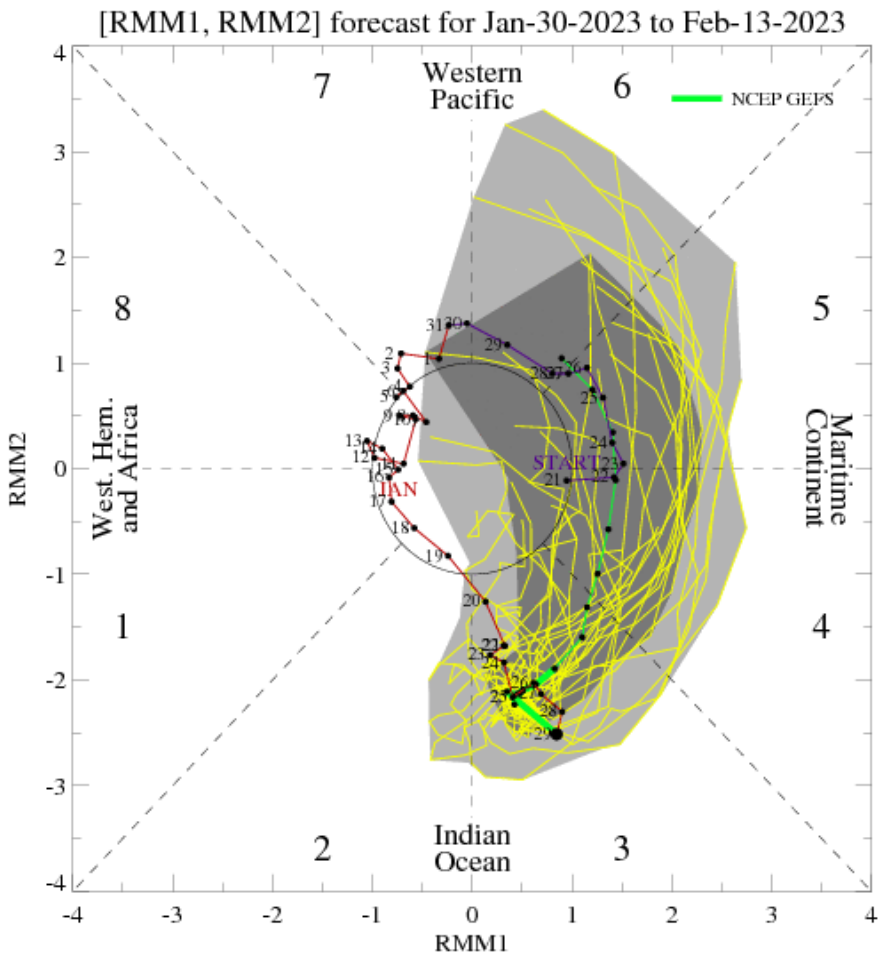

Figure 18. Past and forecast values of the MJO index. Forecast values from the 00Z 30 January 2023 ECMWF model. Yellow lines indicate individual ensemble-member forecasts, with the green line showing the ensemble-mean. A measure of the model "spread" is denoted by the gray shading. Sector numbers indicate the phase of the MJO, with geographical labels indicating where anomalous convection occurs during that phase. Image source: http://www.atmos.albany.edu/facstaff/roundy/waves/phasediags.html

Snow Cover

Snow cover extent (SCE) anomalies across the NH has remained stable this past week. In North America snow cover is normal to slightly above (see **Figure 19**). Snow cover is still above normal across East Asia but snow cover extent is below normal in Eastern Europe and Western Asia but remains above normal in Western Europe. I expect snow cover to remain stable in the coming weeks, especially across the US.

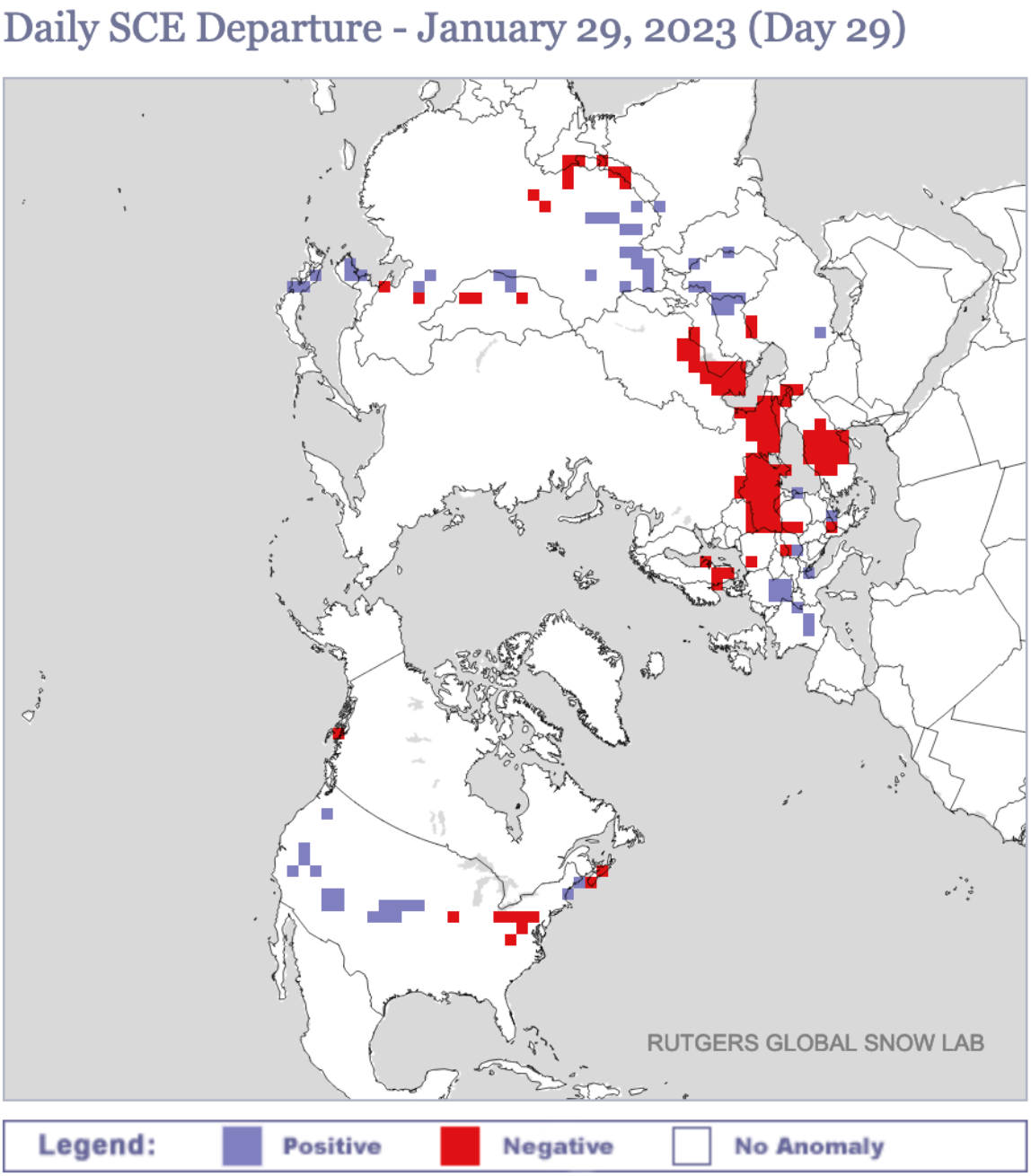

Figure 19. Observed North Hemisphere snow cover anomalies on 29 January 2023. Plot from http://climate.rutgers.edu/snowcover/index.php

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!