November 18, 2019

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) recently 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.

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

Summary

- The Arctic Oscillation (AO) is currently negative and is predicted to remain neutral to negative for the next two weeks.
- The current negative AO is reflective of mostly positive pressure/geopotential height anomalies across the Arctic and mixed pressure/geopotential height anomalies across the mid-latitudes. The North Atlantic Oscillation (NAO) is positive with mostly negative pressure/geopotential height anomalies spread across Greenland; and the NAO is predicted to remain near neutral to negative as geopotential height anomalies remain weakly positive across Greenland over the next two weeks.
- This week, troughing/negative pressure/geopotential height anomalies over Western Europe are predicted to be sandwiched by ridging/positive geopotential height anomalies in the central North Atlantic and Western Asia. Normal to below

normal temperatures are predicted for Western Europe including the United Kingdom (UK) under northerly flow while normal to above normal temperatures are predicted for Eastern Europe under southerly flow. However, over the next two weeks the troughing in Western Europe is predicted to push north into the Barents-Kara Seas setting up westerly flow across Europe with relatively mild temperatures.

- Currently temperatures are mostly above normal across Western Asia and Southeastern Asia as ridging/positive geopotential height anomalies dominate Western and Southern Asia while temperatures are below normal in Siberia and Northeast Asia with troughing/negative pressure/geopotential height anomalies dominating the region. However, over the next two weeks, troughing to the north with ridging to the south will setup a westerly flow across Asia allowing milder temperatures to overspread much of the continent with below normal temperatures mostly confined to Northern Siberia under the troughing.
- This week and into early next week ridging/positive geopotential height anomalies are predicted to dominate much of North America with normal to above normal temperatures for Alaska, much of Canada and the Western United States (US) with troughing/negative geopotential height anomalies and normal to below normal temperatures mostly confined to the Eastern US. However, starting next week increasing troughing will bring colder temperatures to Alaska and Western Canada and the Western US with ridging and milder temperatures in eastern North America. However, the ECMWF model is predicting more seasonable temperatures in the Eastern US.
- In the Impacts section I discuss the implications of the predicted stratospheric polar vortex (PV) disruption on winter weather.

Impacts

In my opinion it is crunch time for the Northern Hemisphere (NH) winter. A minor sudden stratospheric warming (SSW where a warming of at least 25°C occurs in the polar stratosphere) is likely and a major mid-winter warming (MMW where the zonal mean zonal wind at 10hPa and 60N reverses from positive to negative) is possible in mid-December. I include in **Figure i** the temperature animation of the stratosphere and impressive warming is being predicted by the GFS, enough to at least qualify for a minor warming. Based on the GFS forecast, some regions of the polar stratosphere could see a 70°C (126°F) jump in temperature in a matter of days! I saw that some members of the GFS ensemble showed an MMW as early as early December, but I think this is likely too soon.

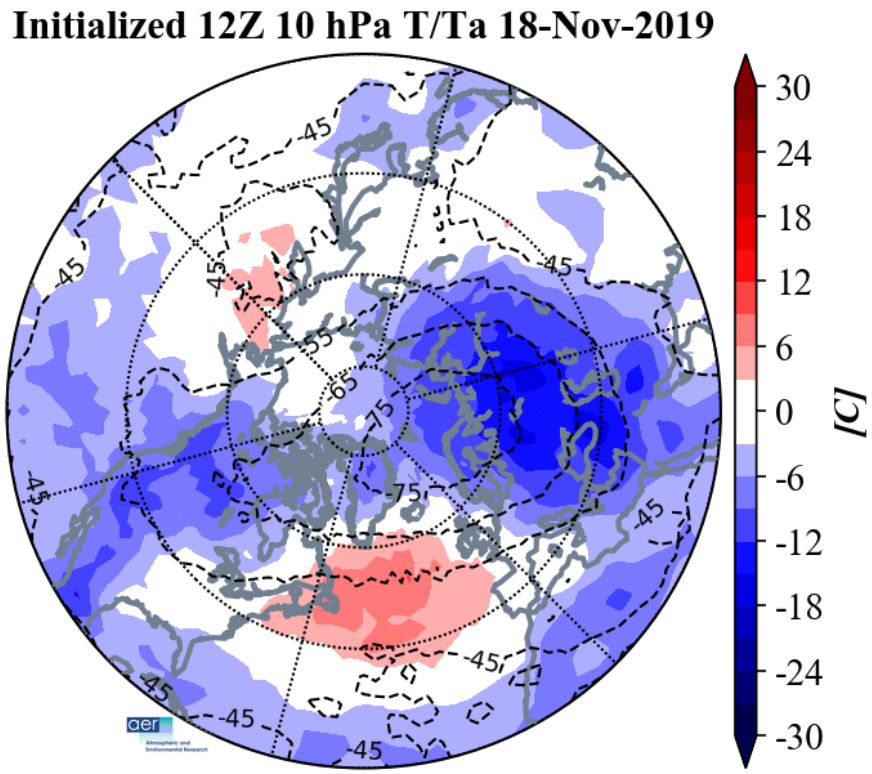


Figure i. (***click to loop***) Forecasted average temperatures (°C/°K; contours) and anomalies (°C/°K; shading) across the Northern Hemisphere for 18 November – 4 December 2019. The forecasts are from the 18 November 2019 GFS.

I believe regardless of the timing and magnitude of the event it will have impacts on the NH weather. I would argue that some of the predicted features in the tropospheric circulation are related to the anticipated PV disruption. The models are predicting a mid-troposphere low pressure over Northern Siberia starting next week. This is very close to the predicted location of the stratospheric PV starting this week. The other predicted main feature in the polar stratosphere is ridging/high pressure centered near Alaska. This will likely be associated with a tropospheric feature/reflection as well. Something similar occurred last December with ridging in the interior of North America and very mild temperatures across the continent. A repeat is possible but my sense of the trends this fall is that the ridge will likely setup further west, forcing a colder solution but admittedly it's a tough call.

In last week's blog, I argued that the increase in the vertical energy transfer and the PV disruption is looking more like an "absorptive" event and less like a "reflective" event and that seems to be even more true this week. Leading up to an "absorptive" event while the stratospheric AO trends negative the tropospheric AO trends positive with milder temperatures across the mid-latitudes and colder temperatures in the Arctic. Though many of the trends are not particularly strong, based on today's forecast

plots included in today's blog all those trends are apparent. The forecast for Europe is consistent with these expectations with an increasing westerly flow and milder temperatures. Milder trends are also predicted for eastern North America, but those trends might run into more resistance due to record low sea ice in the North Pacific sector of the Arctic and the well above normal sea surface temperatures (SSTs) in the eastern North Pacific especially in the Gulf of Alaska. Those features could help to promote ridging near Alaska/Gulf of Alaska with downstream troughing in North America with colder temperatures bucking the trends from the vertical energy transfer.

Regardless of the amplitude, I expect some cold weather from the SSW most likely in eastern North America and Northern Asia. However, if the predicted SSW is relatively minor with a quick recovery in the stratospheric AO, even possibly becoming strongly positive, would favor a positive tropospheric AO. Then an extended mild to very mild period across the NH mid-latitudes could ensue from late December through much of January. I would expect at some point another PV disruption that would reverse the weather to colder but by then an overall mild winter would be almost a certainty.

Last December (before the AO blog was archived), I did analyze some MMW that were of the displacement variety. First, event to event variability is large but there are two PV displacements that occurred relatively recently in mid-December – December 15, 1998 and December 16, 2000. These are calendar dates close to when our polar vortex model predicts as the time most likely for an MMW this upcoming December. If the SSW occurs mid-December then it takes about two weeks for the related circulation to propagate down from the stratosphere to the troposphere with a colder weather regime to follow, starting around the holidays.

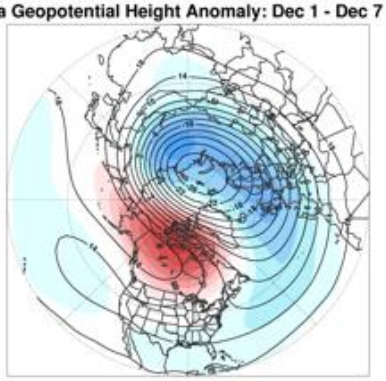
The winter of 1998/99 and 2000/01 are two very different winters with winter 1998/99 being relatively mild and winter 2000/01 being relatively cold in eastern North America and Northern Asia. There was also an MMW in late December 2001/early January 2002 followed by a mild winter. However for now, I am leaning towards a colder solution more similar to 2000/01 more so than 1998/99 given the low sea ice in the North Pacific sector of the Arctic (though based on the weather forecasts, I expect a lot of ice to form over the next two weeks) and the very warm SSTs in the eastern North Pacific. Also, in general the Arctic is warm. I wrote many blogs last winter on the surprisingly cold Central Arctic that may have interfered with the downward propagation of a negative AO. So far this fall, the central Arctic has not been cold. Also the QBO (quasi biennial oscillation) is easterly or at least trending east. An easterly QBO favors a more negative AO than a westerly QBO (see Labe et al. 2019).

