Arctic Oscillation and Polar Vortex Analysis and Forecasts

March 7, 2022

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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Summary

- The Arctic Oscillation (AO) is currently positive and is predicted to remain neutral to positive through late-March with mixed to mostly negative pressure/geopotential height anomalies across the Arctic especially the North Atlantic side of the Arctic and mixed pressure/geopotential height anomalies across the mid-latitudes. The North Atlantic Oscillation (NAO) is also positive and is predicted to remain positive as pressure/geopotential height anomalies are predicted to remain negative across Greenland the next two weeks.
- The next two weeks, troughing/negative geopotential height anomalies across Greenland will favor ridging/positive geopotential height anomalies centered over the Scandinavia/Baltic States forcing downstream troughing/negative geopotential height anomalies over Southeastern Europe. This pattern favors normal to above normal temperatures across much of Europe including the United Kingdom (UK) with normal to below normal temperatures across the Southeastern Europe and Turkey.
- The dominant pattern across Asia the next two weeks is likely related to the predicted polar vortex (PV) disruption with the main PV centered over Western Siberia. In the troposphere this will result in troughing/negative geopotential

height anomalies centered in Western Siberia and extending southwestwards across Western Asia with strengthening ridging/positive geopotential height anomalies across East Asia. This favors normal to below normal temperatures first in Western Siberia and then spreading southwards across Western Asia with normal to below normal temperatures across East Asia.

- The general pattern across North America the next two weeks is ridging/positive geopotential height anomalies in the Gulf of Alaska and Alaska anchoring troughing/negative geopotential height anomalies across Eastern Canada that extend southwestward into the Western United States (US) with more ridging/positive geopotential height anomalies in the Eastern US except for next week when the troughing/negative geopotential height anomalies will temporarily swing into the Eastern US with ridging/positive geopotential height anomalies in the Western US. This pattern mostly favors normal to above normal temperatures in Alaska, Western Canada and the Western US with normal to below normal temperatures across Central and Eastern Canada and the Western US. The exception will be next week when normal to below normal temperatures slide into the Eastern US while ridging briefly returns with normal to above normal temperatures to the Western US.
- In the *Impacts* section I continue to discuss my expectations of more polar vortex (PV) disruptions. Looking like the last stretched PV is winding down with the next prediction likely a more classical sudden stratospheric warming (SSW) and the related weather of the Northern Hemisphere (NH) through late-March.

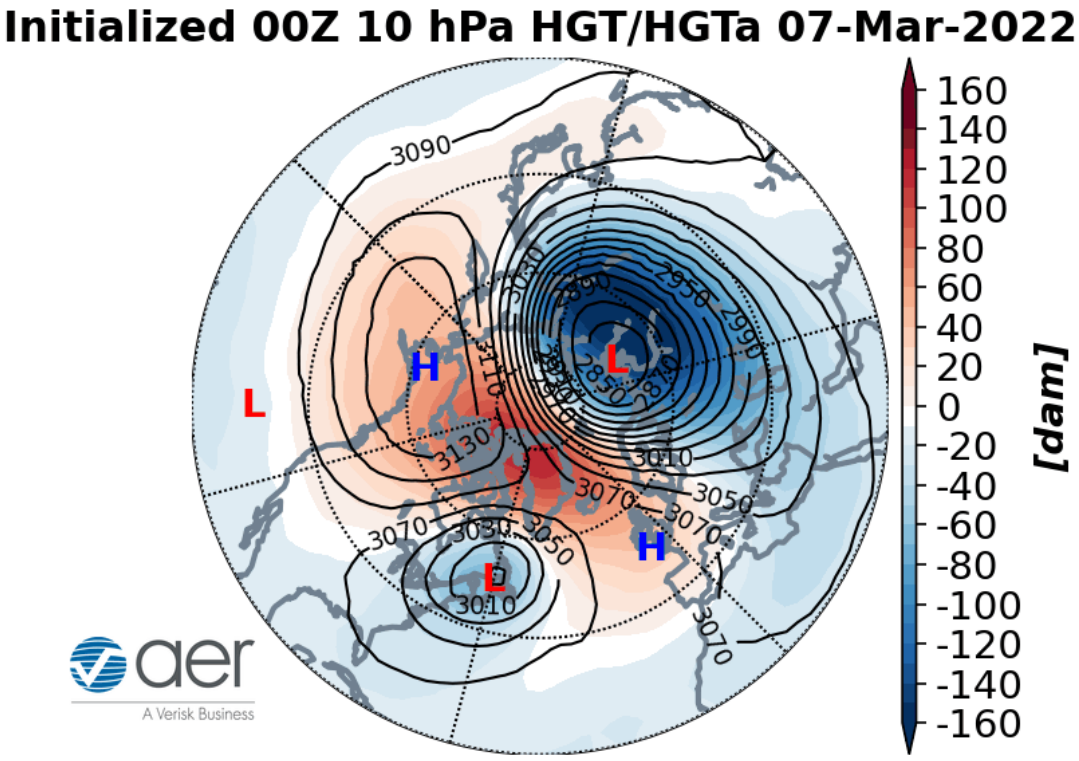
Plain Language Summary

Looks like one last stretching or elongation of the polar vortex in the first week of March that delivers cold into the Central and eventually Eastern US and parts of Western Asia and Eastern Europe. The next polar vortex disruption looks to be of a different nature that of a larger disruption known as a sudden stratospheric warming. Lots of uncertainty to the weather impacts as weather models struggle.

Impacts

It looks more and more likely to like to me (and admittedly it is subjective) that the PV stretching events will likely end at number six and may not make it to seven this winter as I previously thought. As you can see in **Figure 12** the strongest pulse of vertical Wave Activity Flux (WAFz) from the troposphere to the stratosphere or poleward heat transport in the stratosphere of the winter so far is now winding down (see **Figure 12**). This has resulted in the largest stratospheric PV disruption of the winter (see **Figure 1** resulting in the first negative stratospheric AO of the winter) and for the first time all winter, warm/positive polar cap geopotential height anomalies (PCHs) are observed in the stratosphere (see **Figure 11**).

As seen from the latest PV animation in **Figure i**, there is a very distinct PV split this week with the major PV center centered over Western Siberia and a minor PV center over Labrador. Though it might appear like a large PV disruption since the PV splits into two daughter vortices, as I discussed in last week's blog wave reflection is observed with this PV disruption and therefore has much in common with all PV disruptions so far this winter, though some important differences as discussed below.



Click for Loop

Figure i. Initialized 10 mb geopotential heights (dam; contours) and temperature anomalies (°C; shading) across the Northern Hemisphere for 7 March 2022 and forecasted from 8 – 23 March 2022. The forecasts are from the 00Z 7 March 2022 GFS operational model.

Our energy diagnostics show wave energy reflection currently in the stratosphere with upward WAF over Siberia (90-180°W) and downward over Canada (210-270°W) as seen in **Figure ii**. This is resulting in widespread cold temperatures across North America (see **Figure 3**). However, because this PV stretch is the strongest of the winter with the PV actually splitting into two pieces, its impacts are more widespread across Eurasia

than previous stretched PV events. With the major PV center over Western Siberia, the counterclockwise flow around the major PV center is inducing northerly flow across Western Asia and Eastern Europe bringing with it relatively cold temperatures (see also **Figure 3**).

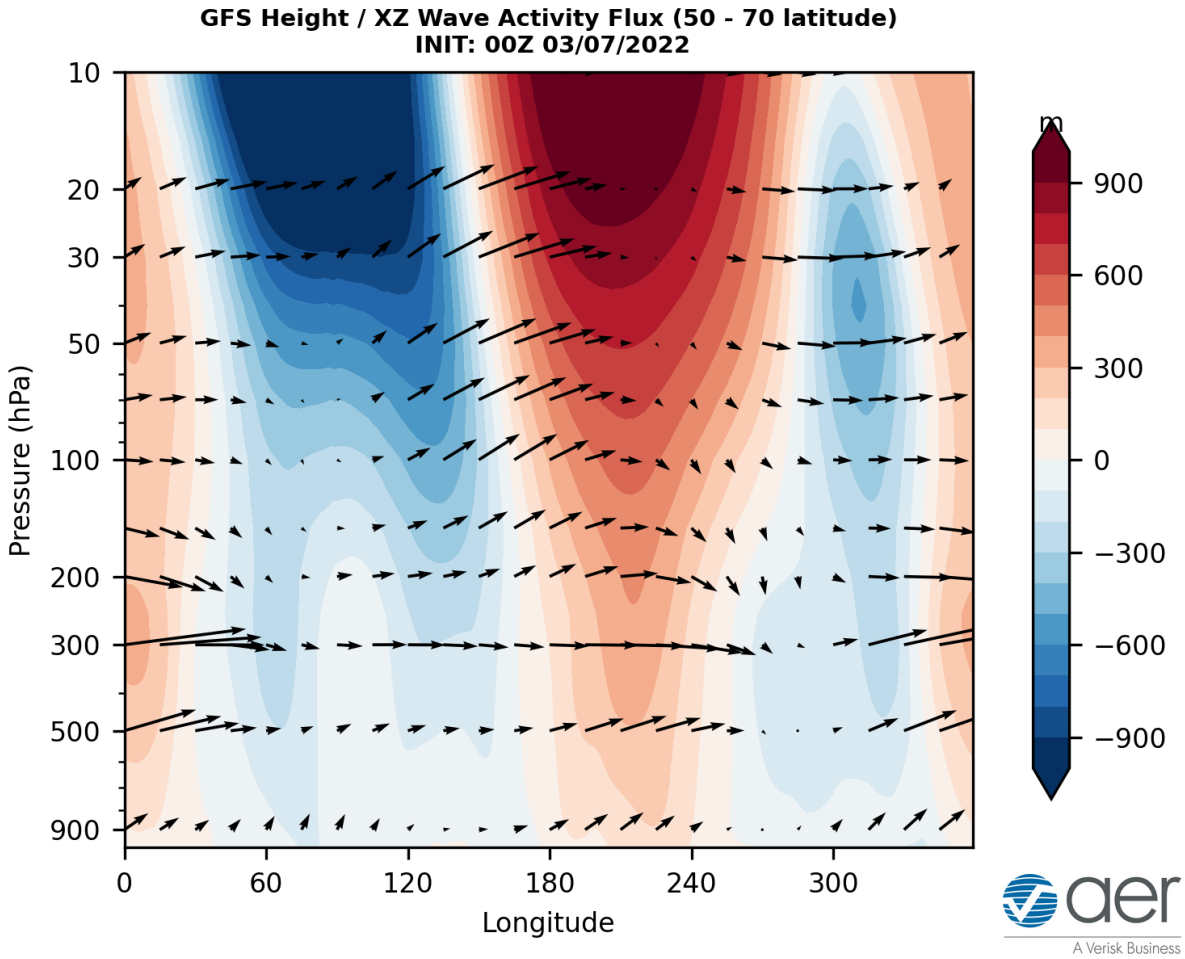


Figure ii. Longitude-height cross section of geopotential eddy height anomalies and wave activity flux vectors and wave activity flux vectors in the longitudinal and height directions from the surface through 10-hPa initialized for 7 March 2022. The forecast is from the 00Z 7 March 2022 operational GFS.

