Arctic Oscillation and Polar Vortex Analysis and Forecasts

December 6, 2021

Dear AO/PV blog readers:

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

For those who would like an early look on Mondays, we will be offering at a nominal price (US $25) a PDF version of the upcoming blog, and we will be rolling out in the coming weeks 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.

Special blog on winter 2018/2019 retrospective can be found here - http://www.aer.com/winter2019

Special blog on winter 2017/2018 retrospective can be found here - http://www.aer.com/winter2018

Special blog on winter 2016/2017 retrospective can be found here - http://www.aer.com/winter2017

Special blog on winter 2015/2016 retrospective can be found here - http://www.aer.com/winter2016

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.

Subscribe to our email list or follow me on Twitter (@judah47) for notification of updates.

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 the next two weeks with mostly negative pressure/geopotential height anomalies across the Arctic and mixed pressure/geopotential height anomalies across the mid-latitudes. The North Atlantic Oscillation (NAO) is currently neutral but is also predicted to be positive the next two weeks as pressure/geopotential height anomalies are predicted to become increasingly negative across Greenland.
- This week ridging/positive geopotential height anomalies in the central North Atlantic will favor troughing/negative geopotential height anomalies coupled with normal to below temperatures across Northern and Western Europe including the United Kingdom (UK). However next week the return of troughing/negative geopotential height anomalies across Greenland will no longer support troughing/negative geopotential height anomalies and heights are predicted to rise across Europe with normal to above normal temperatures becoming more widespread across Europe including the UK.
- The predicted general pattern across Asia the next two weeks is strengthening ridging/positive geopotential height anomalies coupled with normal to above normal temperatures across Western and Southern Asia with deepening troughing/negative geopotential height anomalies coupled with normal to below normal temperatures across much Northern and Eastern Asia.
- The current ridging/positive geopotential height anomalies in the central North Atlantic is predicted to split into two pieces with one piece sliding into Europe and another piece retrograding west into the Eastern United States (US) and then strengthen over the next two weeks. Meanwhile strengthening ridging/positive geopotential height anomalies between the Dateline and the Aleutians will favor deepening troughing/negative geopotential height anomalies in Alaska, Western Canada and the Western US. This pattern favors normal to below normal temperatures across Alaska and Western Canada and normal to above temperatures for much of the US and Eastern Canada. One exception is this week with more seasonable temperatures in Eastern Canada and the Northeastern US.
- In the *Impacts* section I discuss how the large scale atmospheric circulation are favoring a troposphere-stratosphere-troposphere coupling event that favors a positive AO, strong polar vortex (PV) and relatively mild temperatures across the Northern Hemisphere (NH) mid-latitudes.
- **Next week I am attending Fall AGU and there could a one-day delay in the publication of the blog.**

Plain Language Summary

I discuss in the Impacts section how the large-scale atmospheric circulation is clearly in the mid-stage of a cycle that favors an extended period of widespread relatively mild temperatures across the Eastern US and Northern Europe. However, this forecast remains uncertain and if cold weather can gain a foothold in East Asia, I believe that the cold weather can spread from there to other regions.

Impacts

I have been pondering this week when is too soon to cancel winter? Of course the right answer is that it is premature to cancel winter for more than two weeks at a time since that is the limit of our visibility into the weather future. I think that I have been overly pessimistic about the lack of winter and how long it can persist, but I do believe that there are some strong signs that we are teetering on a prolonged mild period for the US east of the Rockies and even Northern Europe where it has been colder.

When we were developing our ideas on how Siberian snow cover in the fall can influence winter weather in the Eastern US two decades ago, we settled on a six-step model that can be simplified to three or a troposphere-stratosphere-troposphere coupling event. The first step is the tropospheric precursor usually characterized by anomalous high pressure near the Urals when snow cover extent (SCE) is expansive but low pressure when SCE is sparse. The second step is a disruption of the stratospheric PV when SCE is high but a strong PV when SCE is low. The third and final step is a long lived negative AO about two weeks after the PV disruption when SCE is high but a long lived positive AO about two weeks after the PV becomes anomalously strong on average from late January through most of February. All three steps are visible when compositing the AO also known as the Northern Annular Mode (NAM) for high minus low October Eurasian SCE (see **Figure i** drafted by my former AER colleague and current University of Oklahoma professor Jason Furtado).

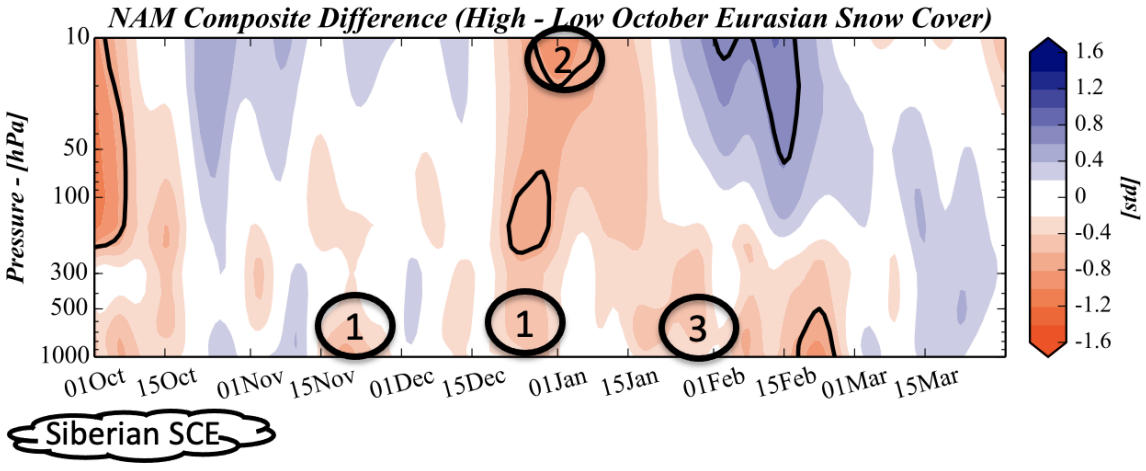

Figure i. Composite of the northern annular mode (NAM) for high minus low snow cover years based on October Eurasian snow cover. I included the three steps of troposphere-stratosphere-troposphere coupling: 1. tropospheric precursor, 2. anomalous stratospheric polar vortex behavior and 3. anomalous and long lived NAM anomaly. Black contours show those values that are statistically significant.

The polar cap geopotential height anomalies (PCHs) for the past week or so have suggested two of the first three steps have occurred or will occur shortly consistent with sparse SCE, anomalous low pressure centered near the Urals and a strengthened stratospheric PV (see **Figure ii**). The only step still not obvious, and is beyond the two-week forecast period, is the downward propagation of the atmospheric circulation anomalies from the polar stratosphere to the Arctic surface that is consistent with a positive AO. If the three step process or cycle continues to completion, then we could be looking at a mild start to December with a possible reversal to colder weather (at least based on the latest PCH plot **Figure 11**) the second half of December but then a more extended mild period beginning either the very end of December or more likely early January.

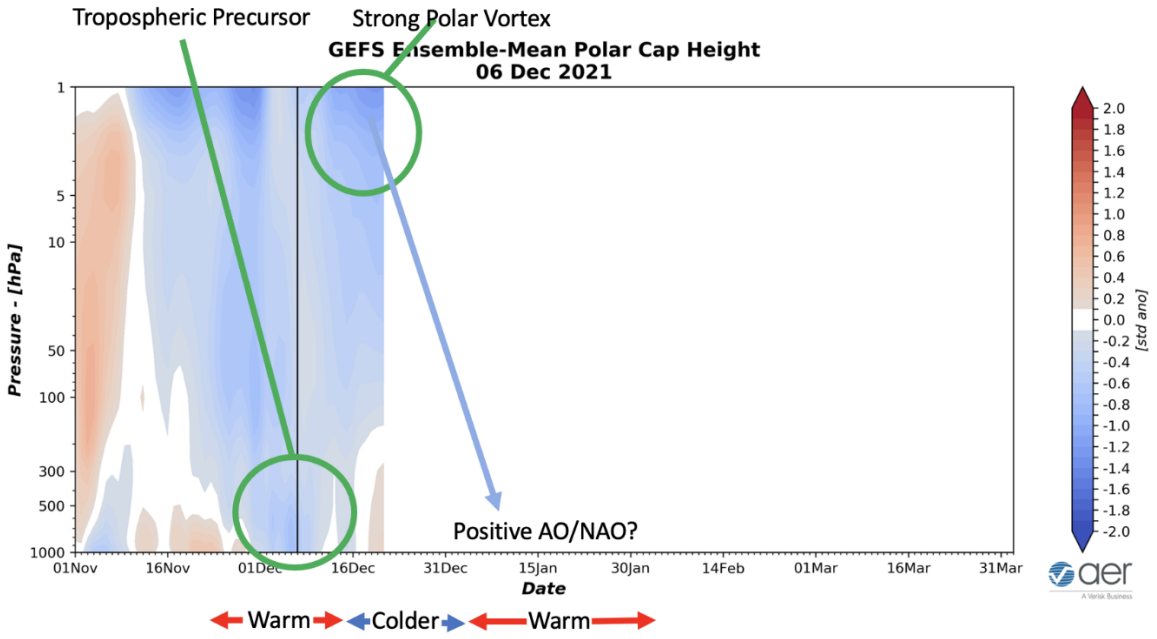

Figure ii. Observed and predicted daily polar cap height (i.e., area-averaged geopotential heights poleward of 60°N) standardized anomalies. The forecast is from the 00Z 6 December 2021 GFS ensemble. Also marked are three steps of troposphere-stratosphere-troposphere coupling with the final step hypothesized.