The following is some of the relevant text and figures copied from last December: "I have included in **Figure ii** the stratospheric PV a week or longer prior to when an MMW was observed and then in **Figure iii** the observed temperature anomalies across the NH the month when an MMW was observed and the following one or two months. Winters included are 1998/99, 2000/01, 2001/02, 2003/04, 2005/06 (in the Cohen and Jones

paper this is listed as PV split - the cold Europe and blockbuster February snowstorm along the mid-Atlantic are consistent with this - but at least the beginning resembles a PV displacement), 2006/07 and 2007/08. Prior to 1998, the most recent stratospheric PV displacement was in 1987. My personal preference is not to use analogs prior to the era of amplified Arctic warming (pre-1990) for current winters.

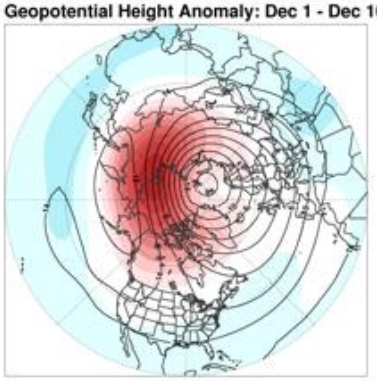
a)

10 hPa Geopotential Height Anomaly: Dec 1 - Dec 7 1998



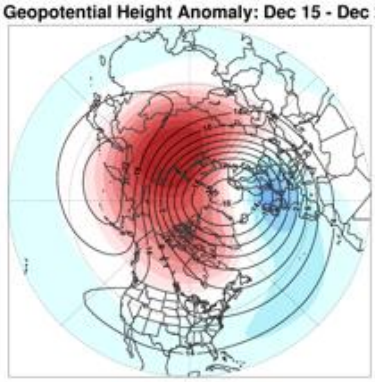
b)

10 hPa Geopotential Height Anomaly: Dec 1 - Dec 10 2000



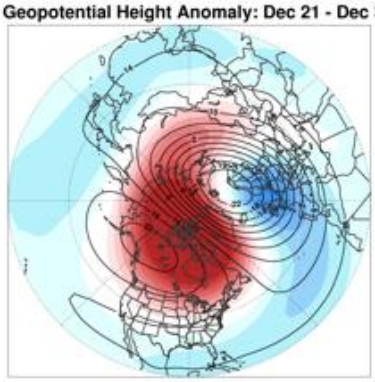
c)

10 hPa Geopotential Height Anomaly: Dec 15 - Dec 28 2001



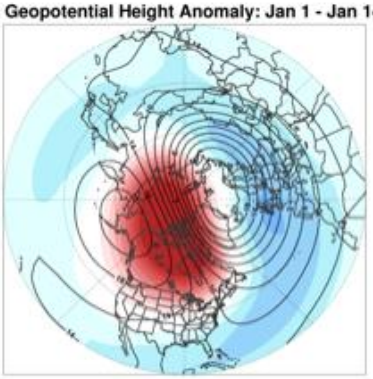
d)

10 hPa Geopotential Height Anomaly: Dec 21 - Dec 31 2003



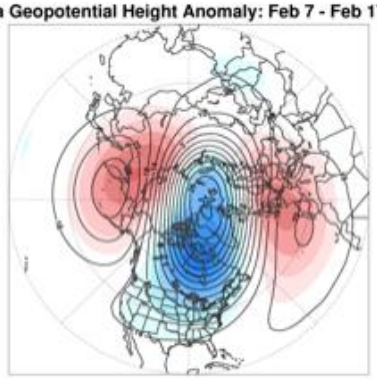
e)

10 hPa Geopotential Height Anomaly: Jan 1 - Jan 14 2006



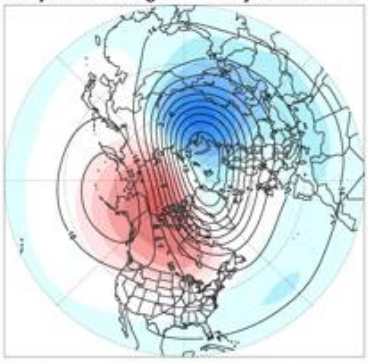
f)

10 hPa Geopotential Height Anomaly: Feb 7 - Feb 17 2007



g)

10 hPa Geopotential Height Anomaly: Feb 5 - Feb 15 2008



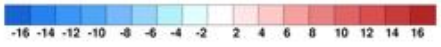


Figure ii. Observed geopotential heights (contouring) and anomalies (shading) for a) December 1-17,
1998, b) December 1-10, 2000, c) December 15-28, 2001, d) December 21-31, 2003, e) January 1-14, 2006, f)
February 7-17, 2007 and g) February 5-15, 2008.

In all of the stratospheric PV displacements since 1998 the stratospheric PV is displaced towards northern Eurasia with the exception of February 2007 when the stratospheric PV was displaced towards Greenland. Also, the flow around the stratospheric PV in all winters was directed from Siberia towards eastern North America (5 winters) or to Europe (2 winters). The predicted stratospheric PV displacement (see **Figure 13** below) is consistent with all the previous stratospheric PV displacements of the past two decades.

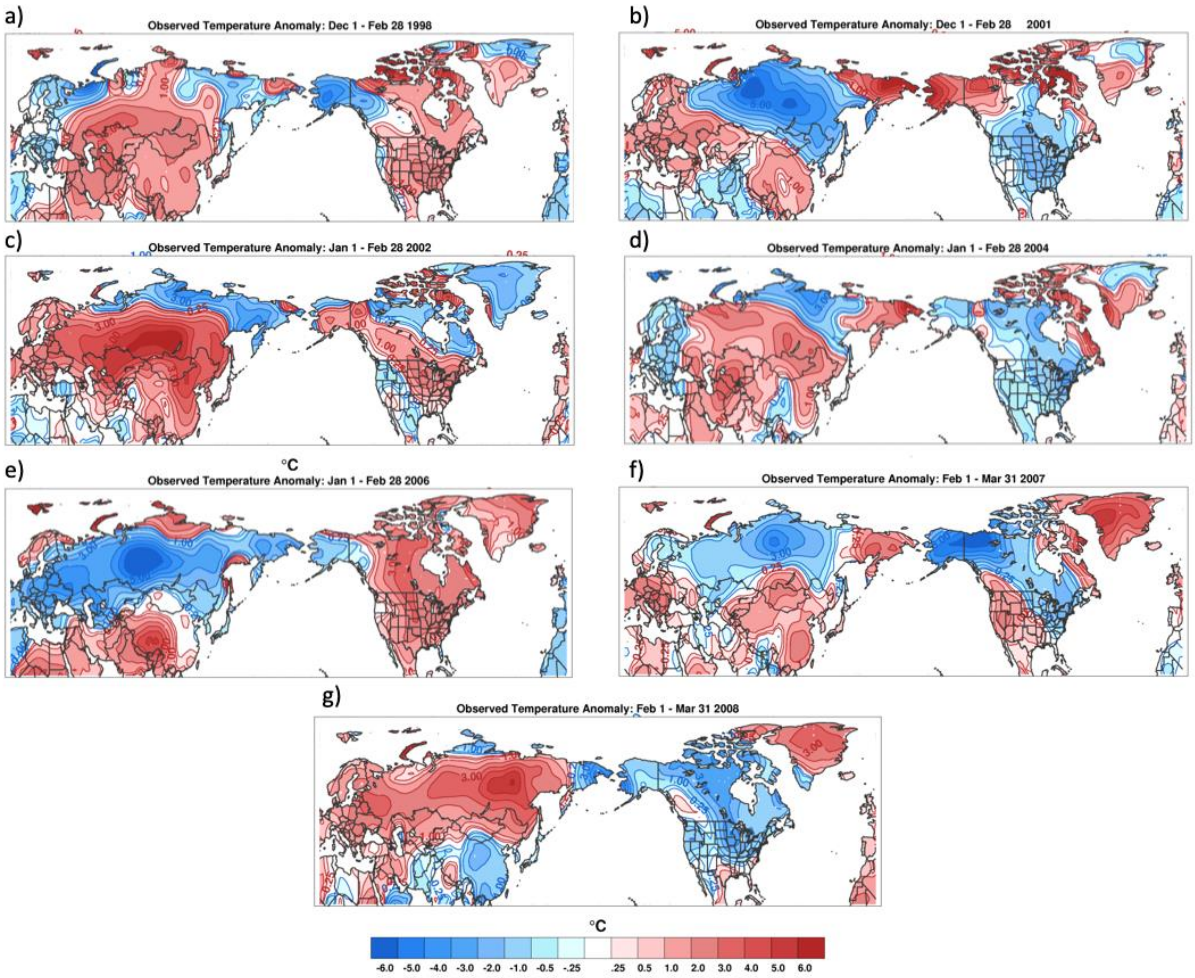


Figure iii. Observed surface temperature anomalies (shading) for a) December 1 - February 28, 1998 b) December 1 - February 28, 2001, c) January 1 - February 28, 2002,

d) January 1 - February 28, 2004, e) January 1 - February 28, 2006, f) February 1 - March 31, 2007 and g) February 1 - March 31, 2008.