Looking at the same energy diagnostic for the third week of March there are important differences (see **Figure iii**). The WAF remains upward over Northern Asia (60-180°W) but unlike all previous charts that I showed with downward WAF over Canada this winter, the WAF over Canada and into the North Atlantic is upward (270-360°W). This forecast, if correct, will lead to the largest polar stratospheric warming of the winter with ridging and warming predicted for the entire Eastern Hemisphere in the polar stratosphere (see **Figure iii**). Furthermore, looking at the PV animation towards the end of the forecast period, the GFS is predicting widespread warming in the polar

stratosphere across the entire Eastern Hemisphere with a center of high pressure over Greenland. Certainly, based on the GFS forecast this PV disruption looks more akin to a classical sudden stratospheric warming. Forecast plots in **Figures i** and **iii** are from the operational GFS forecast and are not as reliable as the ensemble forecasts. **Figure 13b** from the GFS ensembles is not nearly as dramatic in the polar stratosphere with no indications of a Greenland high in the polar stratosphere. Whether the Greenland high actually forms, I believe could have important weather impacts.

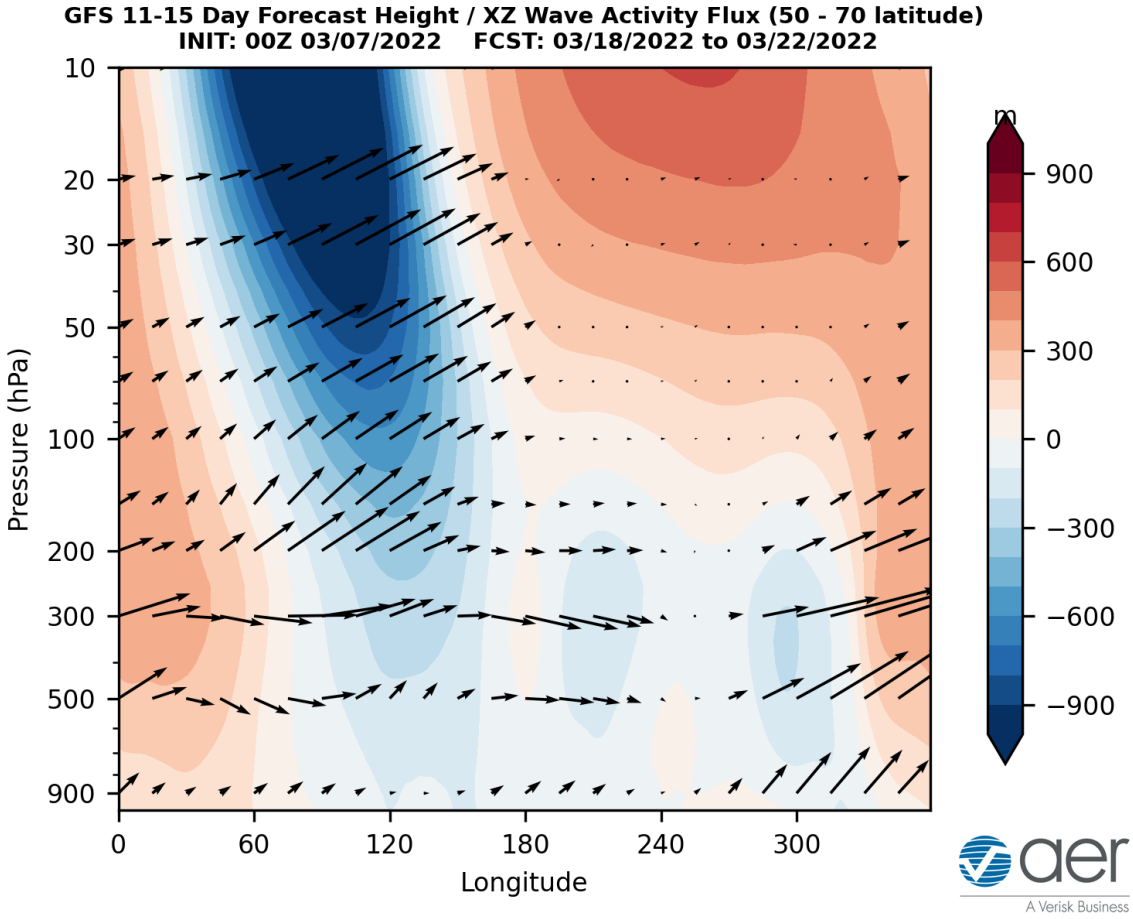


Figure iii. Longitude-height cross section of geopotential eddy height anomalies and wave activity flux vectors and wave activity flux vectors in the longitudinal and height directions from the surface through 10-hPa for 18 – 22 March 2022. The forecast is from the 00Z 7 March 2022 operational GFS.

I included the PV animation because I thought that it was amusing how the GFS seems resolve into a second PV split almost through the backdoor. The initial minor PV daughter vortex survives just barely but long enough to become reinvigorated with the second PV disruption later this month. That the GFS is correct is a low probability event and, but the models are struggling it will be interesting to see how this PV disruption is resolved. If the GFS forecast is anywhere close to being correct it would certainly

suggest Greenland blocking in the troposphere before the month is over and potentially a colder stormier period for Europe and even the Northeastern US. However overall I think the models are struggling and will continue to struggle with the upcoming PV disruption and the resultant surface impacts.

I will end with an initial verification of the winter forecast. I show in **Figure iv** the three surface temperature forecast anomalies posted to the 29 November 2021 blog and the observations based on NCEP/NCAR reanalysis. The three forecasts include NMME (ensemble of the North American dynamical models), the C3S (ensemble of the European dynamical models), the AER forecast and the observations. NCEP/NCAR has issues especially across Asia, so all discussions are preliminary but with that caveat here are my thoughts.

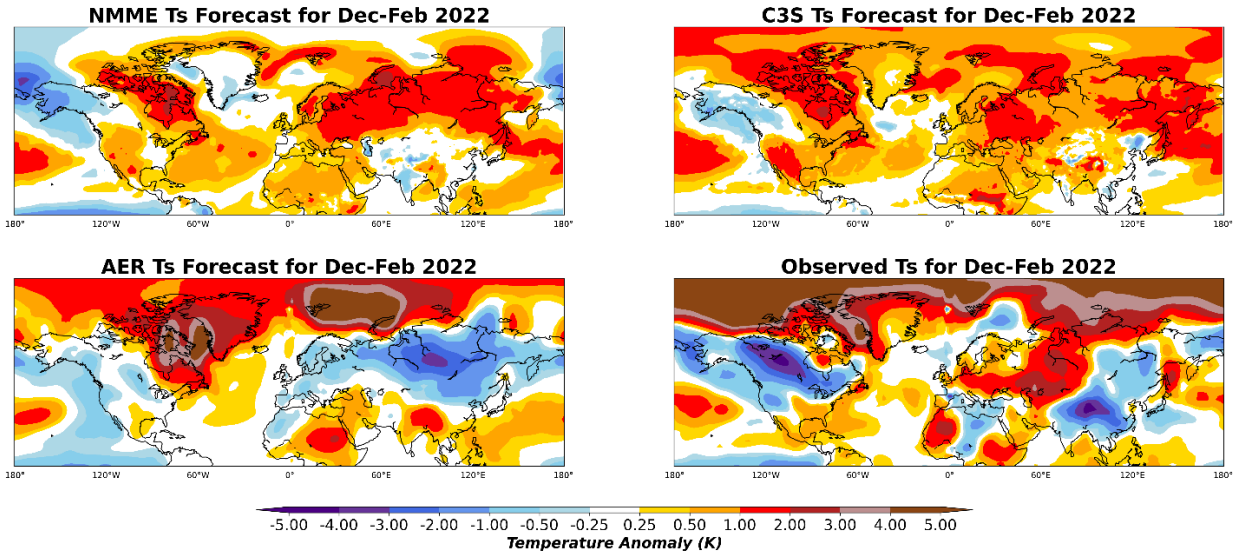


Figure iv. The NMME winter temperature anomaly forecast from https://www.cpc.ncep.noaa.gov/products/NMME/ (top left), the C3S winter temperature anomaly forecast from https://www.copernicus.eu/en (top right), the AER winter temperature anomaly forecast all for December, January and February 2022 (bottom left) and the observed temperature anomalies for December, January and February 2022 from the NCEP/NCAR reanalysis.