October Eurasian SCE was slightly above normal but certainly less than the recent average of the past 10 or 20 years and in addition the snow advance index was negative. But regardless, the Urals region was dominated by low pressure for the month

of November. In **Figure iii**, I show the plot of October Eurasian SCE regressed onto November sea level pressure (SLP), a favorite plot of mine and I have shown it many times before taken from Cohen et al. (2014). Regardless of October 2021 SCE, the observed November 2021 SLP anomalies look almost like the exact inverse of the SLP anomaly pattern favorable for disrupting the stratospheric PV with low pressure centered near the Urals and relative high pressure in the two ocean basins. Therefore, it is no surprise that the stratospheric PV is predicted to become anomalously strong by mid-month. Following the anomalously strong PV, often the atmospheric circulation anomalies descend to the surface in about two weeks' time culminating in a positive AO with low pressure coupled with cold temperatures in the Arctic ocean basin, high pressure across the mid-latitudes coupled with mild temperatures.

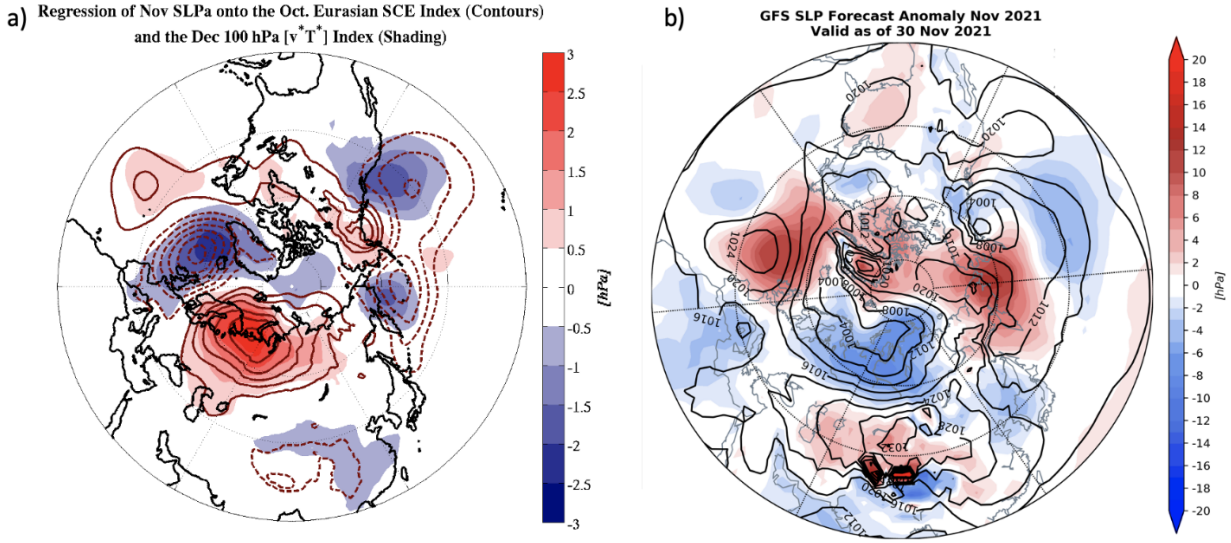

Figure iii. a) Regression of November SLP anomalies (hPa) onto October monthly-mean Eurasian SCE (contouring) and onto December meridional heat flux anomalies at 100 hPa, averaged between 40° and 80°N (shading). b) Observed November 2021 sea level pressure (contours) and anomalies (shading in hPa).

Now there are many different possible scenarios. One is that the stratosphere does not couple with the troposphere and the atmospheric circulation anomalies associated with the strong PV do not descend to the surface, there is no positive AO and no extended period of mild temperatures. Or alternatively the stratosphere does couple with the troposphere, but it is relatively short-lived.

I did look at historical winter PCHs and the observed and predicted PCHs for December 2021 is fairly unique over the past twenty years. To find similar cold PCHs in both the stratosphere and the troposphere in December you have to go back to the late 1980's and early 1990's a period famous for its lack of sudden stratospheric warmings (SSWs) in winter. Cold PCHs were observed every winter from 1988/89 through 1992/93, a period that I would prefer to forget. It was also observed in 1994/95 and then ended in

1999/2000. Since then, it happened in 2004/05, 2011/12 and maybe you can include 2015/16. Even in 2019/20 the cold PCHs didn't really become established until January. So a complete, mature and long-lived troposphere-stratosphere-troposphere coupling event that favors widespread relatively mild temperatures is far from certain but I think it is a non-trivial possibility, has reasonable precedent and should be monitored.

To be fair there is also a credible case to be made for a colder forecast. The return of high pressure to the Ural region is looking more impressive. The latest forecasts resemble **Figure iiia** that is favorable for disrupting the stratospheric PV. I am especially encouraged that Ural blocking is predicted to be coupled with more expansive cold temperatures across Asia (see **Figure 9**). Shorter term this could trigger a stretched polar vortex and a colder period for Canada and the US. This type of PV disruption is not predicted by the GFS ensembles but is showing up in the GFS operational run (see for example **Figure iv** but looks even better in the 12z GFS). Longer term this could lead to an SSW with cold temperatures more widespread across Europe and Asia and likely some parts of the US. But the earliest this would occur in my opinion is January and there are really no signs of this in any model just yet. Also, the NH mid-tropospheric circulation is clearly dominated by wave-3 and waves 1 and 2 would be preferable for initiating an SSW. In fact, our speculative polar vortex forecast model that has a clear weak bias with many false positives (predicting an SSW) does not predict an SSW through the first week of January. Just the opposite, it is predicting a spike in the strength of the PV right around the New Year, something I don't really recall it ever predicting. But if the Ural ridging/high pressure fades without triggering much of a PV disruption, then I do think the case for extended and widespread warmth becomes a lot stronger.

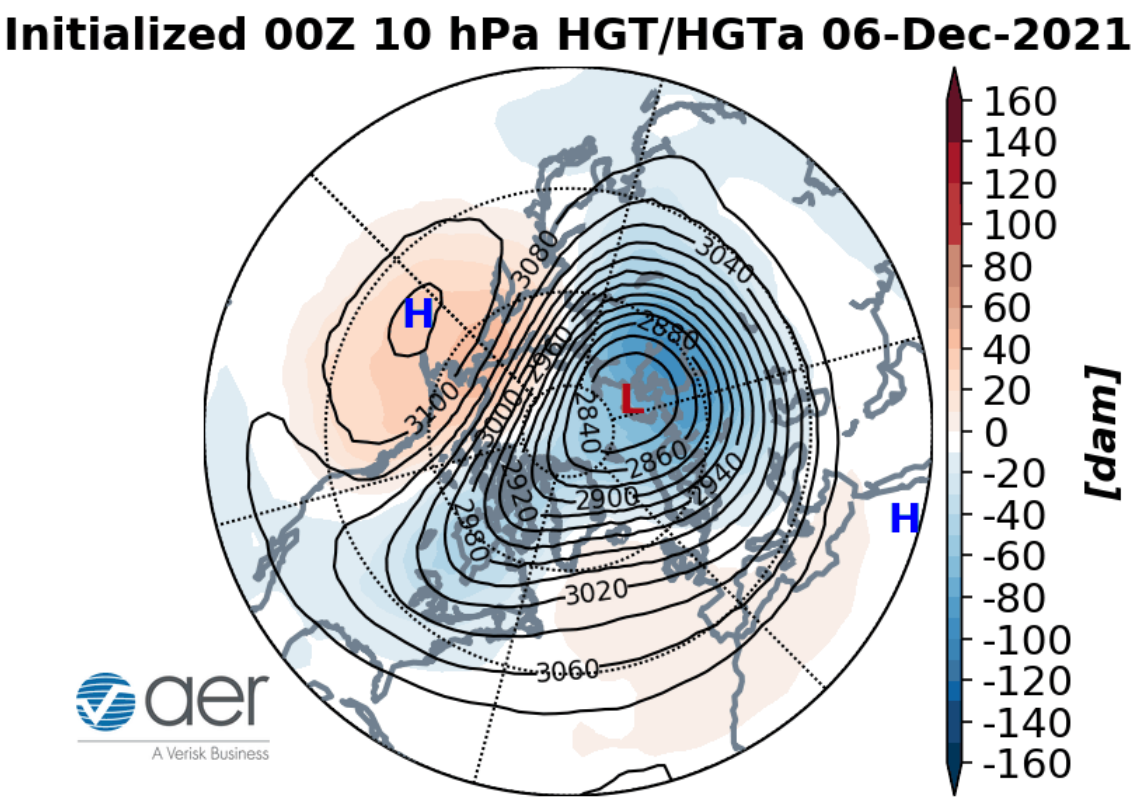

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Figure iv. Initialized 10 mb geopotential heights (dam; contours) and temperature anomalies (°C; shading) across the Northern Hemisphere for 6 December 2021. and predicted through the 22 December 2021. The forecasts are from the 00Z 6 December 2021 GFS operational model.