Looking at the surface temperature anomalies during and following all seven stratospheric PV displacements shows more variability. Temperatures across eastern North America are below normal four of seven two or three winter months during and following the stratospheric PV displacement. Temperatures across much of Europe are below normal really only once for the two or three winter months during and following the stratospheric PV displacement. Temperatures across Asia are below normal three of seven two or three winter months during and following the stratospheric PV displacement."

Near Term Conditions

1-5 day

The AO is currently negative **(Figure 1**) with mostly positive geopotential height anomalies across the Arctic and mixed geopotential height anomalies across the mid-latitudes of the NH (**Figure 2**). And with mostly negative geopotential height anomalies across Greenland (**Figure 2**), the NAO is positive.

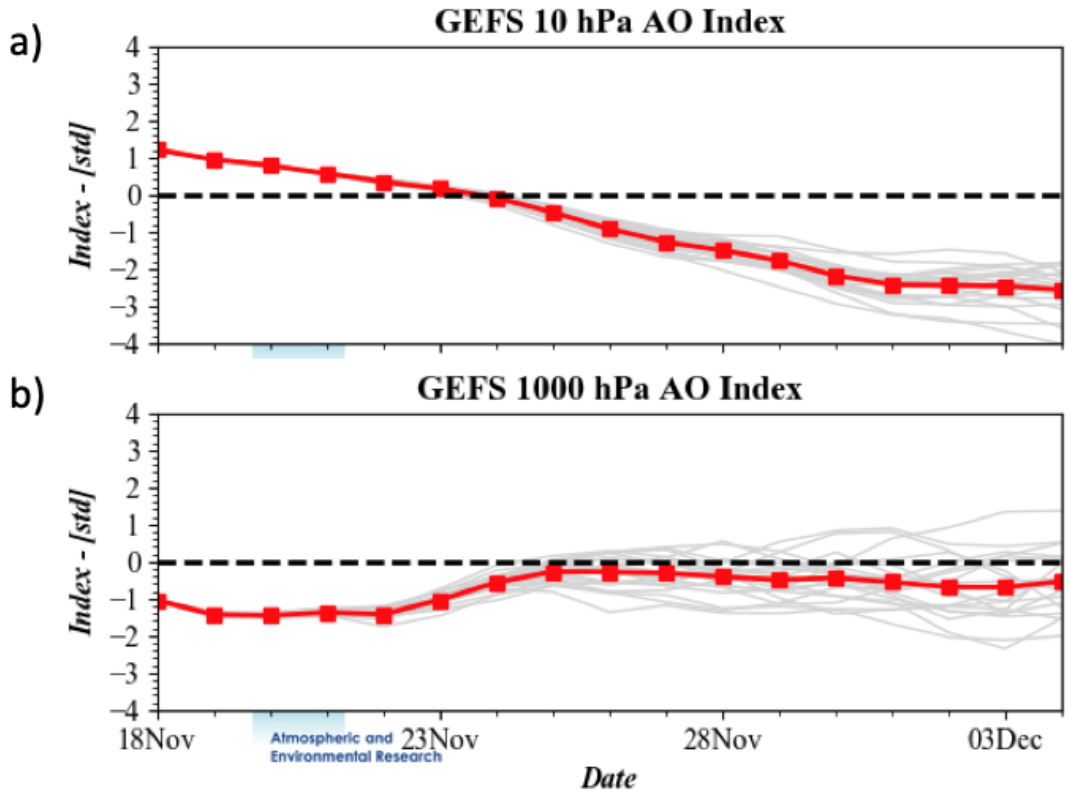


Figure 1. (**a**) The predicted daily-mean AO at 10 hPa from the 00Z 18 November 2019 GFS ensemble. (**b**)The predicted daily-mean near-surface AO from the 00Z 18 November 2019 GFS ensemble. Gray lines indicate the AO index from each individual ensemble member, with the ensemble-mean AO index given by the red line with squares.

This week ridging/positive geopotential height anomalies in the central North Atlantic are predicted to force downstream troughing/negative geopotential height anomalies across Western Europe with more ridging/positive geopotential height in Western Asia (**Figure 2**). This will result in normal to below temperatures across Western Europe including the UK under northerly flow and normal to above normal temperatures across Eastern Europe under southwesterly flow (**Figure 3**). This week ridging/positive geopotential height anomalies are predicted to dominate much of Western and Southern Asia with normal to above normal temperatures including the Middle East and Southeast Asia (**Figure 2**). Meanwhile ridging/positive geopotential height anomalies in the Barents-Kara Seas are forcing troughing/negative geopotential height anomalies with normal to below normal temperatures across much of Siberia and Northeast Asia **(Figure 3**). The Siberian troughing/negative geopotential height anomalies are predicted to trail southwestward bringing normal to below normal temperatures across countries adjacent to the Persian Gulf **(Figure 2 and 3**)**.**

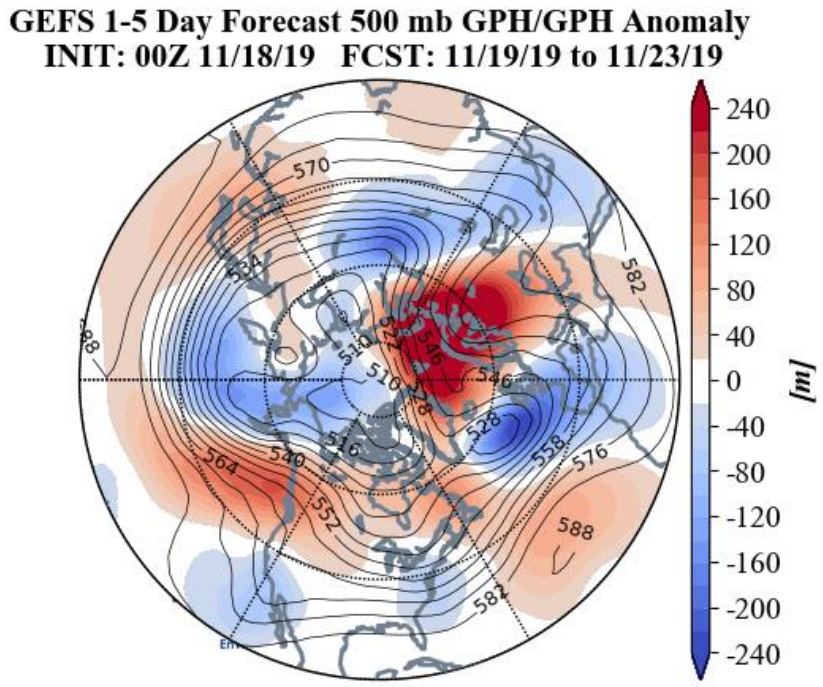


Figure 2. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 19 – 23 November 2019. The forecasts are from the 18 November 00z GFS ensemble.

This week ridging/positive geopotential height anomalies in the Gulf of Alaska and Western Canada are predicted to force downstream troughing/negative geopotential height anomalies in the Eastern US **(Figures 2). This is predicted to result in widespread normal to above normal temperatures in Alaska, much of Canada and the Western US** with normal to below normal temperatures across the Eastern US and in Southeastern Canada mostly in the Saint Lawrence River Valley **(Figures 3).**

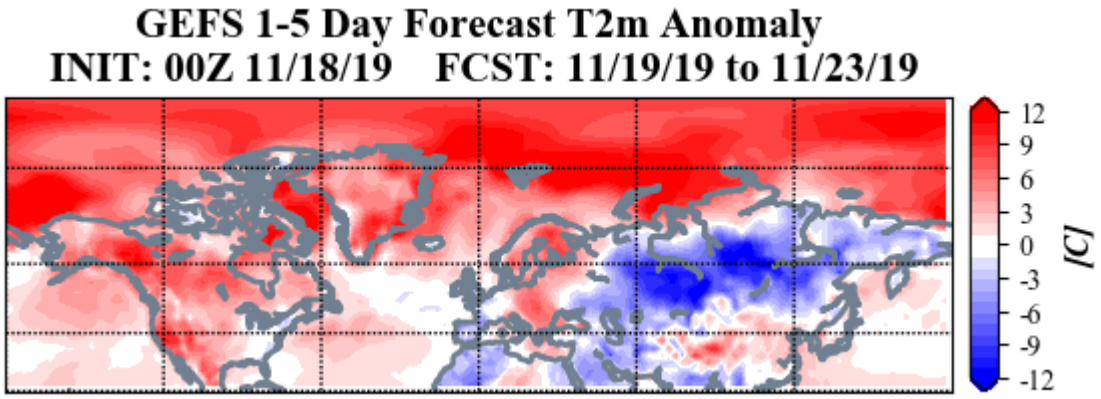


Figure 3. Forecasted surface temperature anomalies (°C; shading) from 19 – 23 November 2019. The forecast is from the 00Z 18 November 2019 GFS ensemble.