Consistent with the findings in Cohen et al. 2020 the dynamical models are consistently too warm across the continents and too cold across the Arctic basin in their winter forecasts. As I have argued for quite a while now this is a model deficiency and the two model biases are related. The inability of the models to simulate the influence of Arctic variability on the polar vortex and the surface impacts results in an Arctic that is too cold and continents that are too warm. This past winter is not the most emphatic example but one of many. To me the winter pattern is to first order consistent with the temperature impacts of the repeated PV stretching events with one cold center across

North America east of the Rockies and a second cold in Central and east Asia but mostly over China. Please compare the observed temperature anomalies in **Figure iv** with the fourth column in Figure 1E from our recent paper on PV stretching events Cohen et al. 2021. I think there is an influence from La Niña as well, especially over North America and the possible connection between La Niña and PV stretching is potentially an interesting one.

I think that the AER forecast compares favorably with the dynamical models especially over North America. It correctly predicted the temperature pattern, but the predicted cold anomalies were damped compared to the observations. But it was the only model that predicted cold temperatures associated with the PV disruptions/stretching across North America.

Across Asia it is more complicated, the dynamical models are too warm and the AER model is too cold. The temperature pattern predicted by the AER model is consistent with an SSW and the observed one more consistent with PV stretching and hence the differences. There is a region of below normal temperatures in the Arctic near the Barents Sea that is unusual and surprising and may have played an important role in the difference of what was predicted and what was observed regarding the PV (multiple PV stretching and no SSWs). The dynamical models always predict universal warmth for Eurasia, which more times than not doesn't work out.

1-5 day

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

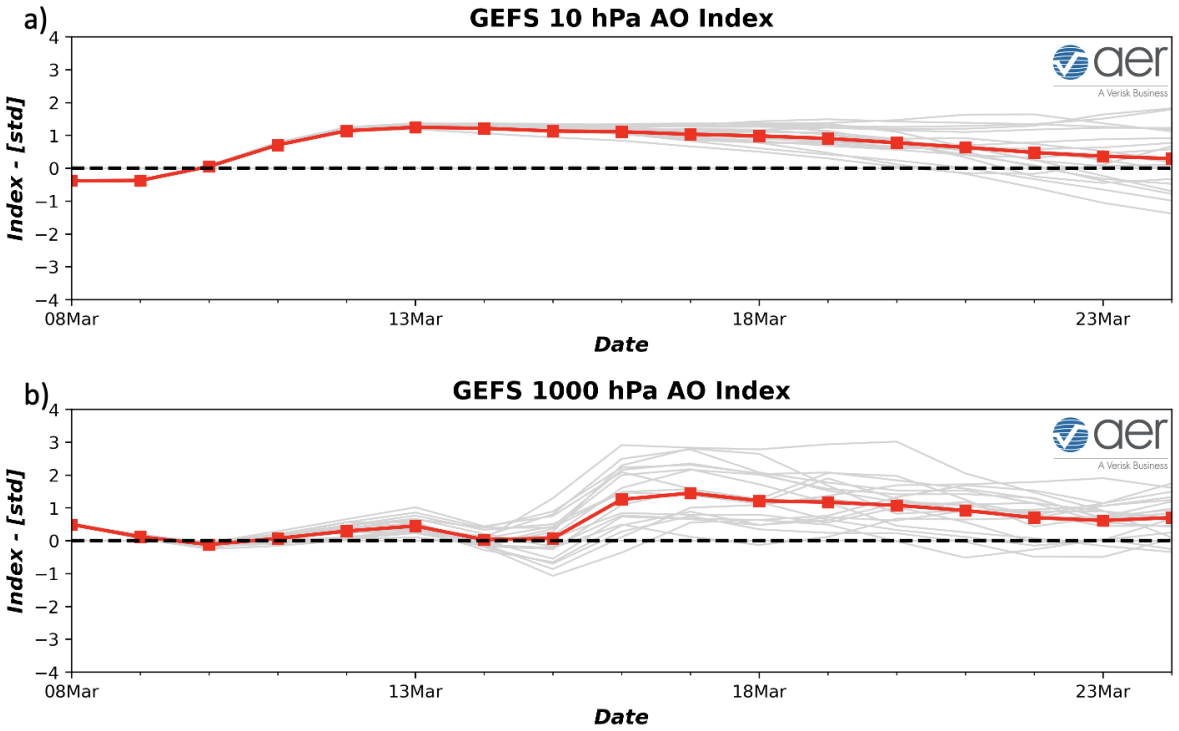


Figure 1. (a) The predicted daily-mean AO at 1000 hPa from the 00Z 7 March 2022 GFS ensemble. (b)The predicted daily-mean near-surface AO from the 00Z 7 March 2022 GFS ensemble. Gray lines indicate the AO index from each individual ensemble member, with the ensemble-mean AO index given by the red line with squares.

Persistent troughing/negative geopotential height anomalies across Greenland will support ridging/positive geopotential height anomalies across Scandinavia forcing downstream troughing/negative geopotential height anomalies across much of Eastern Europe (**Figures 2).** This will result in normal to above normal temperatures across Western and Northern Europe including the UK with normal to below normal temperatures across Southern and Eastern Europe and Turkey due to low heights and/or northerly flow (**Figure 3**). The current displacement of the major center of the stratospheric PV over Western Siberia will help to anchor troughing/negative geopotential height anomalies over Western Siberia that trails southwestward across Western Asia with ridging/positive geopotential height anomalies widespread across Southern and Eastern Asia this period (**Figure 2**). This pattern favors normal to below normal temperatures across Western and Northern Asia with normal to above normal temperatures across Northern and Eastern Asia **(Figure 3**).

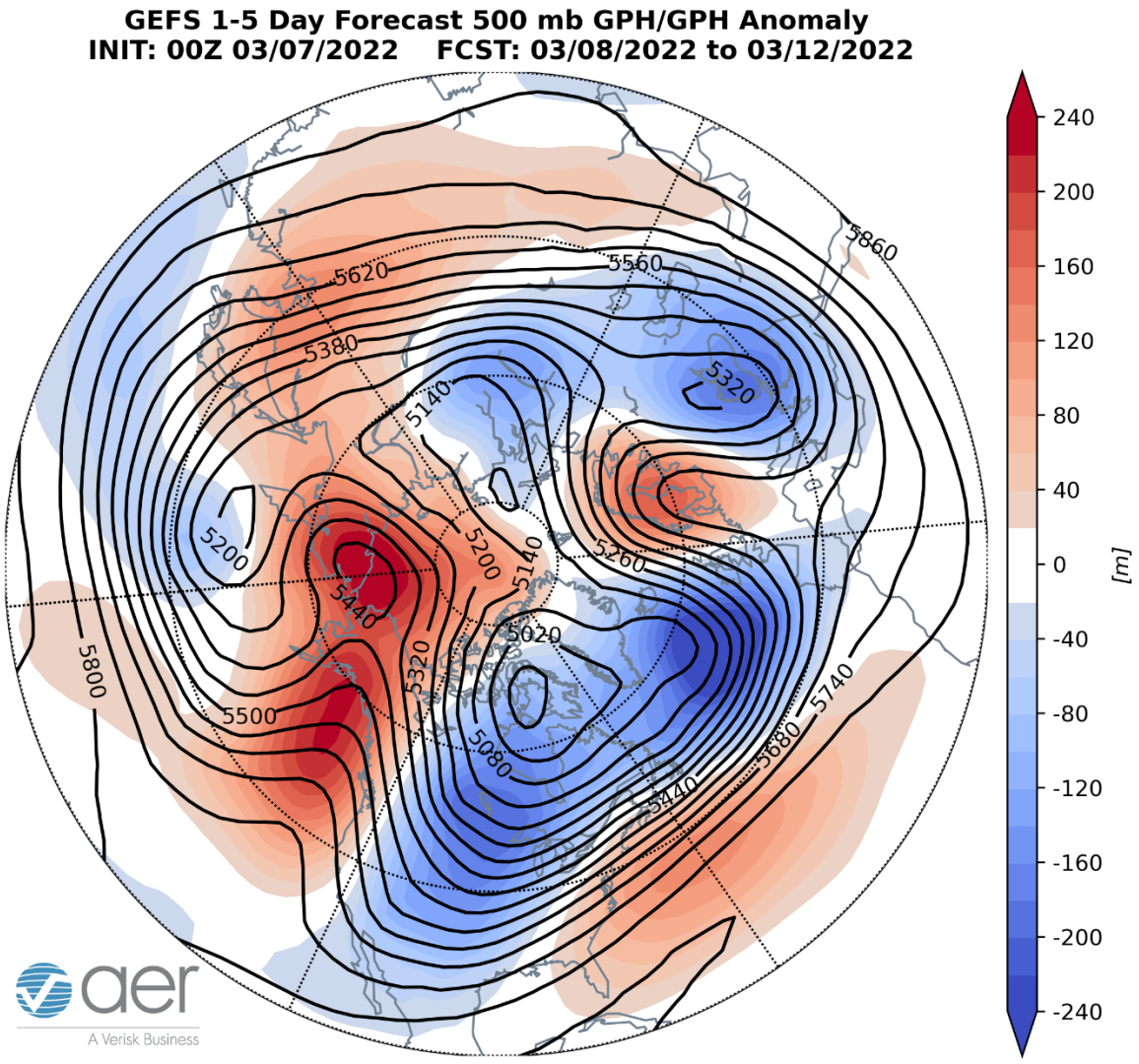


Figure 2. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 8 – 12 March 2022. The forecasts are from the 00z 7 March 2022 GFS ensemble.