Finally, the Madden Julian Oscillation (MJO) is predicted by the models to enter phase seven the second half of December. MJO phase seven is associated with colder temperatures in the Eastern US. In fact, phase six which is the current phase of the MJO has been shown to force an SSW two weeks later (see Garfinkel et al. 2012). I see almost no chance of that happening and I will leave it to those that know more than me to make a forecast based on the MJO.

1-5 day

The AO is predicted to be positive this week **(Figure 1**) as geopotential height anomalies are predicted to be mostly negative across the Arctic with mixed geopotential height

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

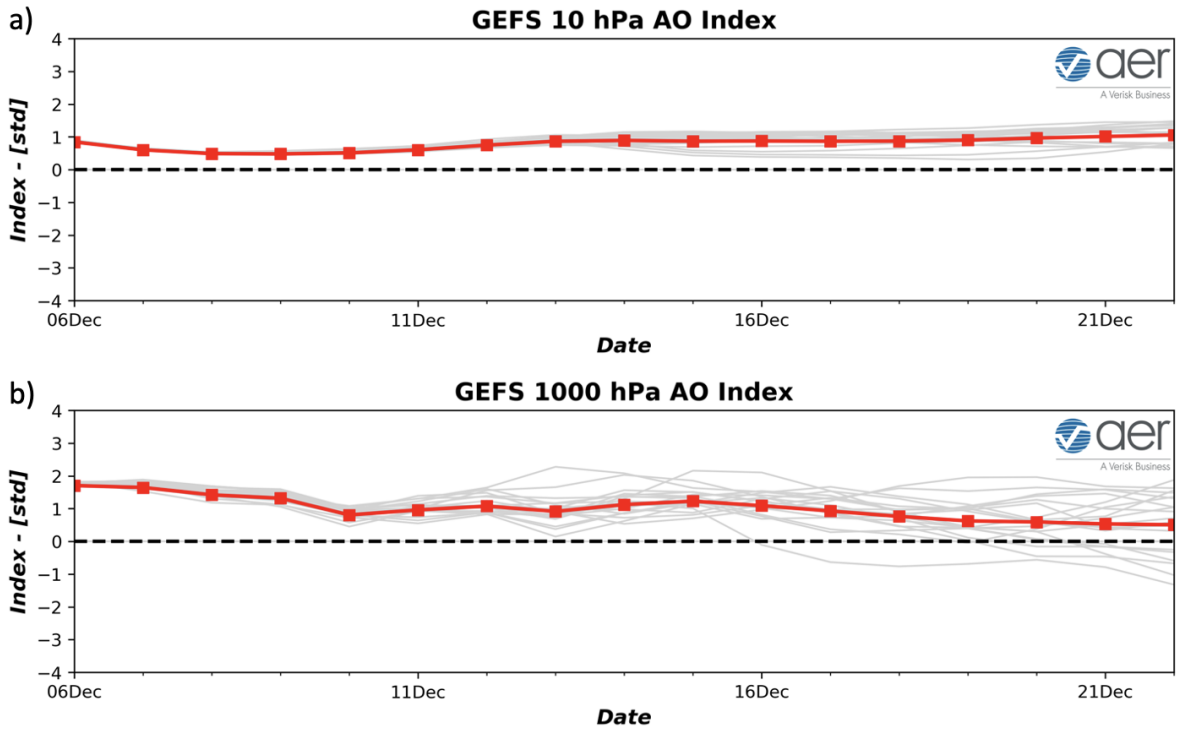

Figure 1. (a) The predicted daily-mean AO at 1000 hPa from the 00Z 6 December 2021 GFS ensemble. (b)The predicted daily-mean near-surface AO from the 00Z 6 December 2021 GFS ensemble. Gray lines indicate the AO index from each individual ensemble member, with the ensemble-mean AO index given by the red line with squares.

This week, ridging/negative geopotential height anomalies centered in the central North Pacific will partially force troughing/negative geopotential height anomalies across much of Europe including the UK this period (**Figures 2).** This will result in normal to below normal temperatures across much of Europe including the UK but especially Scandinavia **with** normal to above normal temperatures across Southwestern and Southeastern Europe closer to mid-tropospheric ridging (**Figure 3**). Ridging/negative geopotential height anomalies are predicted to strengthen near the Urals contributing to deepening troughing/negative geopotential height anomalies across Central Asia and much of Siberia with more ridging/negative geopotential height anomalies over much of Southern Asia this period (**Figure 2**). This pattern favors normal to above normal temperatures across much of Western and Southern Asia with normal to below normal temperatures across far Northern and Central Asia **(Figure 3**).

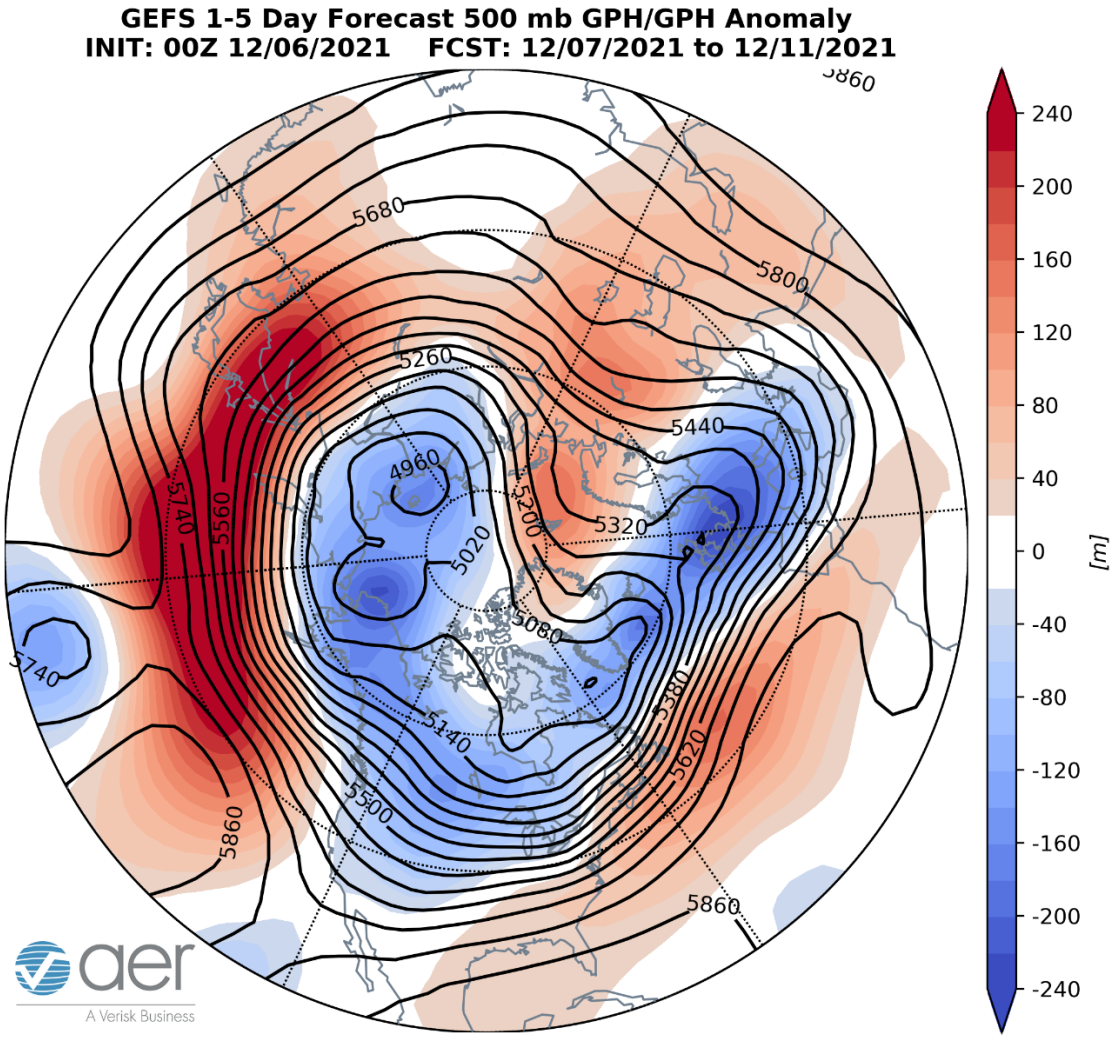

Figure 2. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 7 – 11 December 2021. The forecasts are from the 00z 6 December 2021 GFS ensemble.