Troughing and/or cold temperatures are predicted to bring new snowfall across Siberia, Northwestern Russia, Central Asia, Norway and the Alps (**Figure 4**). However, intrusion of warm air on southerly winds will melt snow in Finland (**Figure 4**). Troughing and cold temperatures are predicted to bring new snowfall to Alaska, Canada, the Rockies and possibly the Northcentral US (**Figure 4**). Warm temperatures will bring some melting to parts of Western Canada (**Figure 4**).

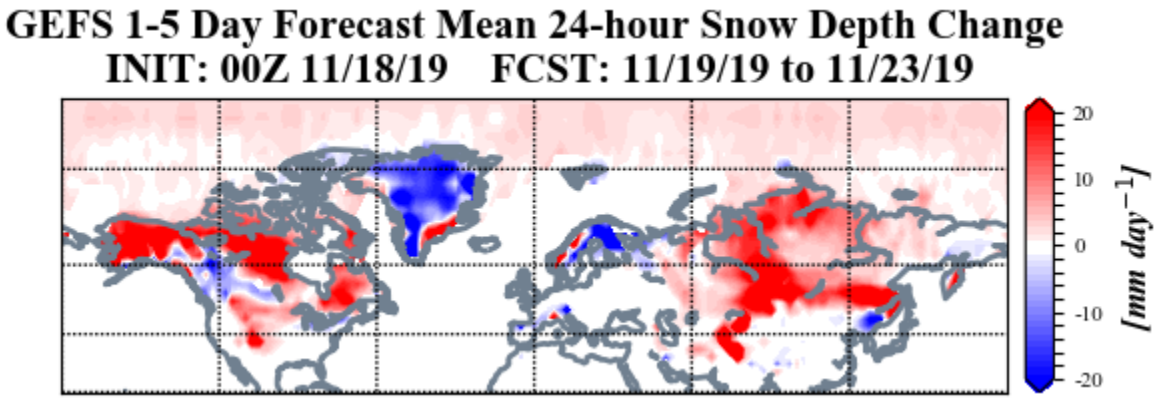


Figure 4. Forecasted snow depth anomalies (mm/day; shading) from 19 – 23 November 2019. The forecast is from the 00Z 18 November 2019 GFS ensemble.

Mid-Term

6-10 day

The AO is predicted to remain neutral to negative this period **(Figure 1**) with mixed geopotential height anomalies across the Arctic and mixed geopotential height anomalies across the mid-latitudes of the NH (**Figure 5**). And with weak positive geopotential height anomalies predicted across Greenland (**Figure 2**), the NAO is predicted to remain near neutral as well.

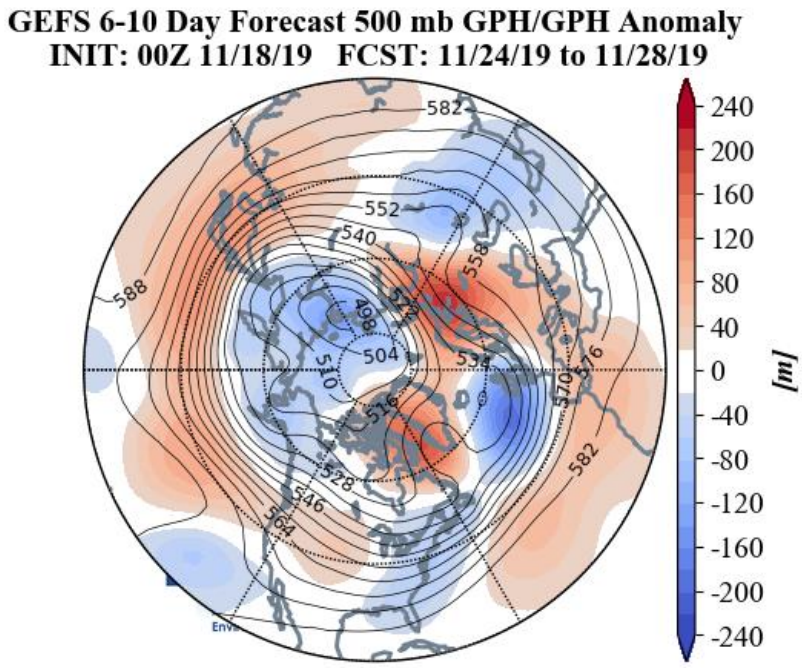


Figure 5. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 24 – 28 November 2019. The forecasts are from the 18 November 00z GFS ensemble.

Predicted troughing/negative geopotential height anomalies for Northwestern Europe with ridging/positive geopotential height anomalies across Southern and Eastern Europe (**Figure 5**) are predicted to promote a westerly flow with relatively mild temperatures across most of Europe including the UK (**Figure 6**). One exception could be far Eastern Europe where some colder air from Siberia is predicted to bleed in from the east (**Figure 6**). Ridging/positive geopotential height anomalies in the Barents-Kara Seas are predicted to continue to force downstream troughing/negative geopotential height anomalies across Siberia that extend southwestward towards the Persian Gulf (**Figure 5**). This is predicted to yield more normal to above normal temperatures for the Middle East and much of Southern and East Asia with normal to below temperatures for Siberia, parts of Northeast Asia, the "Stan' countries and Iran **(Figure 6**).

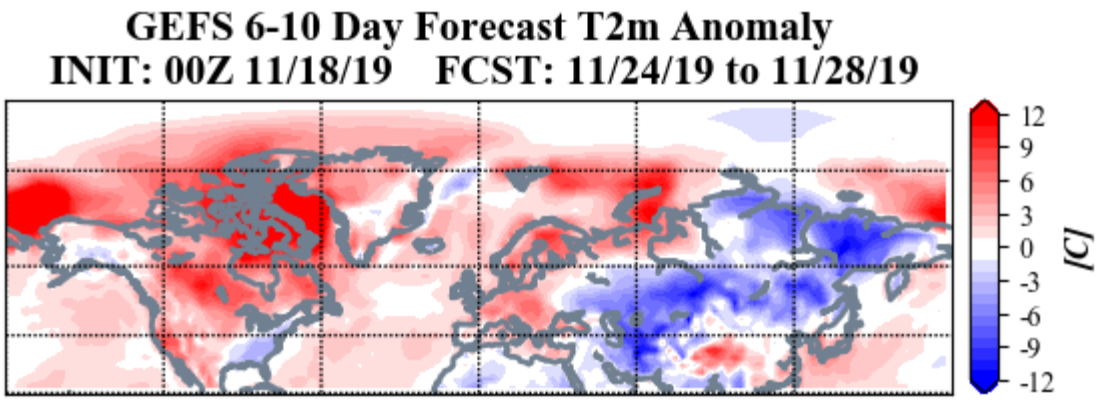


Figure 6. Forecasted surface temperature anomalies (°C; shading) from 24 – 28 November 2019. The forecasts are from the 00Z 18 November 2019 GFS ensemble.

The pattern is predicted to continue transitioning this period with increasing troughing/negative geopotential height anomalies in Alaska and Northwestern Canada while persisting in the Eastern US with ridging/positive geopotential height anomalies in Southwestern and Northeastern Canada and the Western US **(Figure 5).** This pattern is predicted to bring normal to above normal temperatures across much of Canada and the Western US with normal to below normal temperatures In Alaska and the Eastern US **(Figure 6).**

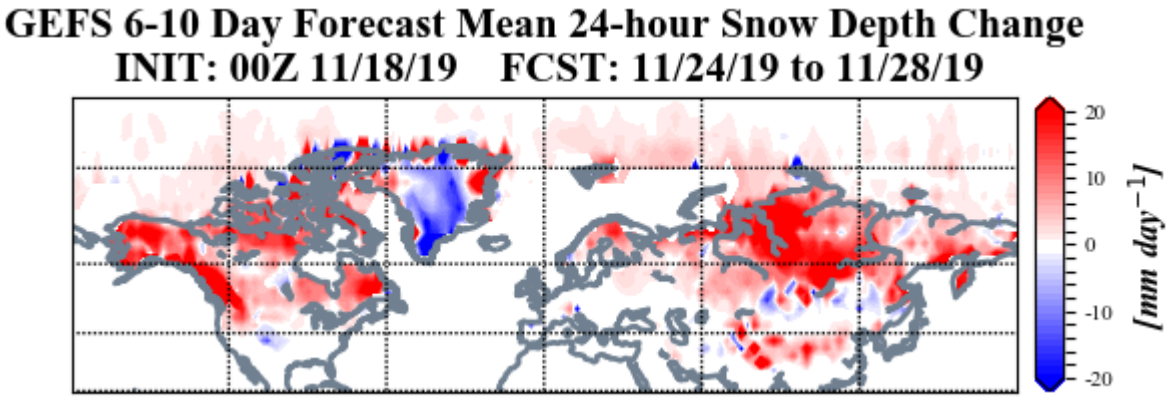


Figure 7. Forecasted snow depth changes (mm/day; shading) from 24 – 28 November 2019. The forecasts are from the 00Z 18 November 2019 GFS ensemble.