Across North America the tropospheric circulation pattern is related to what could be the final stretched stratospheric PV of the winter with ridging/positive geopotential height anomalies centered in the Gulf of Alaska, Alaska, Western and Eastern Canada coupled with troughing/negative geopotential height anomalies across Central and Eastern Canada and the Western and Central US with more ridging/positive geopotential height anomalies along the US East Coast **(Figure 2).** This will favor normal to above normal temperatures across Alaska, Western Canada and the Eastern US with normal to below normal temperatures in Central Canada and the Western and Central US **(Figure 3).**

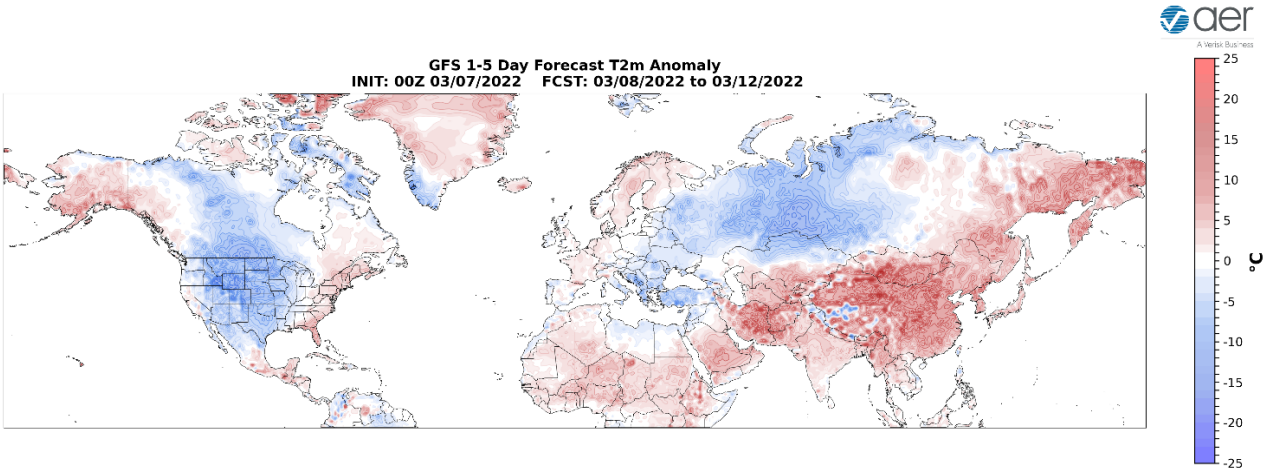


Figure 3. Forecasted surface temperature anomalies (°C; shading) from 8 – 12 March 2022. The forecast is from the 00Z 7 March 2022 GFS ensemble.

As we are now fully into March, snowmelt is predicted to be widespread across Eurasia and North America with new snowfall limited to Turkey, parts of Northern Asia, Canada, the US Plains and the Canadian Plains (**Figure 4**). Though not shown in the GFS forecast the Canadian model predicts snowfall in the Northeastern US.

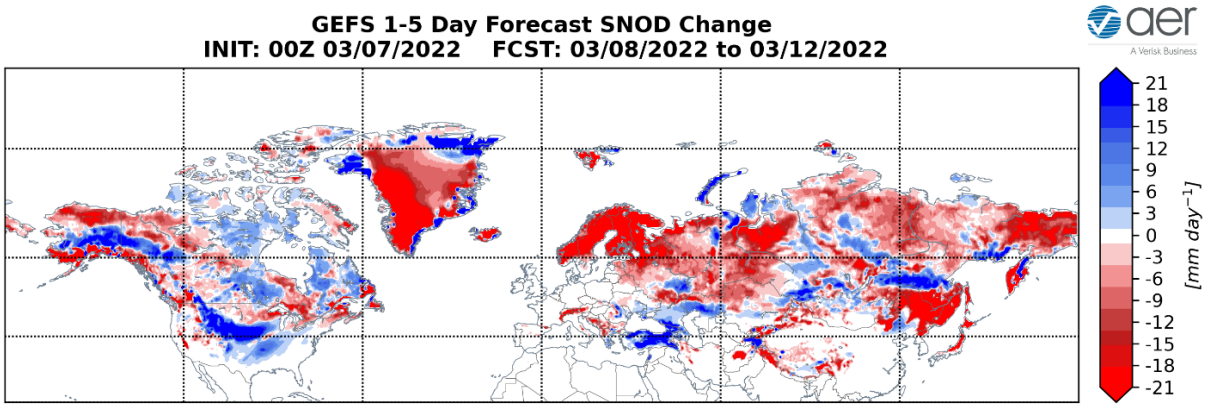


Figure 4. Forecasted snow depth changes (mm/day; shading) from 8 – 12 March 2022. The forecast is from the 00Z 7 March 2022 GFS ensemble.

Mid-Term

6-10 day

The AO is predicted to remain neutral to positive this period **(Figure 1**) with mostly negative geopotential height anomalies spread across the Arctic especially the North Atlantic side of the Arctic with mixed geopotential height anomalies across the mid-

latitudes of the NH (**Figure 5**). And with negative geopotential height anomalies across Greenland (**Figure 5**), the NAO is predicted to remain positive this period.

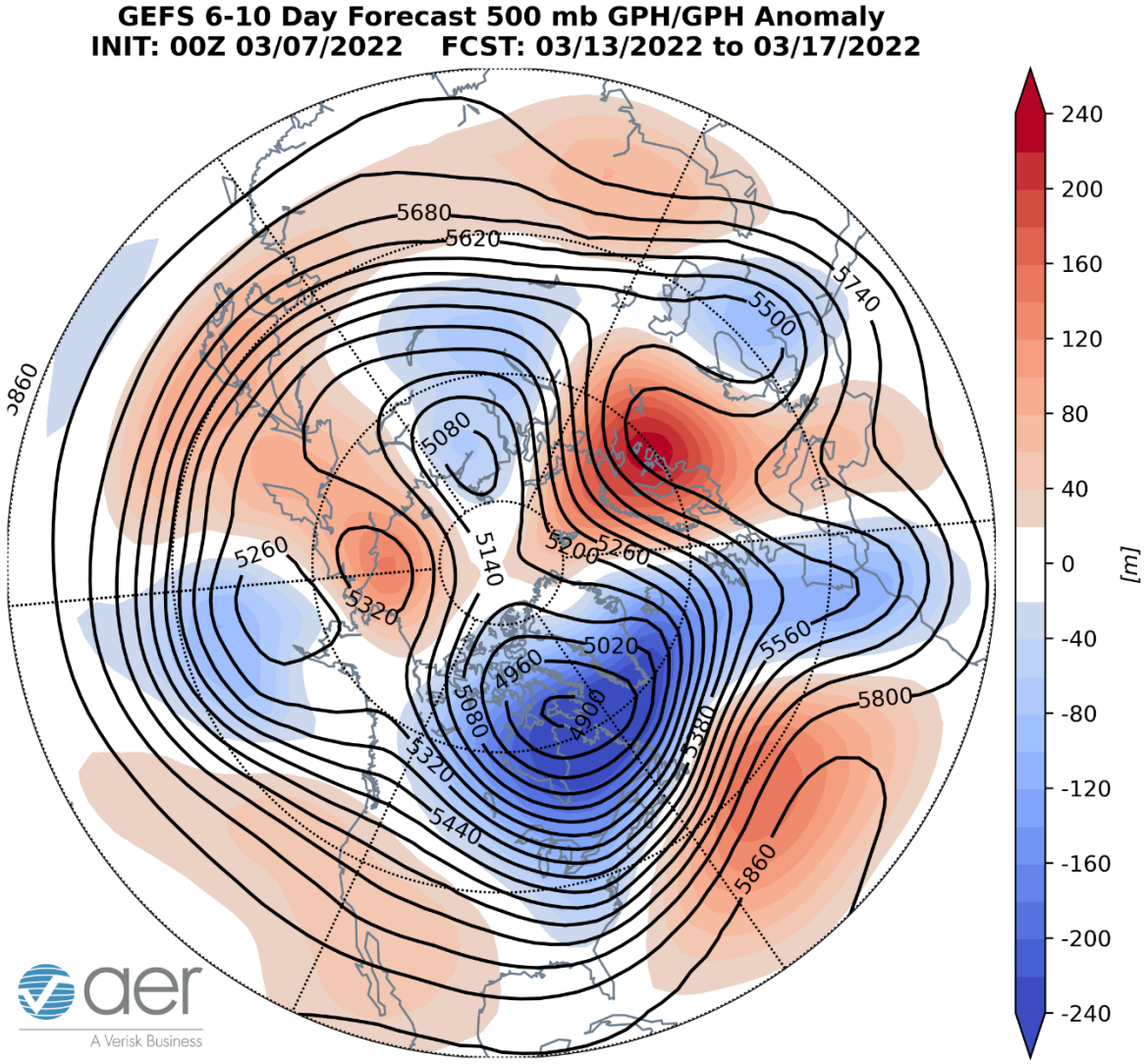


Figure 5. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 13 – 17 March 2022. The forecasts are from the 00z 7 March 2022 GFS ensemble.

Persistent troughing/negative geopotential height anomalies across Greenland that extends southward into Spain will support ridging/positive geopotential height anomalies centered over Scandinavia and the Baltic States forcing downstream troughing/negative geopotential height anomalies across Southeastern Europe (**Figures 5).** This will result in normal to above normal temperatures across much of Europe including the UK with normal to below normal temperatures limited to Ireland, Spain, Portugal, Southeastern Europe and Turkey due to low heights and/or northerly flow

(**Figure 6**). The continued displacement of the main center of the stratospheric PV over Western Siberia will help to persist troughing/negative geopotential height anomalies across Western Siberia that extends southwestward across Western Asia with ridging/positive geopotential height anomalies widespread across East Asia this period (**Figure 5**). This pattern favors widespread normal to above normal temperatures across much of Northern and Southern Asia with normal to below normal temperatures limited to Western Siberia and Central Asia **(Figure 6**).