The general pattern this week across North America is ridging/positive geopotential height anomalies just offshore of both the west and east coasts and extending into the Southeastern US with troughing/negative geopotential height anomalies across Alaska, much of Canada and the Western US **(Figure 2). T**his pattern is predicted to bring normal to below normal temperatures across Alaska, much of Canada and the Northern US with normal to above normal temperatures across the southern two thirds of the US **(Figure 3).**

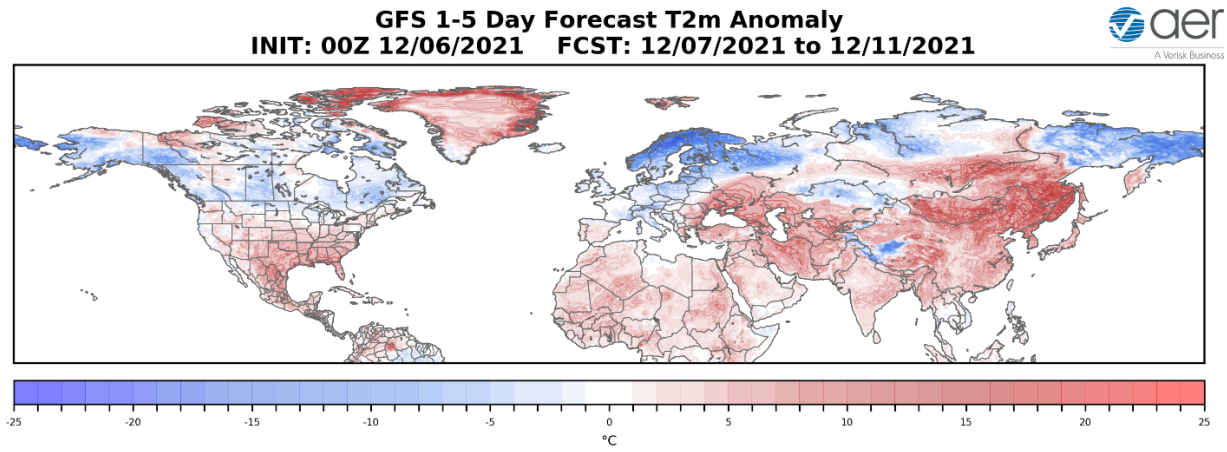

Figure 3. Forecasted surface temperature anomalies (°C; shading) from 7 – 11 December 2021. The forecast is from the 00Z 6 December 2021 GFS ensemble.

Troughing and/or cold temperatures are predicted to support new snowfall across Scandinavia, Central and higher elevations of Europe and Northern and Central Asia while mild temperatures promote snowmelt in Eastern Europe, Western and Eastern Asia (**Figure 4**). Troughing and/or cold temperatures are predicted to support new snowfall across Alaska, much of Canada and the Western and the Northeastern US while mild temperatures promote snowmelt in the southern Canadian and US Northern Plains, the Great Lakes and the Canadian Maritimes (**Figure 4**).

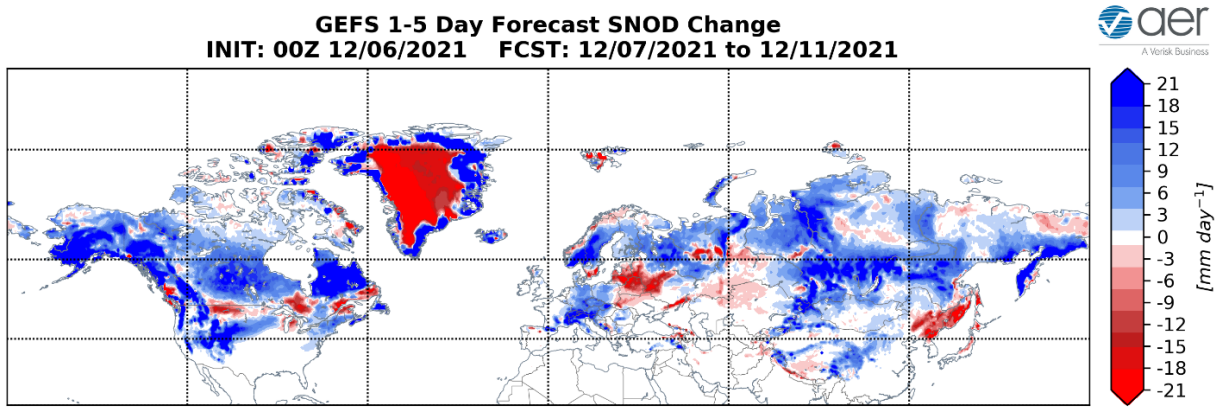

Figure 4. Forecasted snow depth changes (mm/day; shading) from 7 – 11 December 2021. The forecast is from the 00Z 6 December 2021 GFS ensemble.

Mid-Term

6-10 day

The AO is predicted to remain positive this period **(Figure 1**) as geopotential height anomalies remain mostly negative across the Arctic with mixed geopotential height anomalies across the mid-latitudes of the NH (**Figure 5**). And with geopotential height anomalies negative across Greenland (**Figure 5**), the NAO is predicted to also remain positive this period.

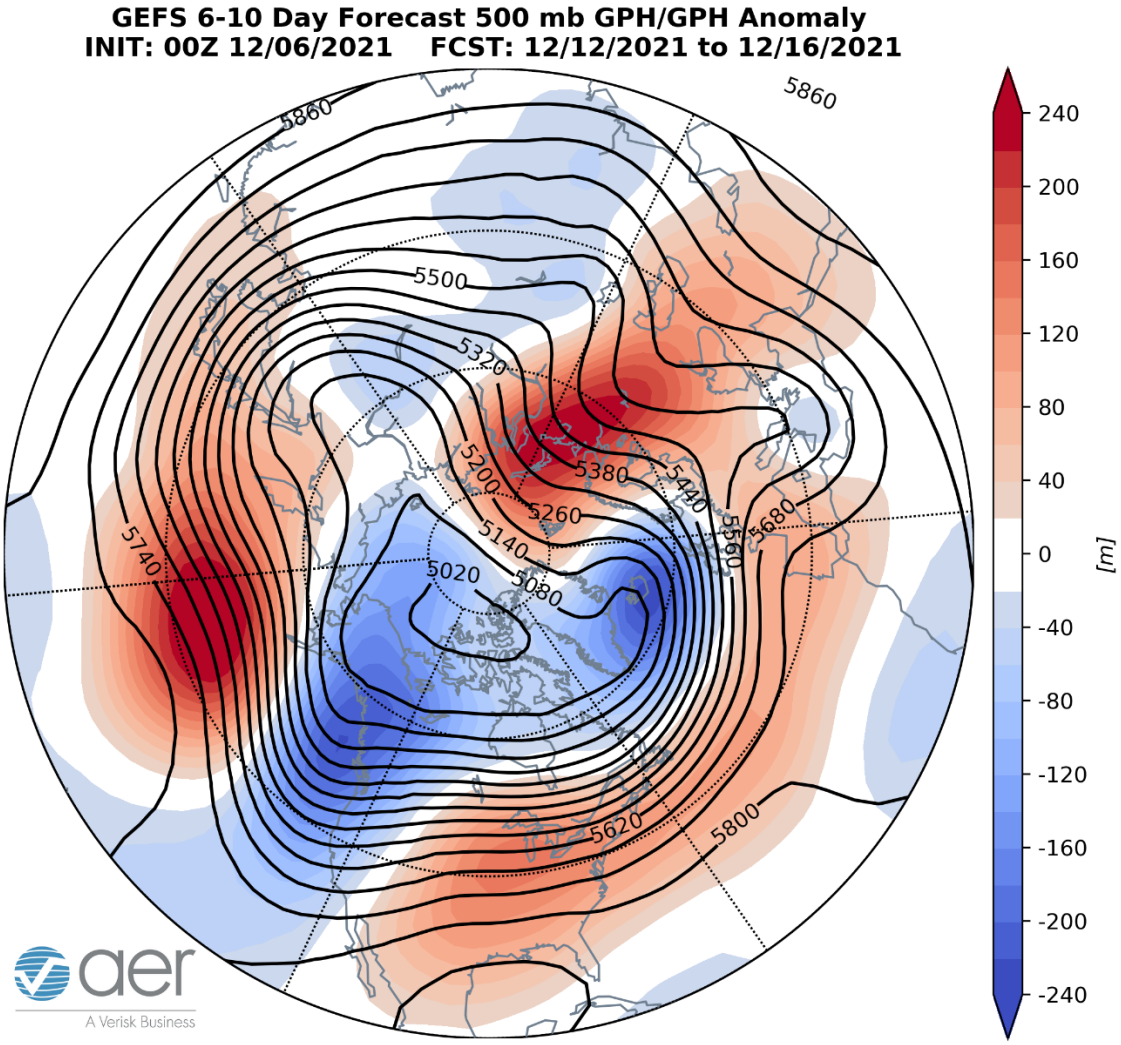

Figure 5. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 12 – 16 December 2021. The forecasts are from the 00z 6 December 2021 GFS ensemble.

Ridging/positive geopotential height anomalies previously in the central North Atlantic will begin to encroach on Europe this period with troughing/negative geopotential height anomalies limited to Northwestern Europe and in the Adriatic Sea (**Figures 5).** This will result in normal to below normal temperatures across far Northern Europe including Scotland and in and around Italy with normal to above normal temperatures across

most of Europe including England (**Figure 6**). Strengthening ridging/positive geopotential height anomalies in Western Asia will continue to contribute to deepening troughing/negative geopotential height anomalies Across Central and Eastern Asia with more ridging/positive geopotential height anomalies in Southeast Asia (**Figure 5**). This pattern favors normal to above normal temperatures across Western, Southern and Eastern Asia with normal to below normal temperatures across much of Northern Asia and parts of Central Asia **(Figure 6**).