Troughing and/or cold temperatures will support the potential for new snowfall across much of Siberia, Scandinavia, Northwest Russia, the Tibetan Plateau, Central China, Northeast Asia, Alaska, Canada and the Northwestern US (**Figure 7**). Some snowmelt is predicted in the US Central Plains (**Figure 7**).

11-15 day

With mixed geopotential height anomalies predicted for the Arctic and the mid-latitudes (**Figure 8**), the AO is predicted to remain negative to neutral yet again this period (**Figure 1**). With predicted weak positive pressure/geopotential height anomalies across Greenland (**Figure 8**), the NAO is likely to remain close to neutral this period as well.

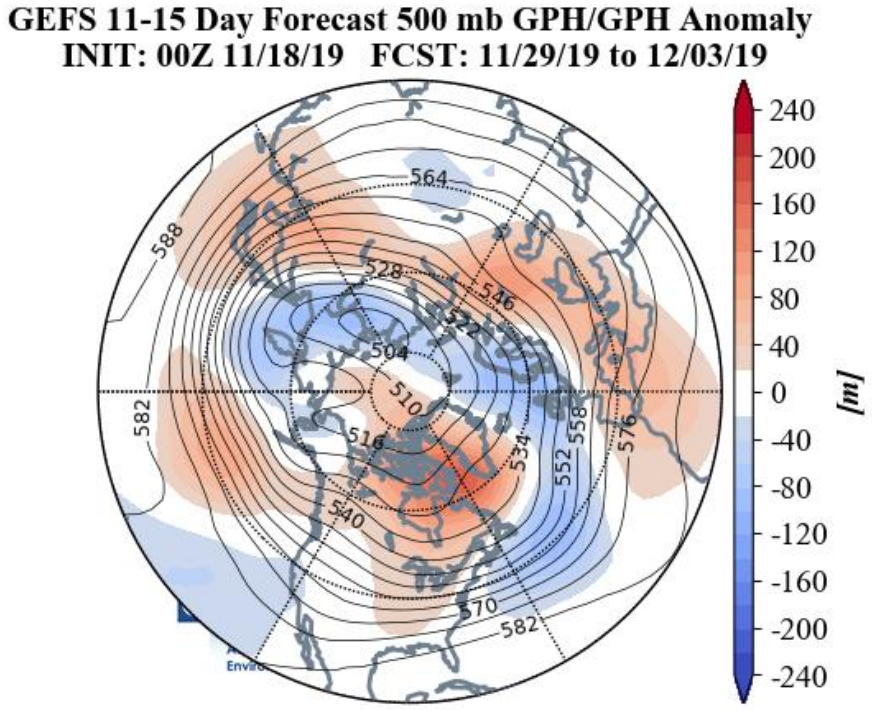


Figure 8. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 29 November – 3 December 2019. The forecasts are from the 18 November 00z GFS ensemble.

Troughing/negative geopotential height anomalies across Northern Europe with ridging/positive geopotential height anomalies across Southern Europe (**Figures 8**) should persist a westerly flow with relatively mild temperatures across all of Europe including the UK this period with the possible exception of Norway (**Figures 9**). Mild, westerly flow across Europe will begin to bring warmer temperatures to Western Russia (**Figure 9**). However, troughing/negative geopotential height anomalies are predicted to persist across much of Siberia and Central Asia with above normal geopotential heights in Southeastern and Southwestern Asia (**Figure 8**). This pattern favors normal to above normal temperatures across Southern, Western and Southeast Asia including the Middle East and the Indian subcontinent with normal to below normal temperatures widespread across Siberia and the "Stan' countries (**Figure 9**).

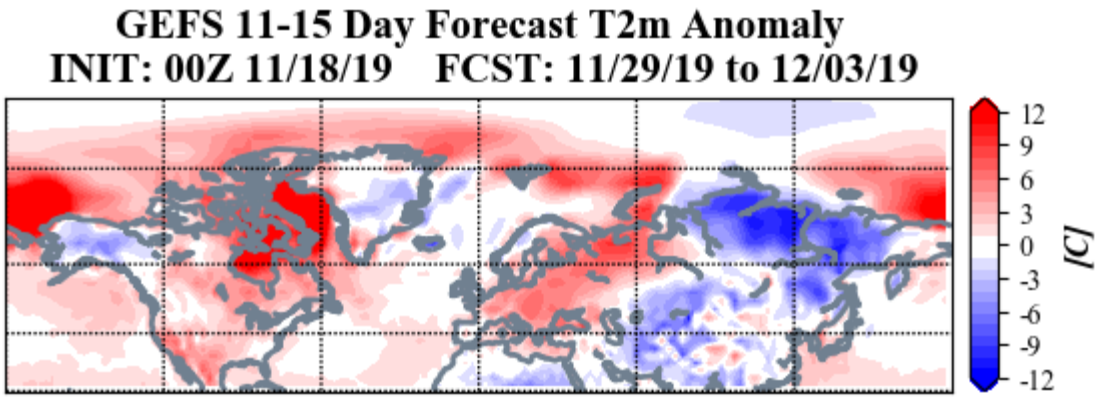


Figure 9. Forecasted surface temperature anomalies (°C; shading) from 29 November – 3 December 2019. The forecasts are from the 18 November 00z GFS ensemble.

Troughing/negative geopotential height anomalies are predicted to persist across Alaska and the Western US with ridging/positive geopotential height anomalies across much of Canada and the Eastern US (**Figure 8**). This is predicted to favor widespread normal to above normal temperatures across Canada and the US below normal temperatures confined to Alaska and Northwestern Canada (**Figure 9**). The ECMWF model is predicting more widespread cold temperatures across the US this period with ridging/positive geopotential height anomalies in the Gulf of Alaska forcing more amplified downstream troughing/negative geopotential height anomalies in the US.

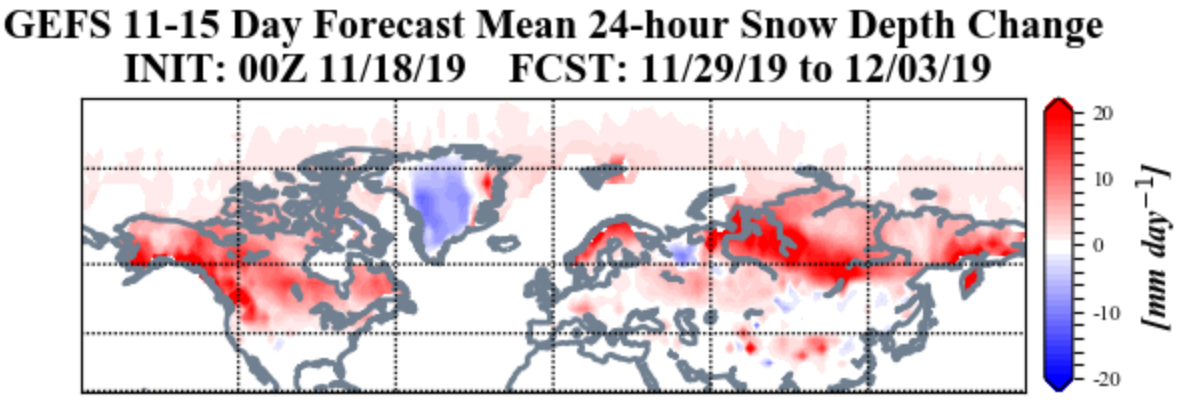


Figure 10. Forecasted snow depth changes (mm/day; shading) from 29 November – 3 December 2019. The forecasts are from the 00z 18 November GFS ensemble.

Troughing and/or cold temperatures will support new snowfall across much of Siberia, Western Russia, Central Asia, Scandinavia and possibly parts of Eastern Europe and the Baltic States, Alaska, much of Canada the Northwestern US and possibly the Northeastern US (**Figure 10**).