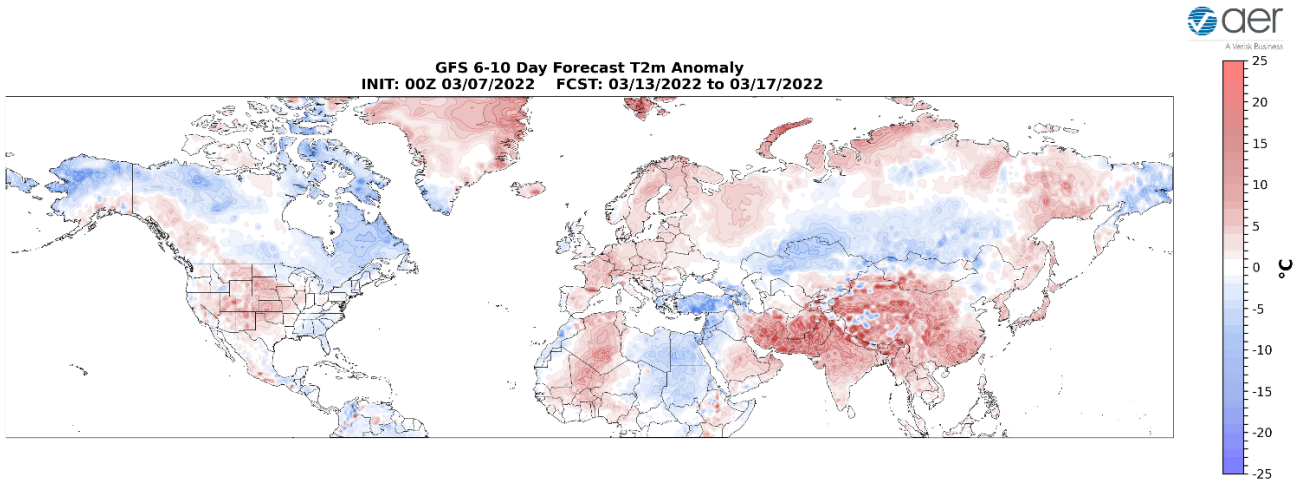


Figure 6. Forecasted surface temperature anomalies (°C; shading) from 13 – 17 March 2022. The forecasts are from the 00Z 7 March 2022 GFS ensemble.

Across North America persistent ridging/positive geopotential height anomalies centered in the Gulf of Alaska, Alaska, Western Canada and the Western US will support troughing/negative geopotential height anomalies across Eastern Canada that extends southward into the Eastern US **(Figure 5).** This will favor normal to above normal temperatures across Alaska, Western Canada and the Western US with normal to below normal temperatures in Central and Eastern Canada and the Eastern US **(Figure 6).**

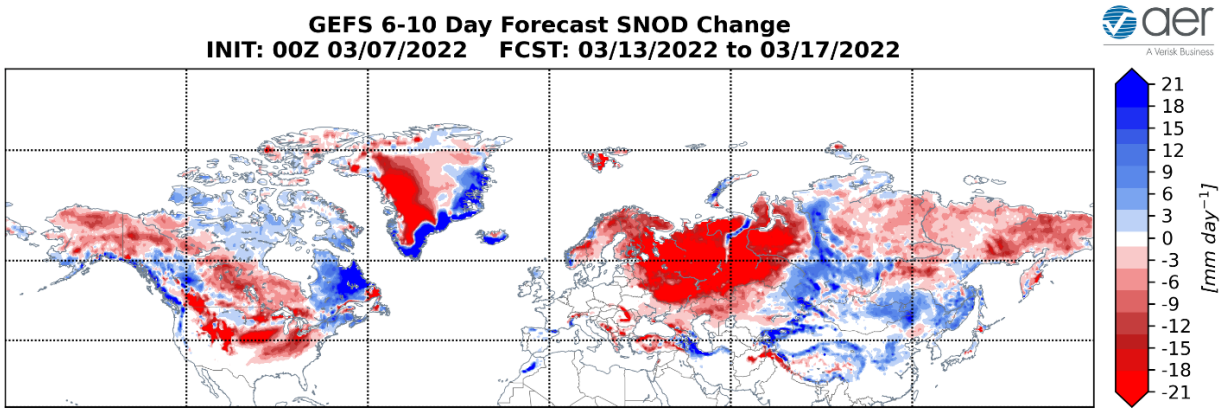


Figure 7. Forecasted snow depth changes (mm/day; shading) from 13 – 17 March 2022. The forecast is from the 00Z 7 March 2022 GFS ensemble.

As March progresses snowmelt is predicted to remain widespread across Eurasia and North America with new snowfall limited to parts of Western Siberia, Central and East Asia, the Tibetan Plateau, Western and Eastern Canada and New England (**Figure 7**).

11-15 day

Negative geopotential height anomalies are predicted to remain widespread across the North Atlantic and Eurasian sides of the Arctic with mixed geopotential height anomalies across the mid-latitudes of the NH (**Figure 8**), therefore the AO should remain neutral to positive this period (**Figure 1**). With predicted mostly negative pressure/geopotential height anomalies across Greenland (**Figure 8**), the NAO is forecasted to remain positive this period.

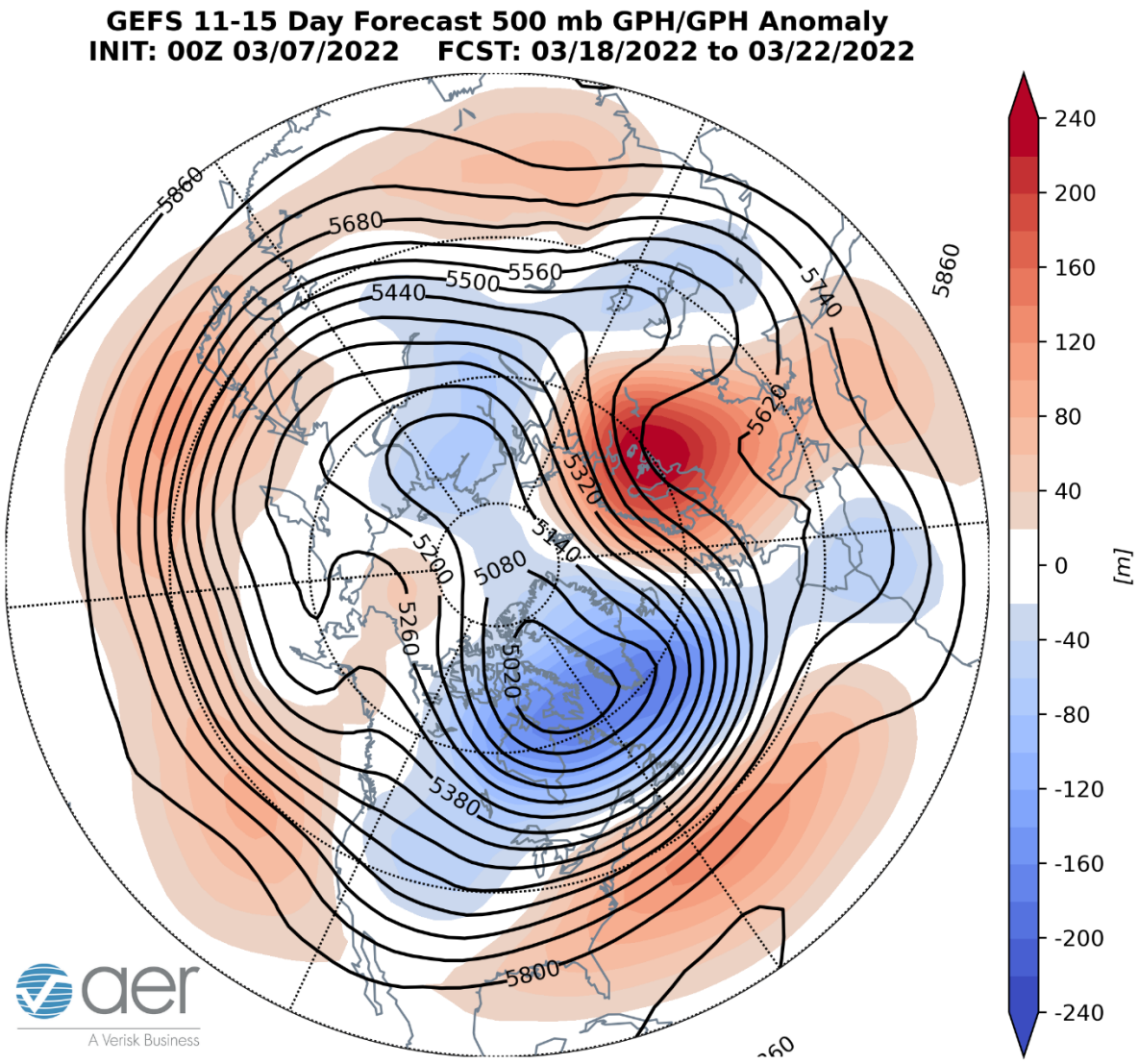


Figure 8. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 18 – 22 March 2022. The forecasts are from the 00z 7 March 2022 GFS ensemble.

Persistent troughing/negative geopotential height anomalies across Greenland that extends southeastwards towards Spain will continue to support ridging/positive geopotential height anomalies centered in the Scandinavia/Baltic Sea and States forcing troughing/negative geopotential height anomalies across the Middle East this period (**Figure 8**). This pattern favors more normal to above normal temperatures widespread across much of Europe including the UK with normal to below normal temperatures limited across Ireland, Spain, Southeastern US and Turkey due to low geopotential heights and/or northerly flow (**Figures 9**). The pattern of troughing/negative geopotential height anomalies across Siberia and Western Asia with ridging/positive geopotential height anomalies widespread across Eastern Asia is

predicted to persist this period (**Figure 8**). This pattern favors widespread normal to above normal temperatures across much of Asia with normal to below normal temperatures limited to the north slope of Asia and parts of Central Asia due to low geopotential heights and/or northerly flow this period (**Figure 9**).