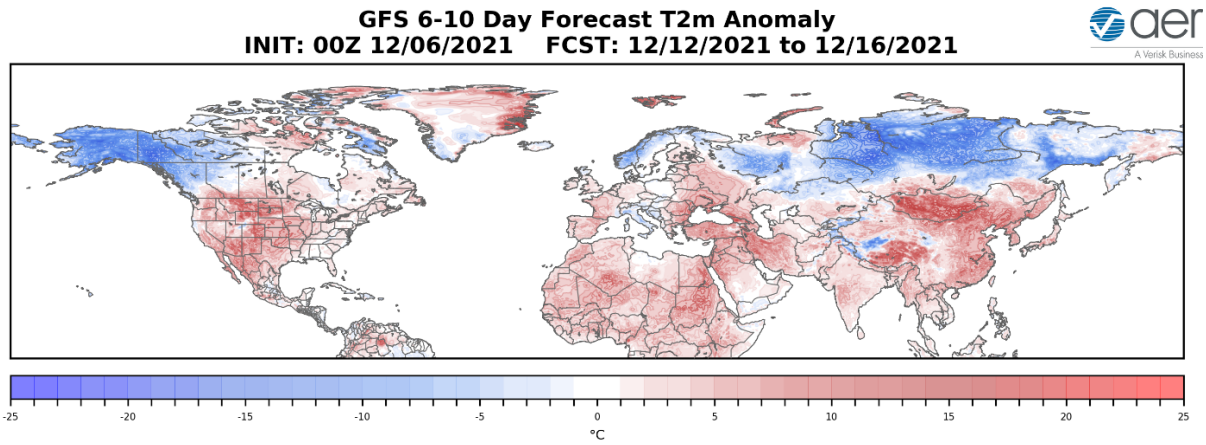

Figure 6. Forecasted surface temperature anomalies (°C; shading) from 12 – 16 December 2021. The forecasts are from the 00Z 6 December 2021 GFS ensemble.

Strengthening ridging/positive geopotential height anomalies between the Dateline and the Aleutians will contribute to deepening troughing/negative geopotential height anomalies in western North America with strengthening ridging/positive geopotential height anomalies across the US east of the Rockies centered near the Great Lakes this period **(Figure 5).** This will favor normal to below normal temperatures across Alaska much of Western Canada with normal to above normal temperatures in Southwestern, Central and Eastern Canada and much of the US **(Figure 6).**

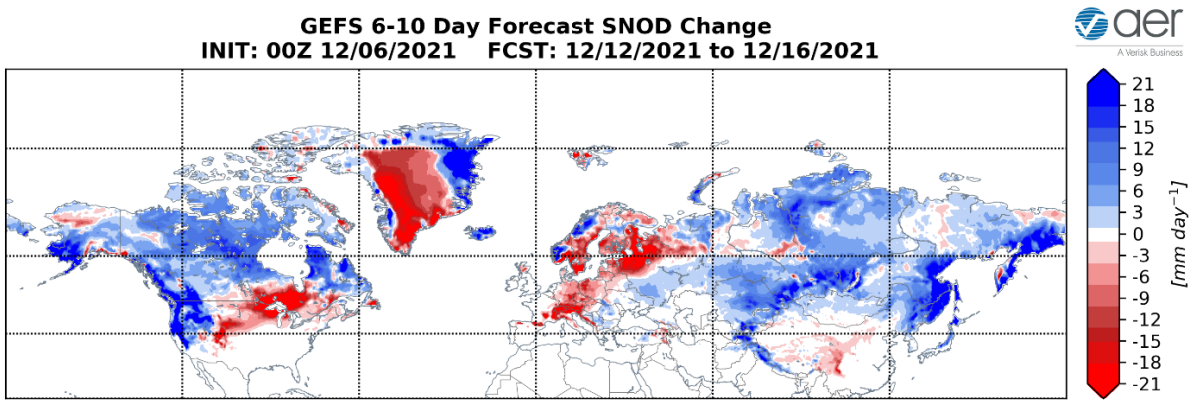

Figure 7. Forecasted snow depth changes (mm/day; shading) from 12 – 16 December 2021. The forecast is from the 00Z 6 December 2021 GFS ensemble.

Troughing and/or cold temperatures are predicted to support new snowfall across Norway, the Alps, Northern and Central Asia and the Tibetan Plateau while milder temperatures promote snowmelt across Central and Northern Europe (**Figure 7**). Troughing and/or cold temperatures are predicted to support new snowfall across Alaska, Western and Northern Canada and the Western US while milder temperatures promote snowmelt across the Central US and Southcentral Canada (**Figure 7**).

11-15 day

With mostly negative geopotential height anomalies predicted to persist across the Arctic and mixed geopotential height anomalies across the mid-latitudes of the NH (**Figure 8**), the AO should remain positive this period (**Figure 1**). With predicted negative pressure/geopotential height anomalies across Greenland (**Figure 8**), the NAO is forecasted to remain positive this period as well.

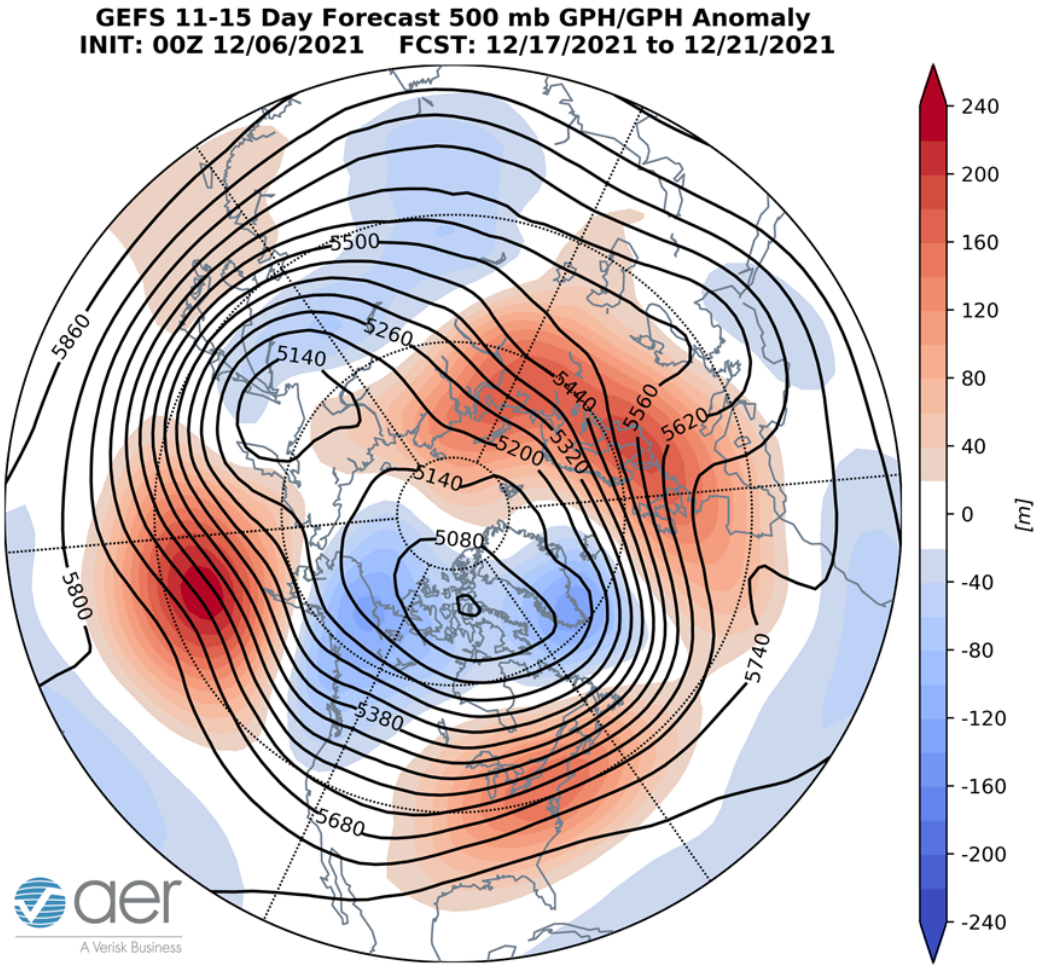

Figure 8. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 17 – 21 December 2021. The forecasts are from the 00z 6 December 2021 GFS ensemble.

Ridging/positive geopotential height anomalies are predicted to strengthen across Europe with troughing/negative geopotential height anomalies limited to Southeastern Europe this period (**Figure 8**). This pattern favors more widespread normal to above normal temperatures across much of Europe including the UK with normal to below normal temperatures limited to Southeastern Europe this period (**Figures 9**). Persistent ridging/positive geopotential height anomalies in Western Asia will continue to support troughing/negative geopotential height anomalies across most of Central and East Asia this period (**Figure 8**). This pattern favors widespread normal to above normal temperatures across much of Western and Southern Asia with normal to below normal temperatures across Central and Northern Asia this period (**Figure 9**).