Longer Term

30–day

The latest plot of the polar cap geopotential height anomalies (PCHs) currently shows normal to below normal PCHs in the stratosphere and normal to above normal PCHs in the troposphere (**Figure 11**). However, the stratospheric PCHs are predicted to turn above normal next week, a sign of a sudden stratospheric warming (SSW).

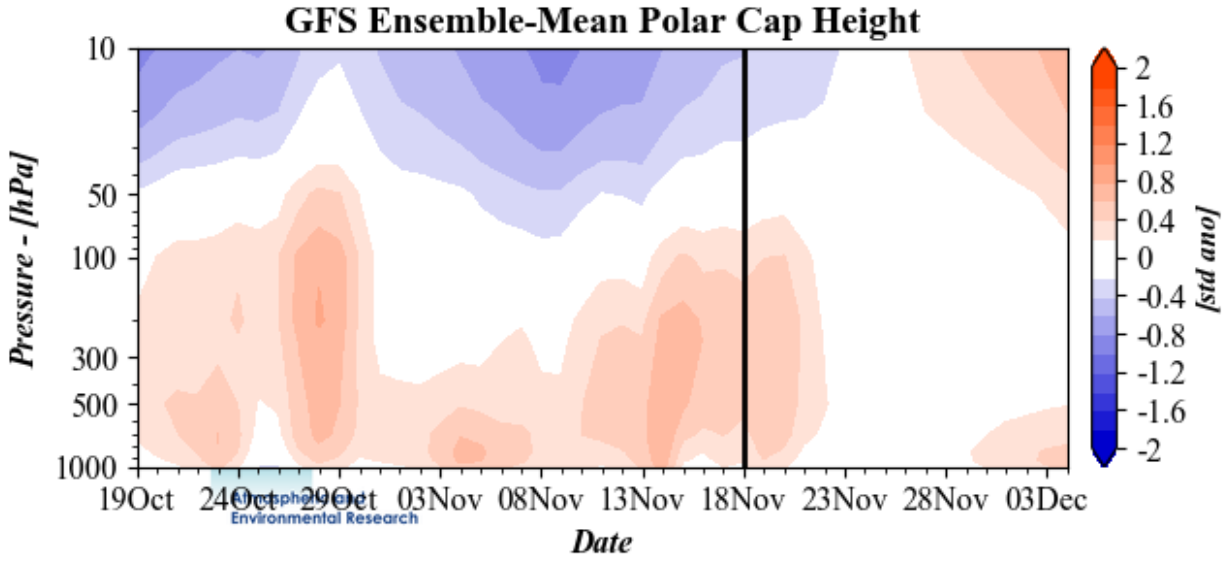


Figure 11. Observed and predicted daily polar cap height (i.e., area-averaged geopotential heights poleward of 60°N) standardized anomalies. The forecasts are from the 00Z 18 November 2019 GFS ensemble.

The plot of Wave Activity Flux (WAFz) or poleward heat transport shows a relatively active upcoming two-week period (**Figure 12**). Though not shown, the ensemble spread of the WAFz shows large uncertainty in the forecast, therefore the amplitude of the predicted WAFz could greater (or less) than shown.

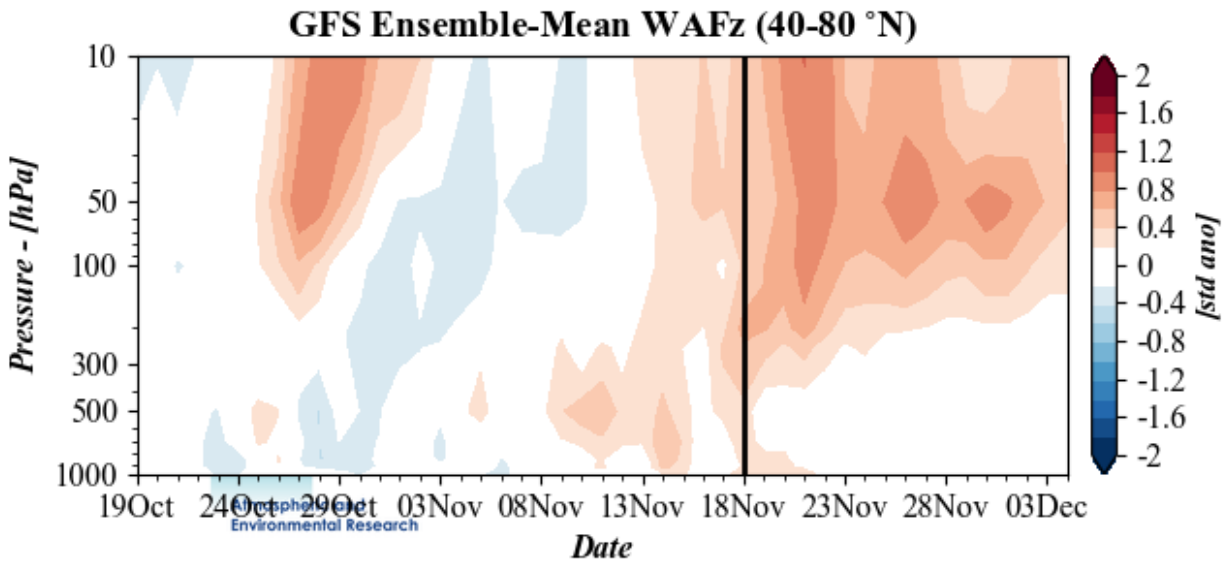


Figure 12. Observed and predicted daily vertical component of the wave activity Wux (WAFz) standardized anomalies, averaged poleward of 40-80°N. The forecast is from the 00Z 18 November 2019 GFS ensemble.

The stratospheric AO is currently positive (**Figure 1**) reflective of a strong PV. However, in response to the positive WAFz predicted over the next two weeks, the stratospheric AO is predicted to continuously trend negative and could be in strong negative territory by the first week of December (**Figure 1**).

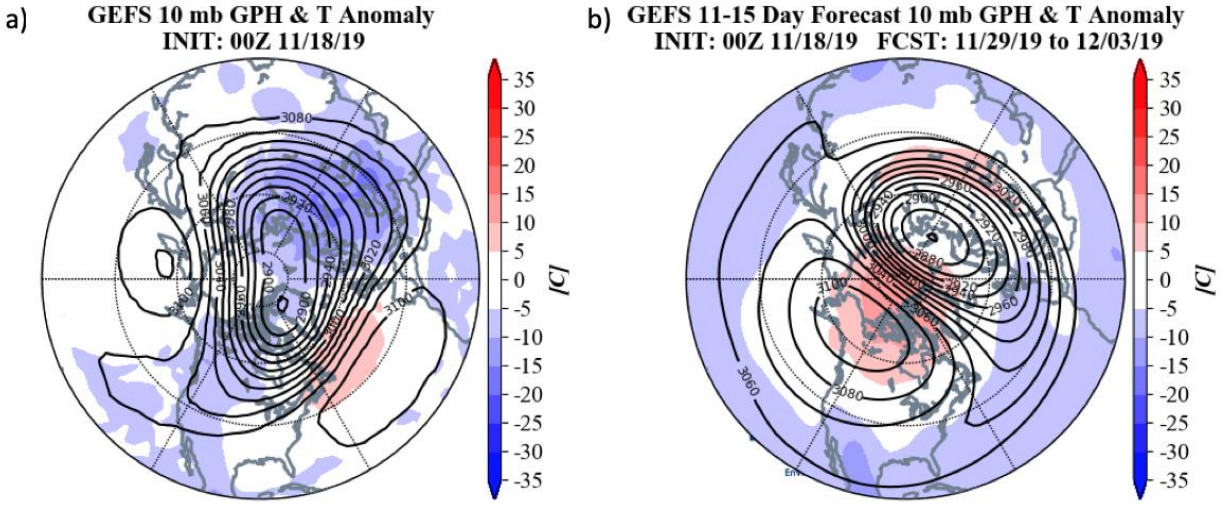


Figure 13. (**a**) Analyzed 10 mb geopotential heights (dam; contours) and temperature anomalies (°C; shading) across the Northern Hemisphere for 18 November 2019. (**b**)

Same as (a) except forecasted averaged from 29 November – 3 December 2019. The forecasts are from the 00Z 18 November 2019 GFS operational model.

Despite the strong circulation around the PV center and relatively low heights, the PV is not circular in shape but rather elongated (**Figure 13**). The counterclockwise flow around the PV center is bringing northerly flow to North America rather than westerly flow more common with a strong PV with a more circular configuration (**Figure 13)**. The northerly flow is supportive of the current cold temperatures in eastern North America.