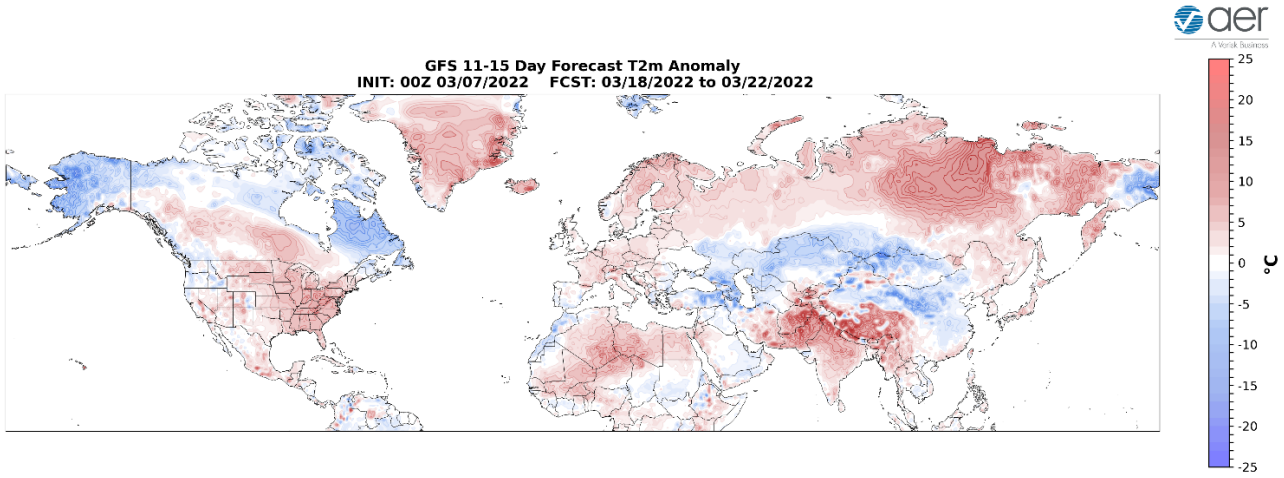


Figure 9. Forecasted surface temperature anomalies (°C; shading) from 18 – 22 March 2022. The forecasts are from the 00z 7 March 2022 GFS ensemble.

Ridging/positive geopotential height anomalies in the Gulf of Alaska, Alaska and Western Canada are predicted to persist and will help to anchor troughing/negative geopotential height anomalies across Central and Eastern Canada that extends southwestwards into the Western US with more ridging/positive geopotential height anomalies across the Eastern US this period (**Figure 8**). This pattern favors normal to above normal temperatures across Alaska, Western Canada and the Eastern US with normal to below normal temperatures in much of Central and Eastern Canada and the Western US (**Figure 9**).

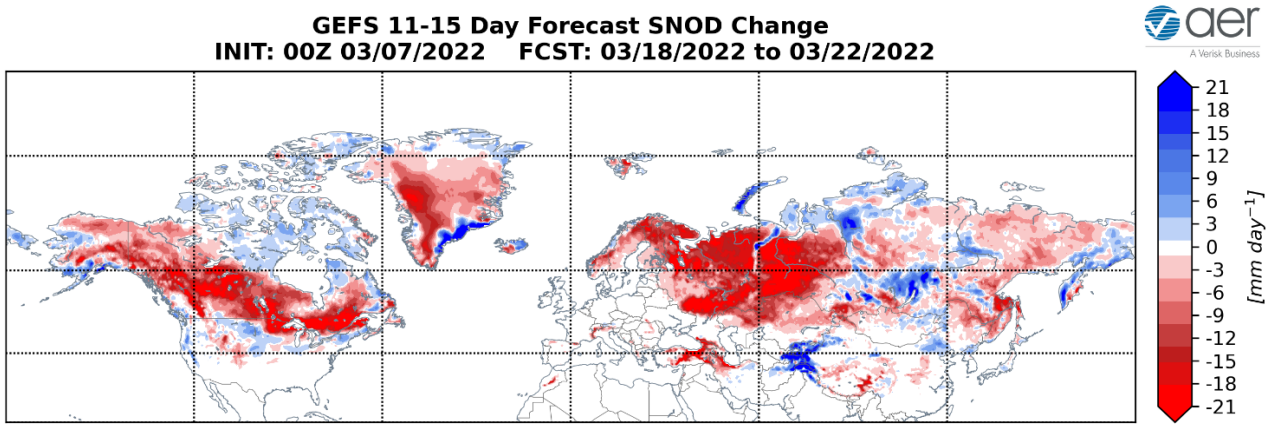


Figure 10. Forecasted snow depth changes (mm/day; shading) from 18 – 22 March 2022. The forecast is from the 00Z 7 March 2022 GFS ensemble.

As we get deeper into March, snowmelt is predicted to remain widespread across Eurasia and North America with new snowfall limited to parts of Siberia, Central Asia, the Tibetan Plateau, the coastal mountains of western North America and Eastern Canada (**Figure 10**).

Longer Term

30–day

The latest plot of the polar cap geopotential height anomalies (PCHs) currently shows cold/negative PCHs in the lower stratosphere and in the upper troposphere but warm/positive PCHs in the upper stratosphere and mid troposphere (**Figure 11**). The positive departures in the upper stratosphere are predicted to turn first negative and then positive again next week into the following week as one disruption to the PV ends and another one takes its place (**Figure 11**). Meanwhile the persistent cold/negative PCHs in the lower stratosphere with warm/positive PCHs in the mid troposphere show that the stratosphere and troposphere remain uncoupled but could couple in late March (**Figure 11**).

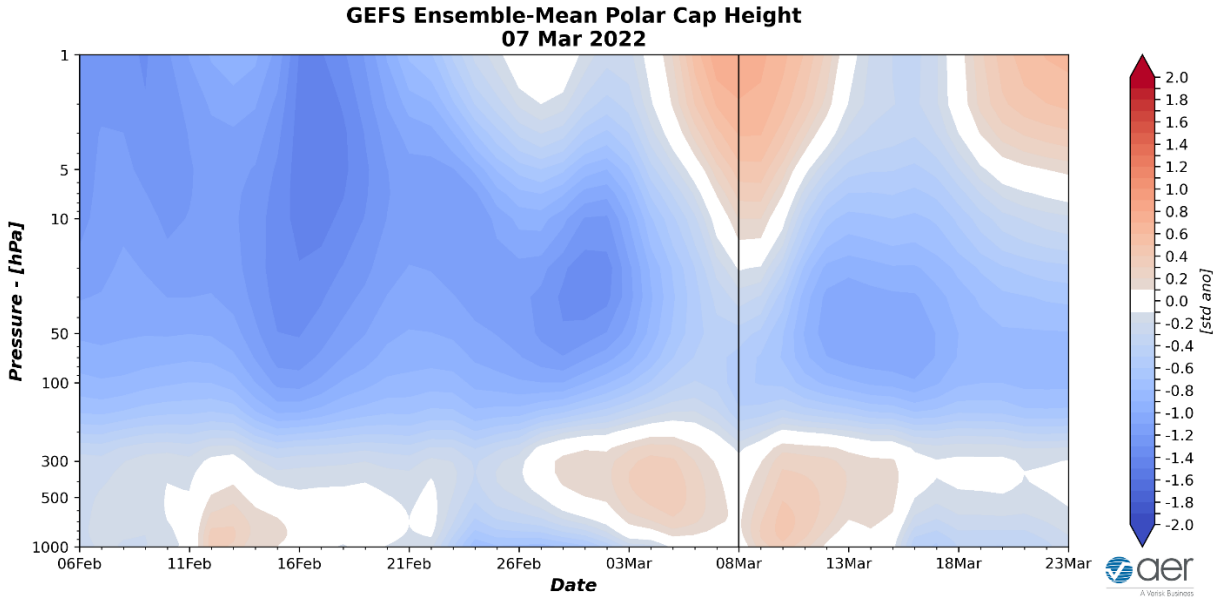


Figure 11. Observed and predicted daily polar cap height (i.e., area-averaged geopotential heights poleward of 60°N) standardized anomalies. The forecast is from the 00Z 7 March 2022 GFS ensemble.

The normal to above normal PCHs predicted in the lower troposphere for this week are related to positive geopotential heights/pressure near Alaska and not related to the predicted positive surface AO during the same time period (**Figure 1**). And despite the positive AO, the normal to above normal PCHs in the mid-troposphere will support some relative cold weather in parts of Eurasia and especially North America.

The largest pulse of the winter in vertical Wave Activity Flux (WAFz) from the troposphere to the stratosphere or poleward heat transport in the stratosphere is winding down this week (**Figure 12**). Negative WAFz anomalies are predicted for the rest of the week and will continue to support a relatively strong PV as suggested by the relatively cold PCHs in the lower stratosphere that extends to the upper stratosphere later this week.

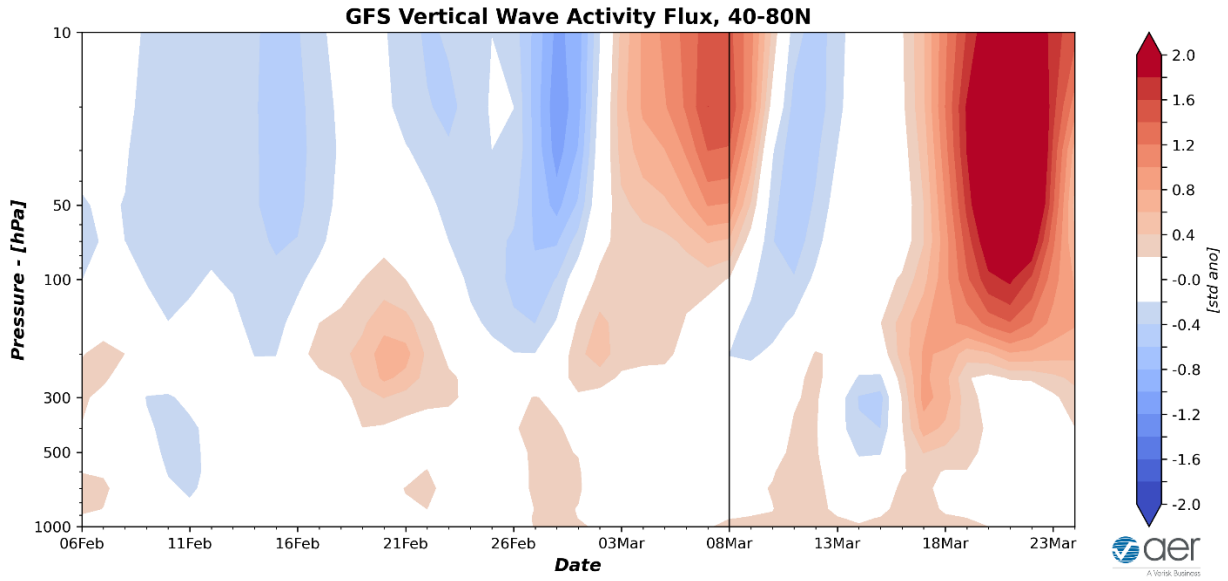


Figure 12. Observed and predicted daily vertical component of the wave activity flux (WAFz) standardized anomalies, averaged poleward of 40-80°N. The forecast is from the 00Z 7 March 2022 GFS ensemble.