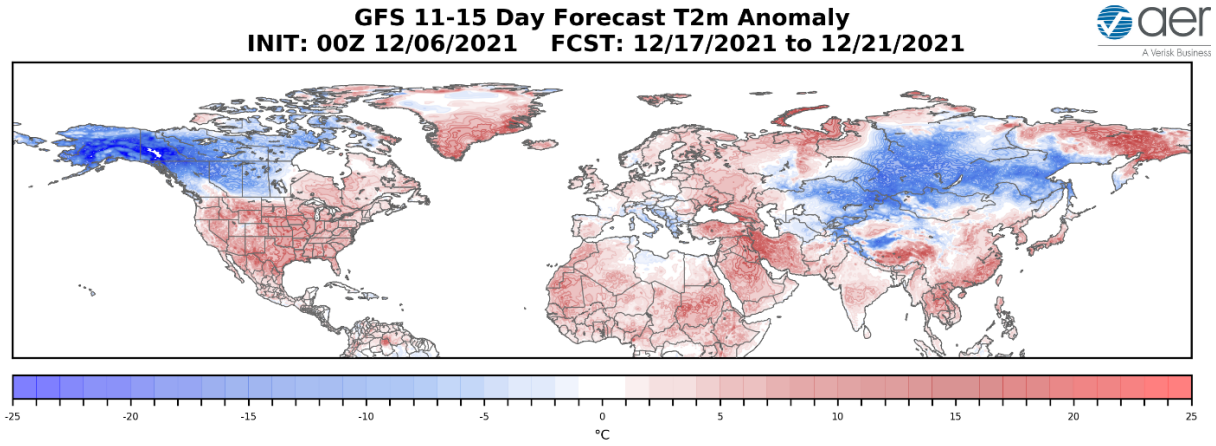

Figure 9. Forecasted surface temperature anomalies (°C; shading) from 17 – 21 December 2021. The forecasts are from the 00z 6 December 2021 GFS ensemble.

Persistent ridging/positive geopotential height anomalies between the Dateline and the Aleutians will anchor troughing/negative geopotential height anomalies in western North America with strengthening ridging/positive geopotential height anomalies across the US east of the Rockies and centered in the Northeast this period (**Figure 8**). This pattern favors normal to below normal temperatures widespread across Alaska and Western Canada with normal to above normal temperatures in Eastern Canada and much of the US (**Figure 9**). Temperatures east of the Rockies could be well above normal this period.

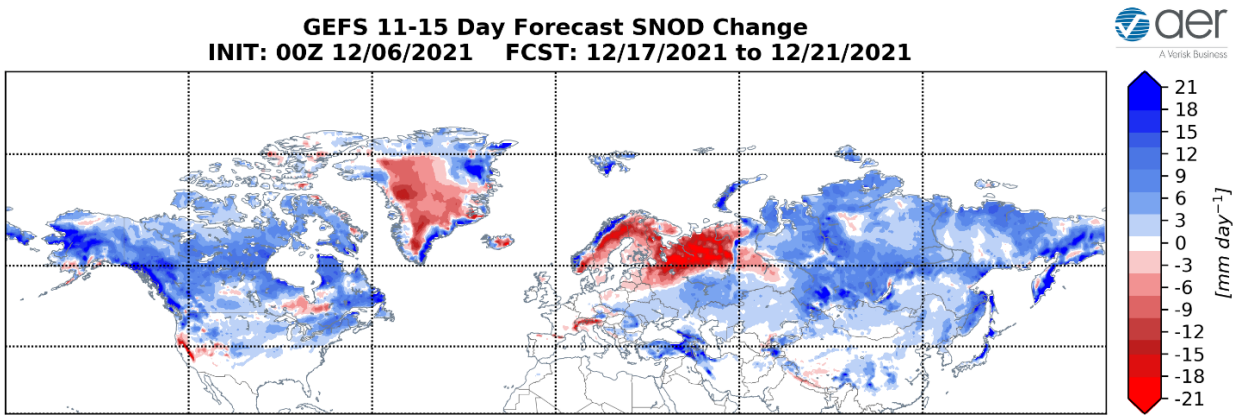

Figure 10. Forecasted snow depth changes (mm/day; shading) from 17 – 21 December 2021. The forecast is from the 00Z 6 December 2021 GFS ensemble.

Troughing and/or cold temperatures are predicted to support possible new snowfall across Southeastern Europe including Turkey and much of Northern and Central Asia while milder temperatures promote snowmelt across the Alps, Northeastern Europe and Northwestern Russia (**Figure 10**). Troughing and/or cold temperatures are predicted to support possible new snowfall across Alaska, much of Canada and the Northern US while milder temperatures promote snowmelt in California and across the Southwestern US (**Figure 10**).

Longer Term

30–day

The latest plot of the polar cap geopotential height anomalies (PCHs) currently shows normal to cold/negative PCHs throughout the stratosphere and troposphere (**Figure 11**). The largest negative departures are currently in the lower troposphere, as a region of deeper cold/negative PCHs in the stratosphere propagated down from the mid-stratosphere to the surface (**Figure 11**). This is the first stratosphere-troposphere coupling event in a while and certainly the first of winter 2021/22 but likely not the last. Starting mid-month the stratosphere and troposphere are predicted to decouple with deepening cold/negative PCHs in the stratosphere while PCHs turn warm/positive in the troposphere (**Figure 11**).

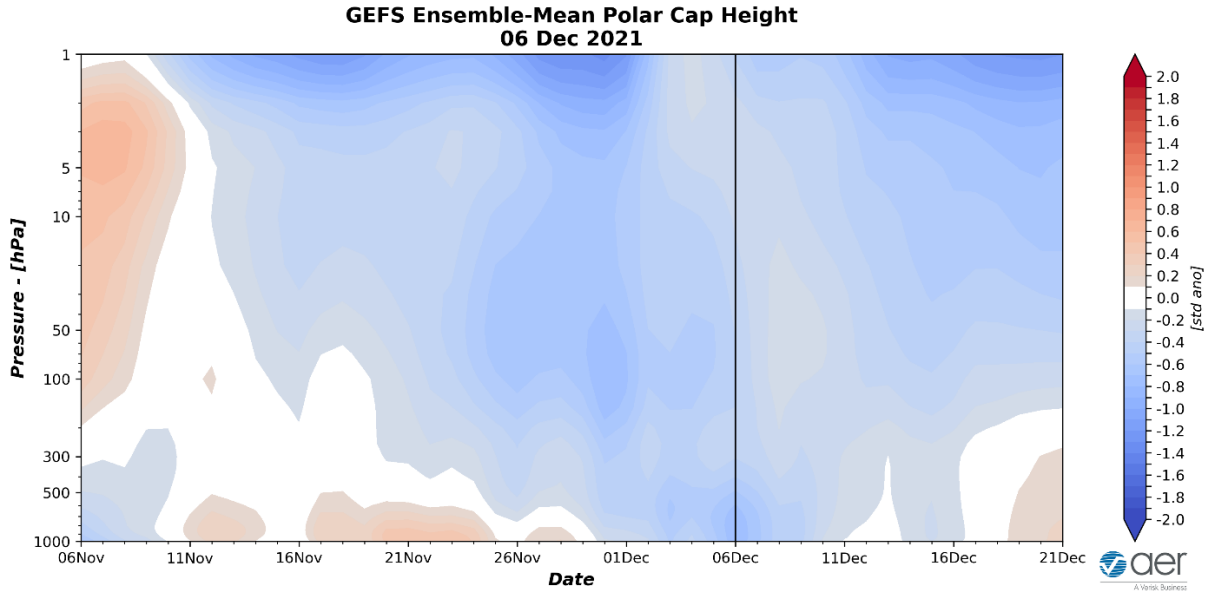

Figure 11. Observed and predicted daily polar cap height (i.e., area-averaged geopotential heights poleward of 60°N) standardized anomalies. The forecast is from the 00Z 6 December 2021 GFS ensemble.

The below normal PCHs in the lower tropospheric are consistent with the predicted positive surface AO the next two weeks (**Figure 1**). A fully coupled strong stratospheric polar vortex and positive surface AO is a favorable environment for widespread mild temperatures in the Eastern US, Northern Europe and Northern Asia. There are some exceptions but overall, December is looking mild in many regions.

The vertical Wave Activity Flux (WAFz) from the troposphere to the stratosphere or poleward heat transport in the stratosphere is predicted to turn active after being below normal for much of November (**Figure 12**). WAFz is predicted to become more active in early December with the onset of Ural ridging (**Figure 12**). However, the relatively weak WAFz anomalies have allowed the polar vortex to strengthen, and the PV should remain strong for much of the month. Though of note the GS operational model is suggestive of a stretched polar vortex, so something to watch.

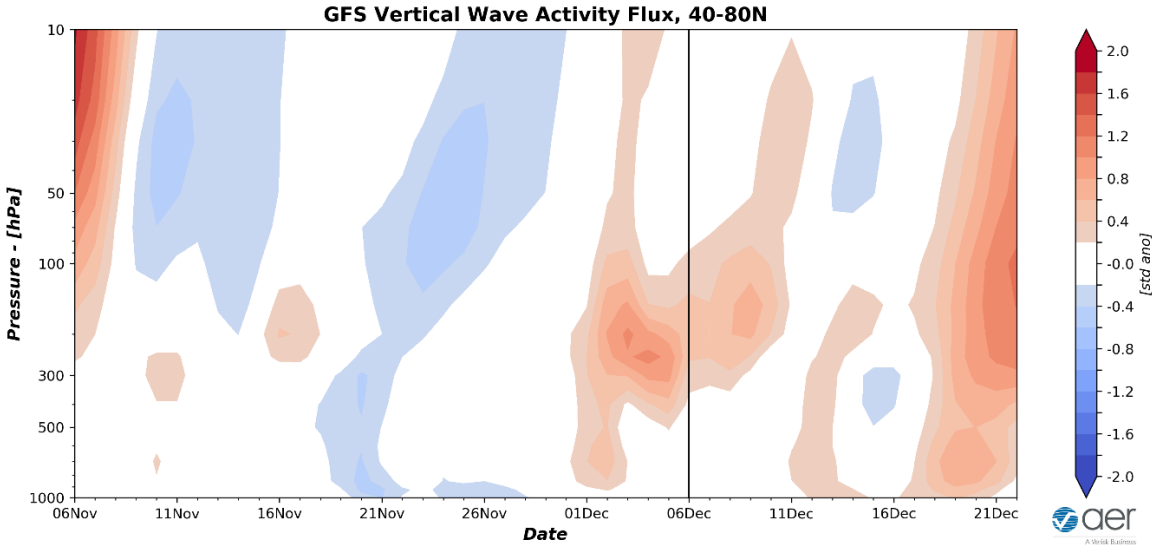

Figure 12. Observed and predicted daily vertical component of the wave activity flux (WAFz) standardized anomalies, averaged poleward of 40-80°N. The forecast is from the 00Z 6 December2021 GFS ensemble.