Currently there is warming and a ridge in the North Atlantic sector of the stratosphere (**Figure 13).** But over time the new WAFz pulses are predicted to cause warming and new ridging centered over Alaska with relatively warm temperatures widespread across the Arctic (**Figure 13)**. Also, the PV center is predicted to be displaced towards northwest Eurasia next week and into early December. The displacement of the PV center towards Northwest Asia is likely contributing to a tropospheric reflection, where low heights are predicted to form across Northern Siberia (e.g., **Figure 8**). The displacement of the stratospheric PV towards Eurasia is usually the first sign of a more significant PV disruption.

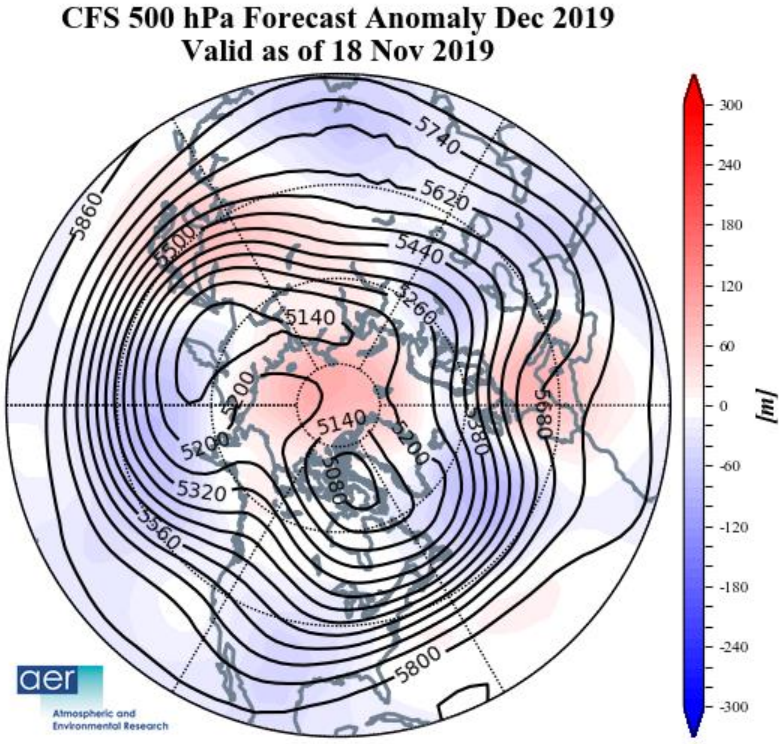


Figure 14. Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere for December 2019. The forecasts are from the 18 November 2019 CFS.

I include in this week's blog the monthly 500 hPa geopotential heights (**Figure 14**) and the surface temperatures (**Figure 15**) forecast for December from the Climate Forecast System (CFS; the plots represent yesterday's four ensemble members). The forecast for the troposphere is ridging across most of the Arctic, Western Europe, East Asia, Alaska and Western Canada with troughs over Greenland and Iceland, Western Asia, Eastern Siberia, the Dateline, and the Central US (**Figure 14).** This pattern favors relatively mild temperatures for much of Europe, Central Asia, most of Canada and the US with seasonable to relatively cold temperatures for Siberia, Northeast Asia, possibly Western Alaska and the Southeastern US (**Figure 15**). Though the CFS is predicting a negative AO consistent with the predicted SSW, the CFS may be unpredicting the cold related to the forecasted SSW. The CFS has also shown little consistency from run to run.

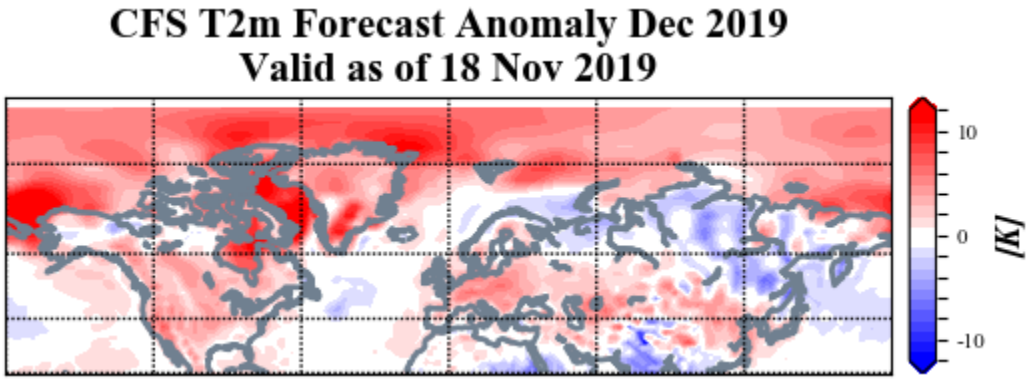


Figure 15. Forecasted average surface temperature anomalies (°C; shading) across the Northern Hemisphere for December 2019. The forecasts are from the 18 November 2019 CFS.

Surface Boundary Conditions

Arctic sea ice extent

Arctic sea ice growth rate has accelerated but remains well below normal. Large negative sea ice anomalies exist in three regions: the Chukchi-Beaufort, west of Greenland and Barents-Kara Seas. The anomalies in the North Pacific sector have emerged as the most well below normal (**Figure 16**), however, based on model forecasts sea ice in the Chukchi-Beaufort Seas may grow more quickly in the next two weeks. Below normal sea ice in and around Greenland and the Canadian Archipelagos may favor a negative winter NAO. Based on recent research low sea ice anomalies in the Chukchi and Bering seas favors cold temperatures in central and eastern North America while low sea ice in the Barents-Kara seas favor cold temperatures in Central and East Asia, however this topic remains controversial. Recent research has shown that 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.

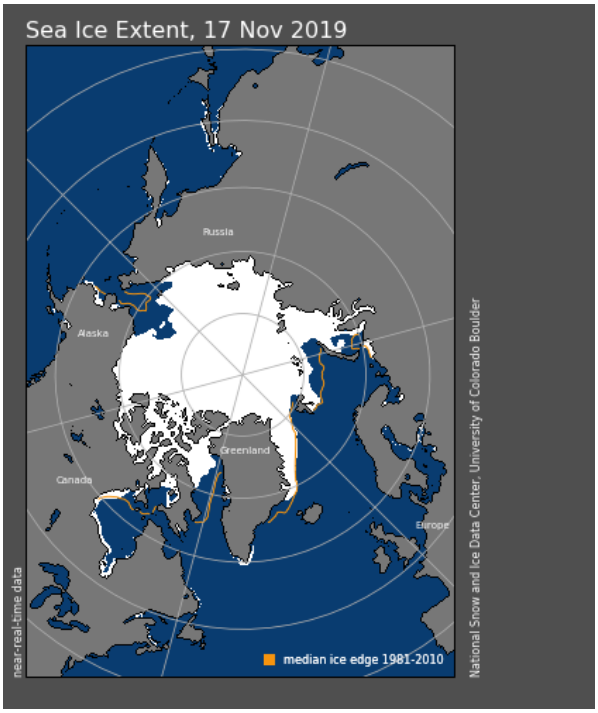


Figure 16. Observed Arctic sea ice extent on 17 November 2019 (white). Orange line shows climatological extent of sea ice based on the years 1981-2010. Image courtesy of National Snow and Ice Data Center (NSIDC). Snow and Ice Data Center (NSIDC).

SSTs/El Niño/Southern Oscillation

Equatorial Pacific sea surface temperatures (SSTs) anomalies have cooled and Neutral El Niño/Southern Oscillation (ENSO) conditions seem most likely (**Figure 17**). Observed SSTs across the NH remain well above normal especially near Alaska and along the north slope of Asia though below normal SSTs exist regionally especially west of South America. Warm SSTs around Alaska may favor mid-tropospheric ridging in the region this upcoming winter.

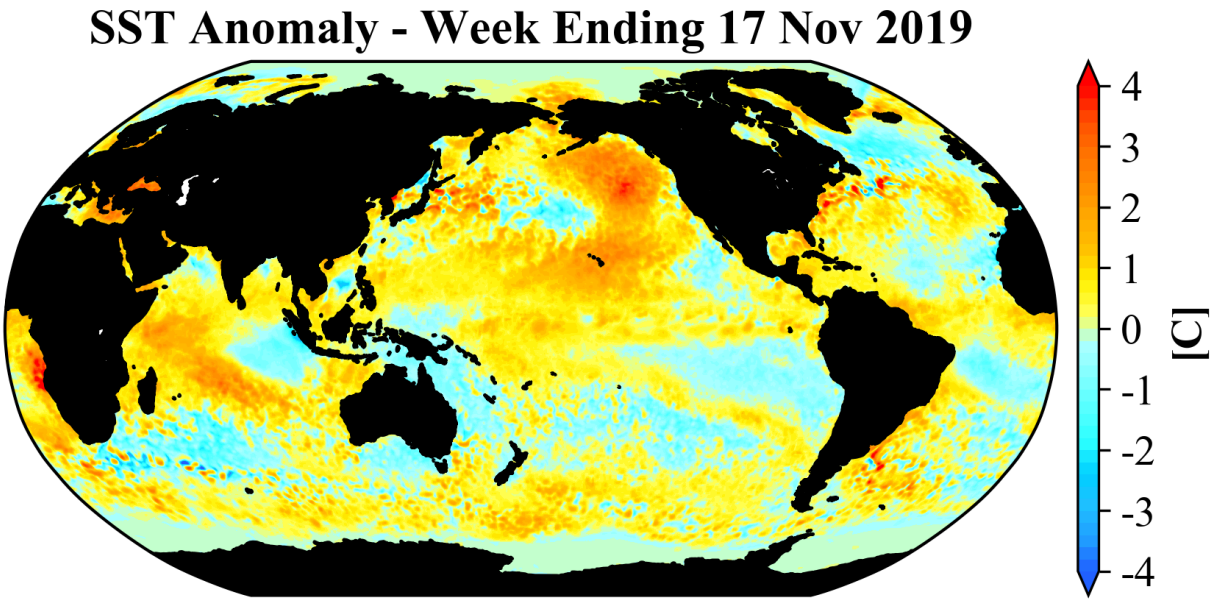


Figure 17. The latest weekly-mean global SST anomalies (ending 17 November 2019). Data from NOAA OI High-Resolution dataset.