The strong pulse of WAFz of last week and predicted to persist into early this week resulted in a sixth stretched stratospheric PV since early January with the PV becoming elongated in shape and then breaking into two pieces with the main PV center over Western Siberia with ridging centered over Alaska (**Figure 13a**). A second minor PV center has settled over Eastern Canada (**Figure 13a**). The two PV centers with one over Western Siberia and another over Eastern Canada (**Figure 13a**) will help to support cold temperatures in Western Asia, Eastern Europe and Eastern Canada into the Central and eventually Eastern US by the end of the week. However, the PV perturbation is relatively minor (no reversal of zonal winds at 60°N and 10hPa are predicted), so despite a brief drop in the stratospheric AO, it will bounce back into positive territory as the PV remains

relatively strong resulting in a positive stratospheric AO later this week and into next week (**Figure 11**).

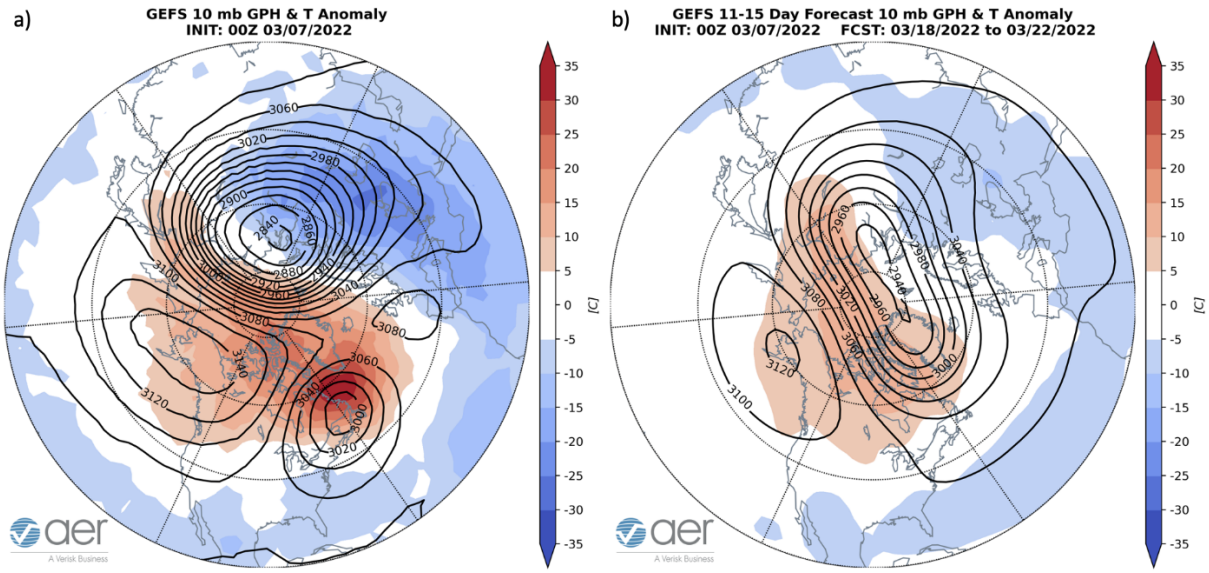
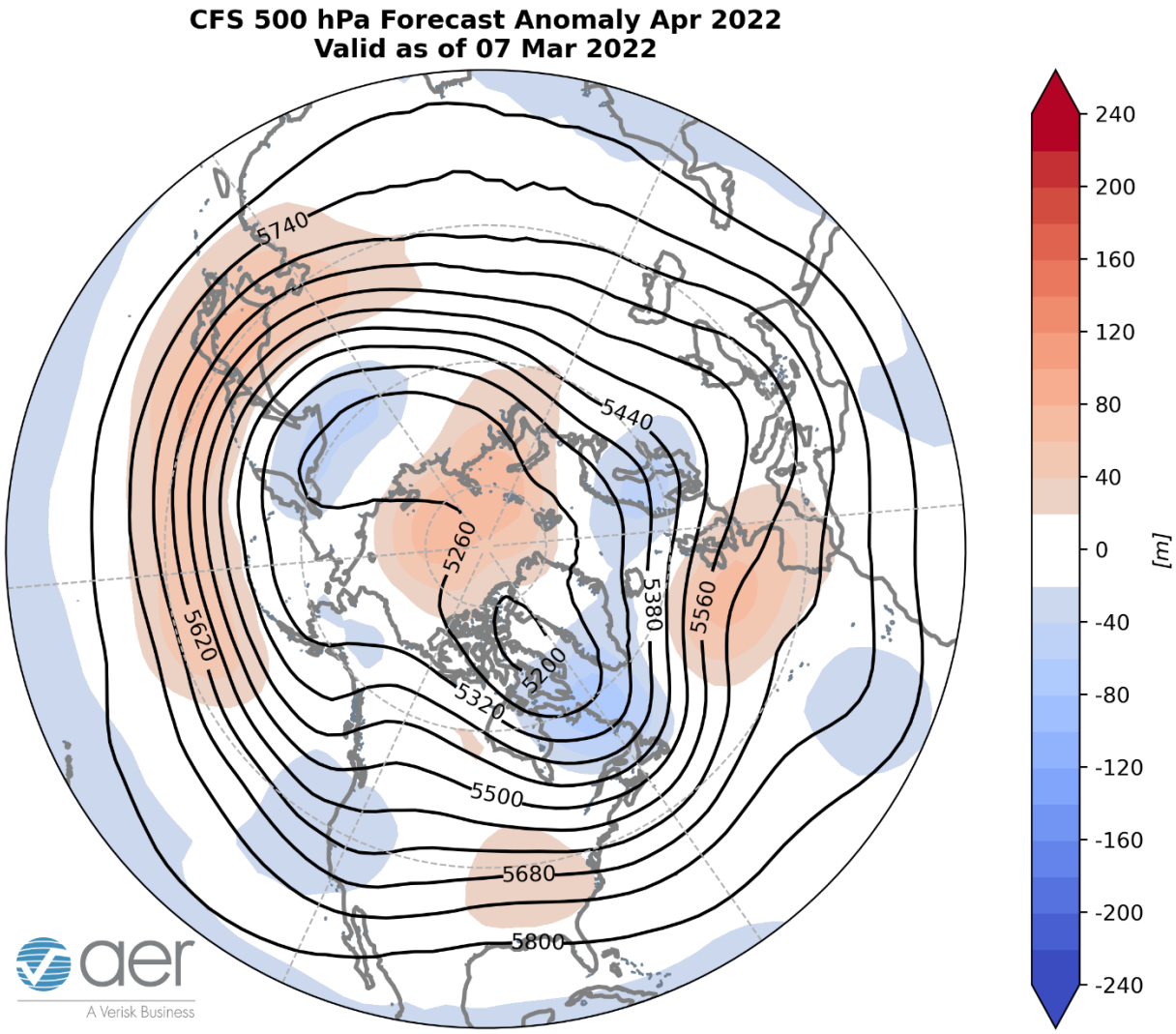


Figure 13. (a) Initialized 10 mb geopotential heights (dam; contours) and temperature anomalies (°C; shading) across the Northern Hemisphere averaged for 7 March 2022. (b) Same as (a) except forecasted averaged from 18 – 22 March 2022. The forecasts are from the 00Z 7 March 2022 GFS model ensemble.

The GFS is predicting another pulse of WAFz next week that is predicted to be the strongest of the winter (**Figure 11**). Therefore, in contrast to WAFz all winter this is predicted to result in polar stratospheric warming coupled with ridging that will spread across the Central Arctic and the North Pole (**Figure 13b**). There are signs that this could be more of a classical sudden stratospheric warming that will result in either a PV split or displacement, though in the snapshot of **Figure 13b** it does appear to be just one more PV stretching, and this can't be ruled out either.

Figure 14. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere for April 2022. The forecasts are from the 00Z 7 March 2022 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 the Barents-Kara Seas into the Central Arctic, near Western Europe, East Asia and the Eastern US with troughing across Northern and Eastern Europe, Siberia, the Gulf of Alaska into the Western US and Eastern **Canada**



(**Figure 14).** This pattern favors seasonable to relatively warm temperatures across Western and Northern Europe, Northern and Central Asia, Alaska and the Western US with seasonable to relatively cool temperatures across Eastern Europe, Turkey, Southwest Asia, much of Canada and the Northern and Eastern US (**Figure 15**).