The recent uptick in WAFz has perturbed the stratospheric PV the PV displaced towards Eurasian and centered over the Barents-Kara Seas with ridging and polar stratospheric warming near Alaska and Northwestern Canada (**Figure 13**). However, the perturbation is relatively minor and the PV is relatively strong resulting in a current positive stratospheric AO (**Figure 11**). In the near term the active WAFz is predicted to be minor allowing for the PV to remain relatively strong PV and centered near the North Pole once again by mid-December (**Figure 13**) with a persistent positive stratospheric AO the next two weeks (**Figure 11**).

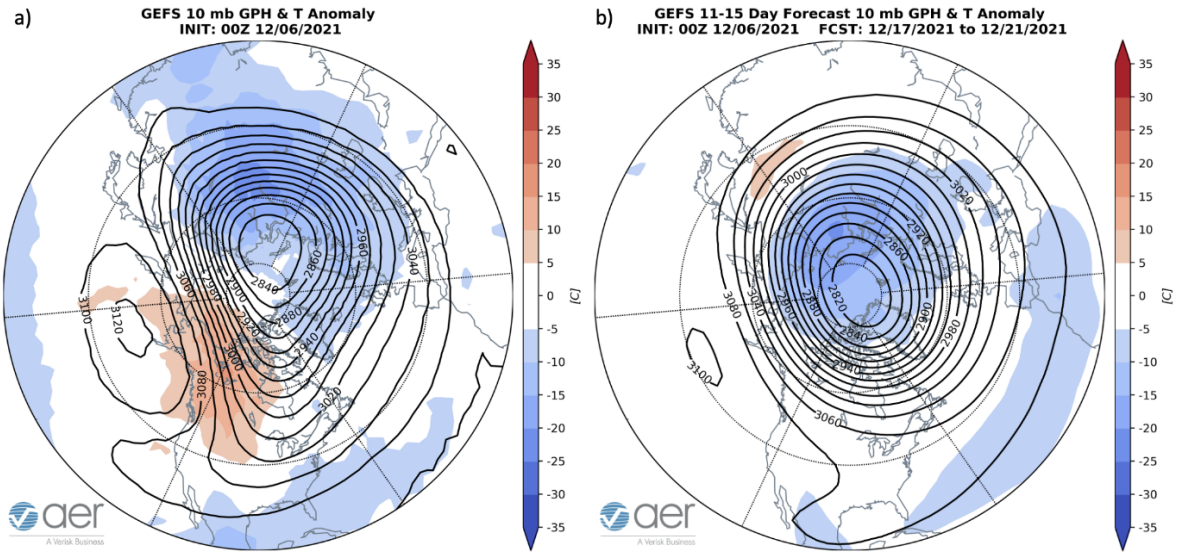

Figure 13. (a) Initialized 10 mb geopotential heights (dam; contours) and temperature anomalies (°C; shading) across the Northern Hemisphere for 6 December 2021. (b) Same as (a) except forecasted averaged from 17 – 21 December 2021. The forecasts are from the 00Z 6 December 2021 GFS model ensemble.

However longer term the more active WAFz could begin to disrupt the stratospheric PV. With the predicted return of Ural blocking further disruption of the PV is possible and is this is something that I am following closely.

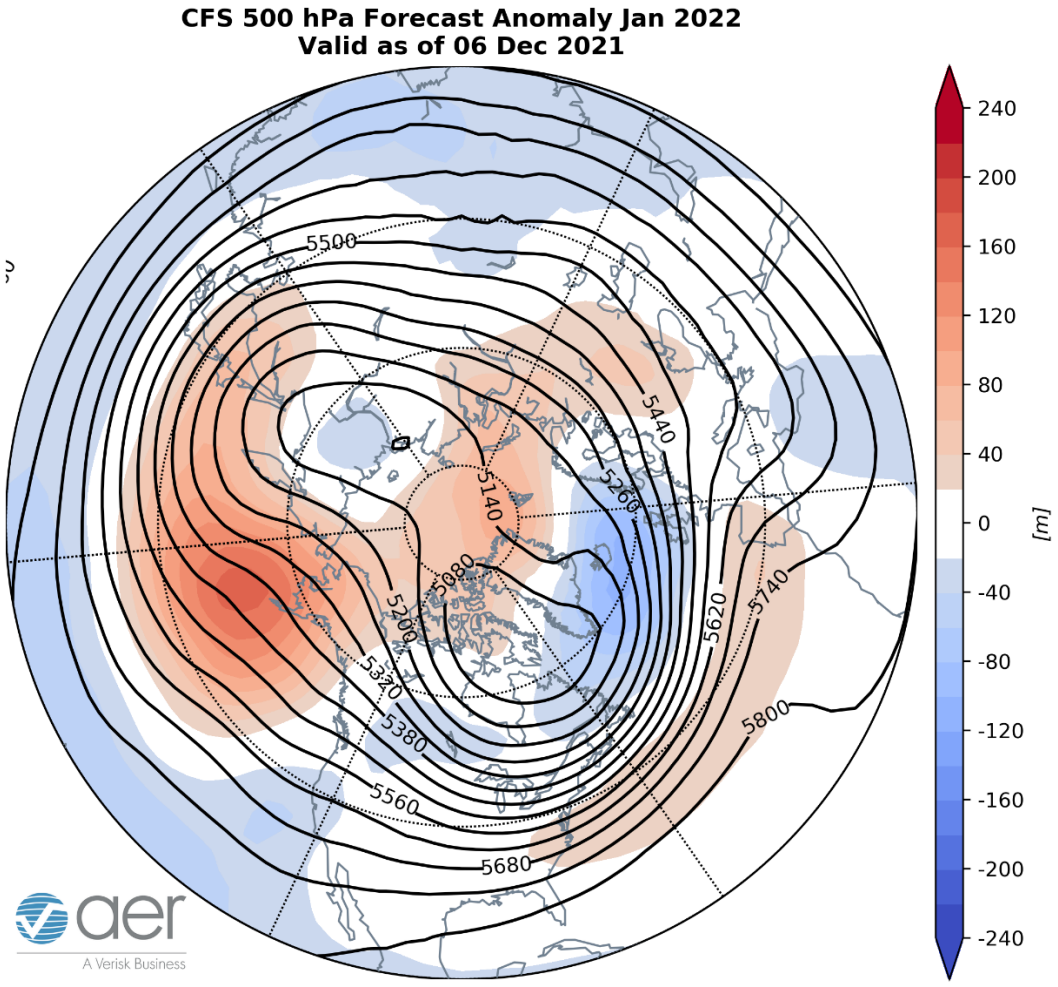

Figure 14. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere for January 2022. The forecasts are from the 00Z 6 December 2021 CFS.

I include in this week's blog the monthly 500 hPa geopotential heights (**Figure 14**) and surface temperatures for January (**Figure 15**) from the Climate Forecast System (CFS; the plots represent yesterday's four ensemble members). The forecast for the troposphere is ridging centered the Urals and Barents-Kara Seas region, centered

between the Dateline and the Aleutians extending into the Central Arctic with troughing across Iceland and Northwestern Europe, Eastern Asia, Eastern Canada and the Great Lakes (**Figure 14).** This pattern favors seasonable to relatively warm temperatures widespread across Eastern Europe, Western and Southern Asia, Alaska, Northwestern Canada and the Western and Southern US with seasonable to relatively cold temperatures across Western Europe, East Asia, Central and Eastern Canada and the Northeastern US (**Figure 15**).