Currently the Madden Julian Oscillation (MJO) is in phase 8 (**Figure 18**). The forecasts are for the MJO to slowly transition to phase 1 and then to where no phase is favored over the next two weeks. Some MJO influence is possible across North American weather in the forecast period as theses phases favor high latitude blocking and troughing in the US transitioning to ridging in the Eastern US and troughing in the Western US.

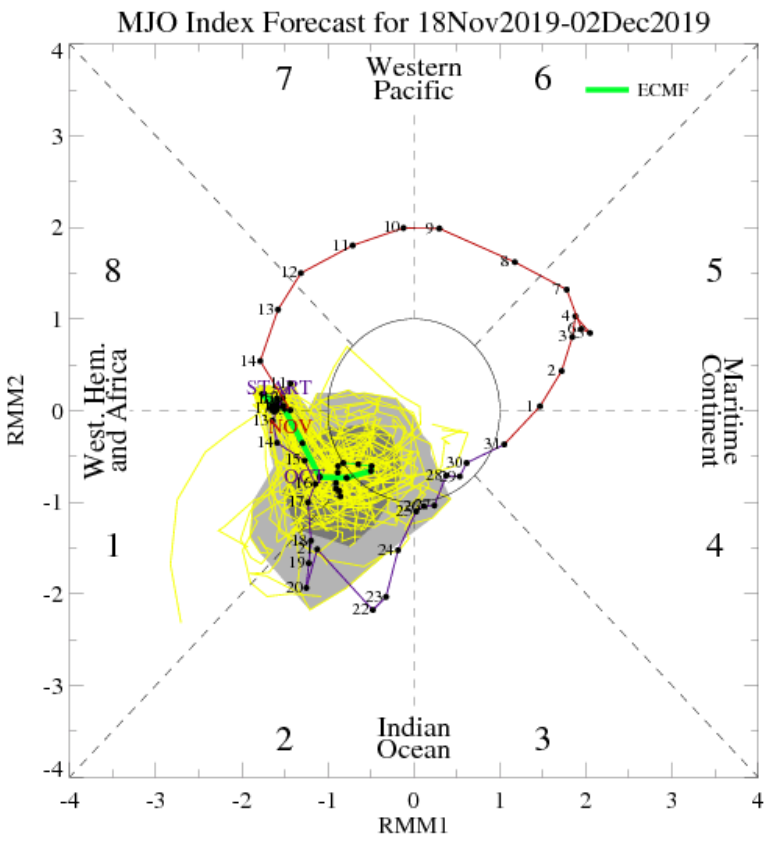


Figure 18. Past and forecast values of the MJO index. Forecast values from the 00Z 18 November 2019 ECMWF model. Yellow lines indicate individual ensemble-member forecasts, with the green line showing the ensemble-mean. A measure of the model "spread" is denoted by the gray shading. Sector numbers indicate 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

Northern Hemisphere Snow Cover

Snow cover advance continues its climb across Eurasia and is currently near decadal averages. Snow cover will likely continue to advance especially across East Asia next week as troughing and cold temperatures spread across the region. Above normal snow cover extent in October, favors a strengthened Siberian high, cold temperatures across northern Eurasia and a weakened polar vortex/negative AO this upcoming winter followed by cold temperatures across the continents of the NH.

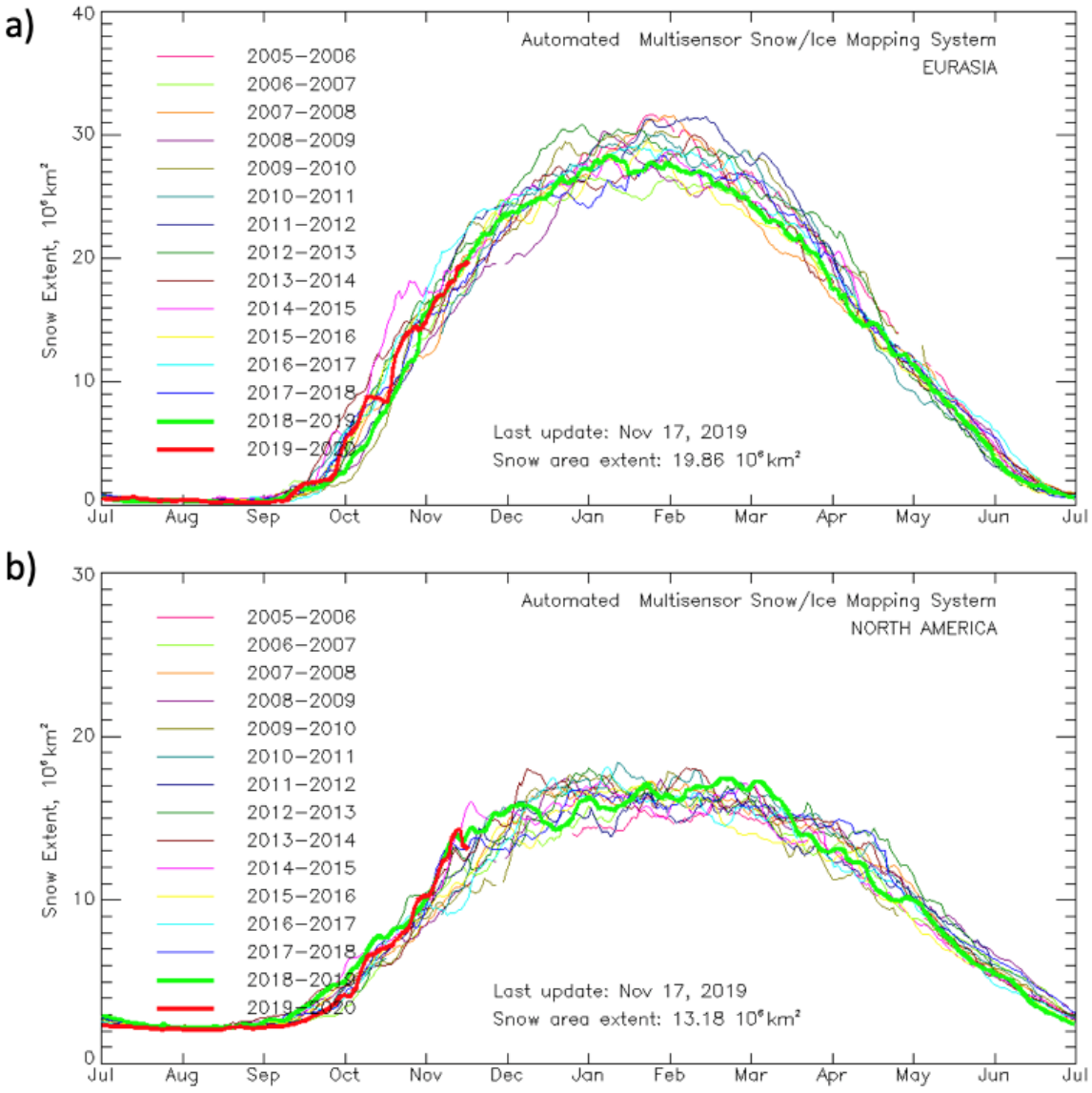


Figure 19. Observed Eurasian (top) and North American (bottom) snow cover extent through 17 November 2019. Image source: https://www.star.nesdis.noaa.gov/smcd/emb/snow/HTML/snow_extent_plots.html

North American snow cover melted back from decadal highs and is comparable to last year at this time. The early advance of snow cover across Canada this fall, has likely contributed to an early start of cold temperatures across the Western US and now Eastern US. However snow cover advance could slow with predicted milder temperatures.