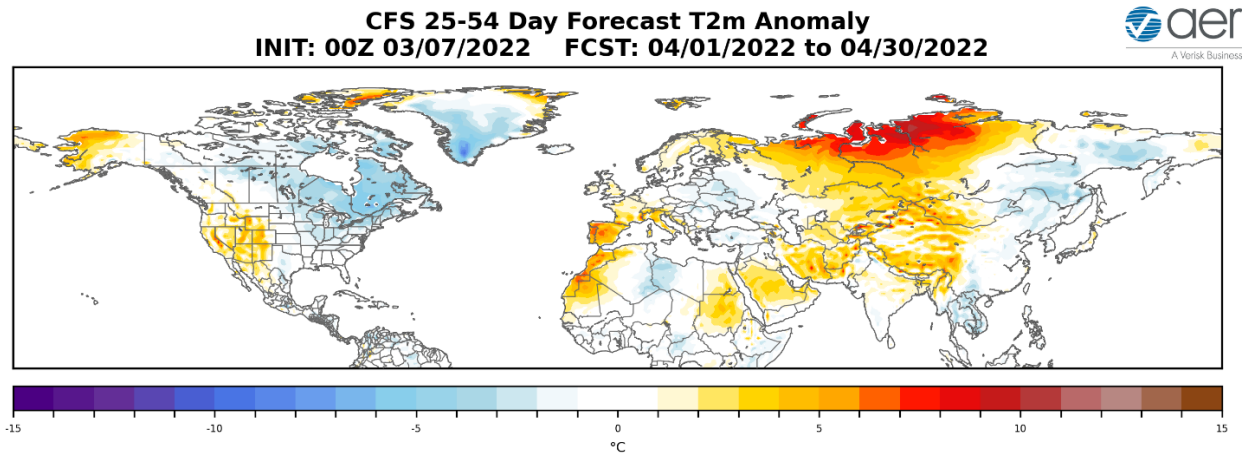


Figure 15. Forecasted average surface temperature anomalies (°C; shading) across the Northern Hemisphere for March 2022. The forecasts are from the 00Z 7 March 2022 CFS.

Surface Boundary Conditions

Arctic Sea ice

Arctic sea ice is growth has stalled and remains below normal mostly in Sea of Okhotsk and recently in the Barents Sea. Overall sea ice is relatively extensive compared to recent winters, though it remains relatively thin. In the Barents-Kara Seas extent is actually above normal. Below normal sea ice in the Barents-Kara seas favors cold temperatures in Central and East Asia, 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.

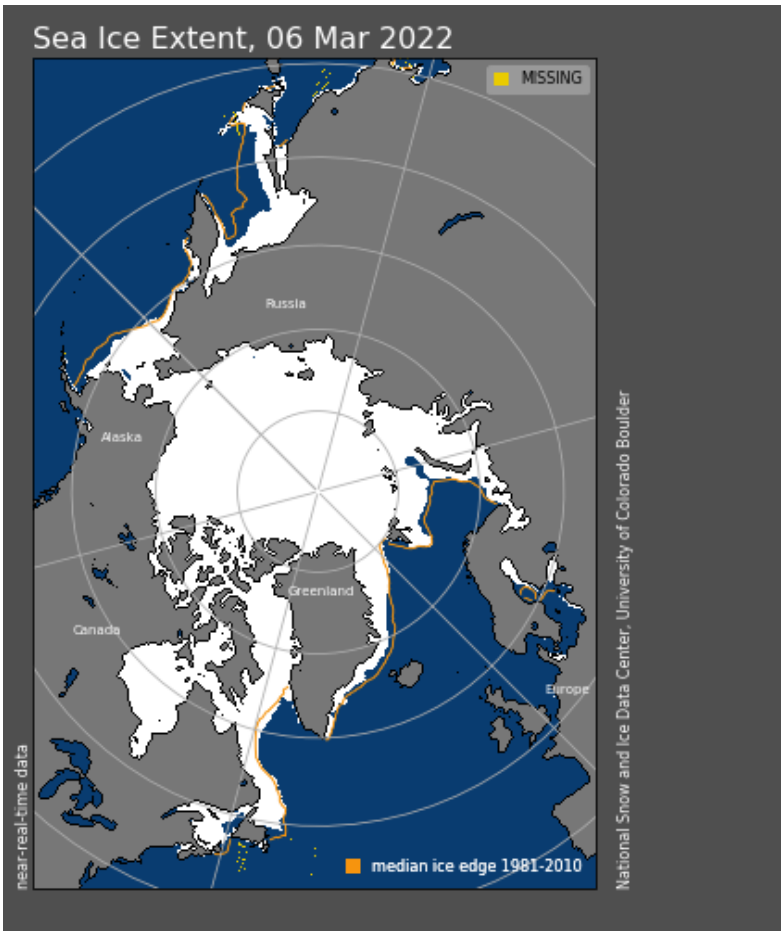


Figure 16. Observed Arctic sea ice extent on 6 March 2022 (white). Orange line shows climatological extent of sea ice based on the years 1981-2010. Image from the National Snow and Ice Data Center (NSIDC).

SSTs/El Niño/Southern Oscillation

Equatorial Pacific sea surface temperatures (SSTs) anomalies are below normal and we continue to observe weak to possibly moderate La Niña conditions (**Figure 17**) and La Niña conditions are expected into 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 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.

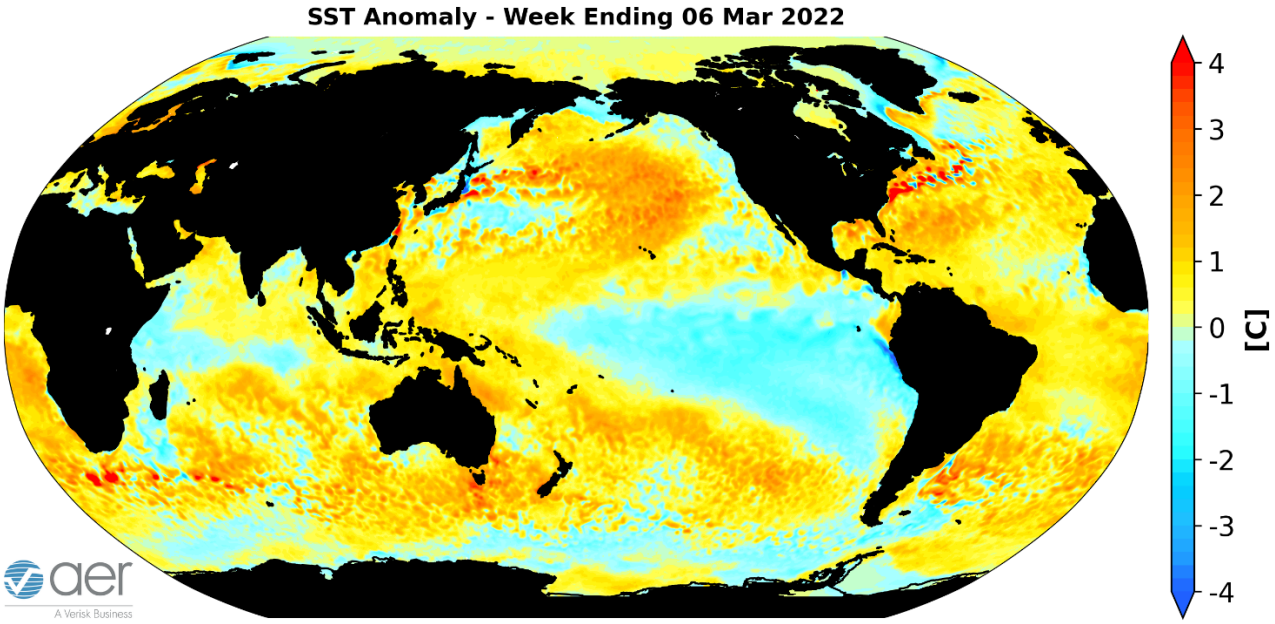


Figure 17. The latest weekly-mean global SST anomalies (ending 6 March 2022). Data from NOAA OI High-Resolution dataset.

Currently no phase of the Madden Julian Oscillation (MJO) is favored (**Figure 18**). The forecasts are for the MJO to remain weak where no phase is favored and eventually could emerge into phases three and four. With no phase favored hard to see that the MJO is likely influencing the weather across North America. But admittedly this is outside of my expertise.

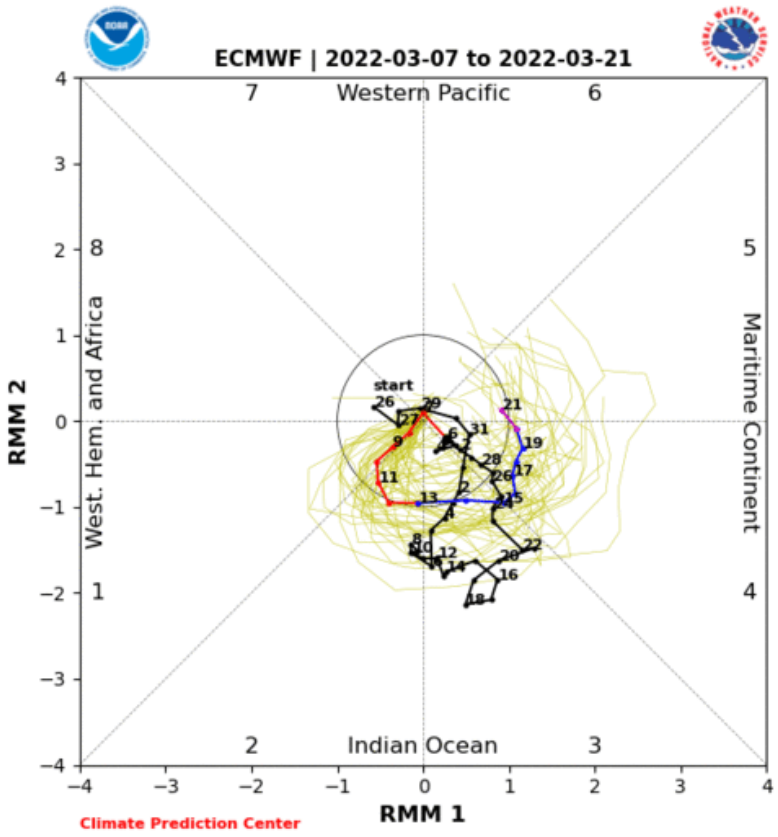


Figure 18. Past and forecast values of the MJO index. Forecast values from the 00Z 7 March ECMWF model. Yellow lines indicate individual ensemble-member forecasts, with the green line showing the ensemble-mean. A measure of the model "spread" is denoted by the gray shading. Sector numbers indicate the 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!