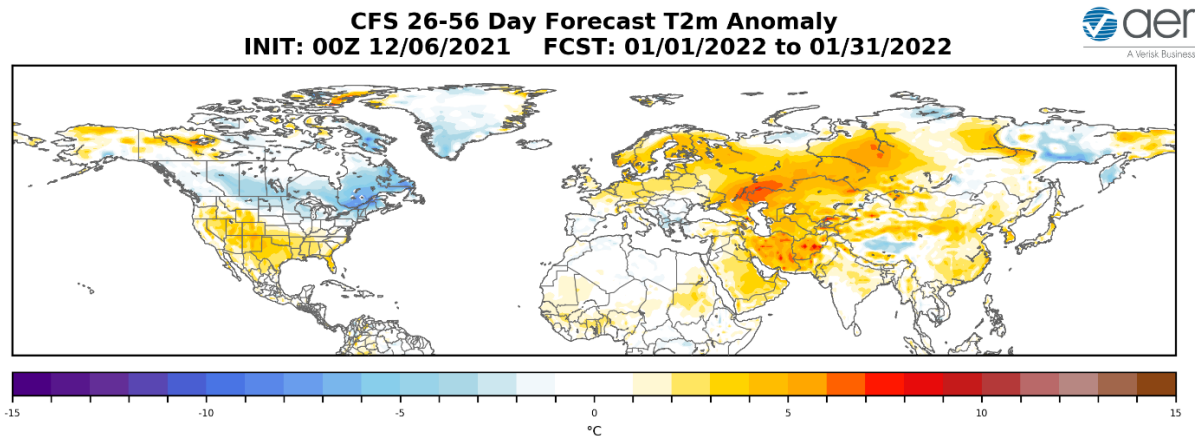

Figure 15. Forecasted average surface temperature anomalies (°C; shading) across the Northern Hemisphere for January 2022. The forecasts are from the 00Z 6 December 2021 CFS.

Surface Boundary Conditions

Arctic Sea ice

Arctic sea ice is growing but remains below normal east of Greenland but especially in Baffin Bay and Hudson Bay. In the Barents-Kara Seas extent is getting closer to normal. Sea ice is above normal in the Bering Sea. Below normal sea ice in the Barents-Kara seas favors cold temperatures in Central and East Asia, while below normal sea ice in Baffin Bay favors cold temperatures in the Eastern Europe and Northern Europe however this topic remains controversial. Recent research has shown that the regional anomalies that are most highly correlated with the strength of the stratospheric PV are across the Barents-Kara seas region where low Arctic sea ice favors a weaker winter PV. Low sea ice in the Chukchi, Beaufort and Bering seas may favor colder temperatures across North America but has not been shown to weaken the PV.

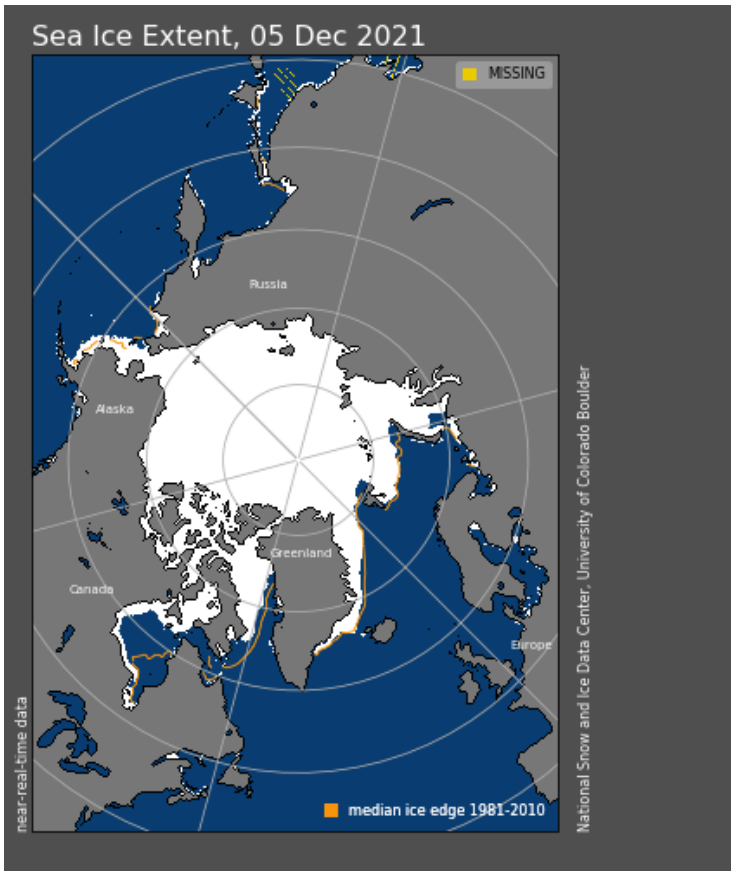

Figure 16. Observed Arctic sea ice extent on 5 December 2021 (white). Orange line shows climatological extent of sea ice based on the years 1981-2010. Image from the National Snow and Ice Data Center (NSIDC).

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 winter. 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 North Pacific. Not my expertise but the SST pattern in the North Pacific are strongly resembling a negative Pacific Decadal Oscillation (PDO) pattern that favors colder temperatures across northwestern North America and milder temperatures across southeastern North America.

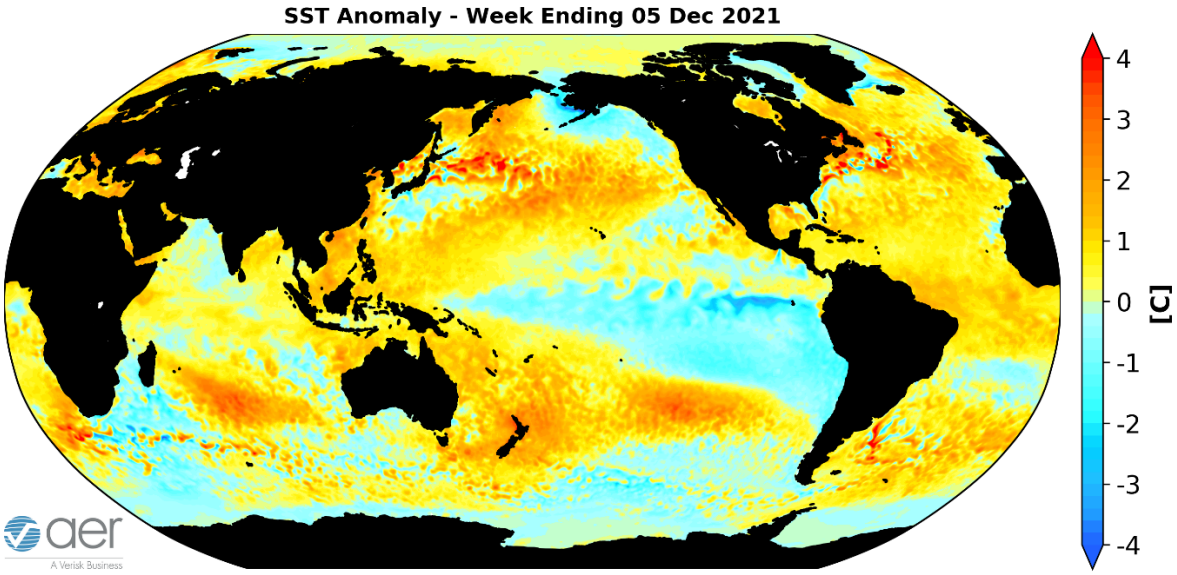

Figure 17. The latest weekly-mean global SST anomalies (ending 5 December 2021). Data from NOAA OI High-Resolution dataset.

Currently the Madden Julian Oscillation (MJO) is in phase six (**Figure 18**). The forecasts are for the MJO to transition into phase seven in mid-December. MJO phases six and seven favor high latitude blocking including Alaska with transitioning ridges and troughs in the US. However, phase six favors initially ridging and warm temperatures in the Eastern US and phase seven favors troughing and cold temperatures in the Eastern US. The warm forecast is consistent with MJO forcing the next two weeks but admittedly this is outside of my expertise.

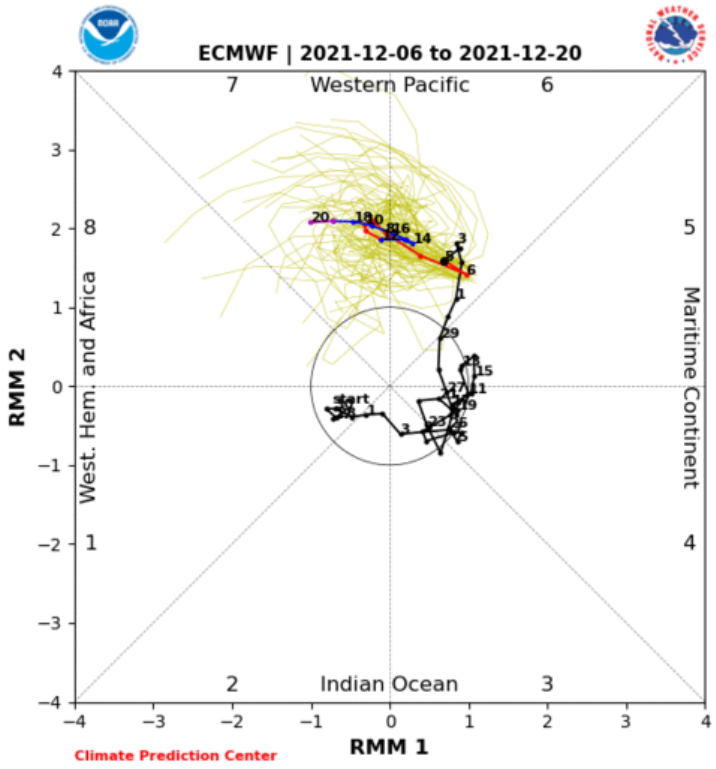

Figure 18. Past and forecast values of the MJO index. Forecast values from the 00Z 6 December 2021 ECMWF model. Yellow lines indicate individual ensemble-member forecasts, with the green line showing the ensemble-mean. A measure of the model "spread" is denoted by the gray shading. Sector numbers indicate 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

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!