

January 28, 2019

***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](#)). 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.

With transition to a fall/winter schedule, postings are once every week. Precipitation forecasts will be replaced by snow accumulation forecasts along with more 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 neutral and is predicted to remain in a tight range between moderately negative to neutral for the next two weeks.
- The current neutral AO is reflective of mixed pressure/geopotential height anomalies across the Arctic and mixed pressure/geopotential height anomalies across the mid-latitudes. The North Atlantic Oscillation (NAO) is currently slightly positive with mixed pressure/geopotential height anomalies across Greenland and positive pressure/geopotential height anomalies across the mid-latitudes of the North Atlantic and is predicted to trend negative as height anomalies turn mostly positive across Greenland over the next two weeks.
- Ridging/positive geopotential height anomalies centered south of Iceland and Greenland are forcing troughing/negative geopotential height anomalies across much of Europe and over the next two weeks, though the trough is predicted to fill and weaken with time. This pattern is predicted to bring seasonable to below normal temperatures to Western Europe including the United Kingdom (UK) while southwesterly winds will bring normal to above normal temperatures to Eastern Europe over the next two weeks.
- Ridging/positive geopotential height anomalies centered in Western Russia and in the Barents-Kara Seas will force troughing/negative geopotential height

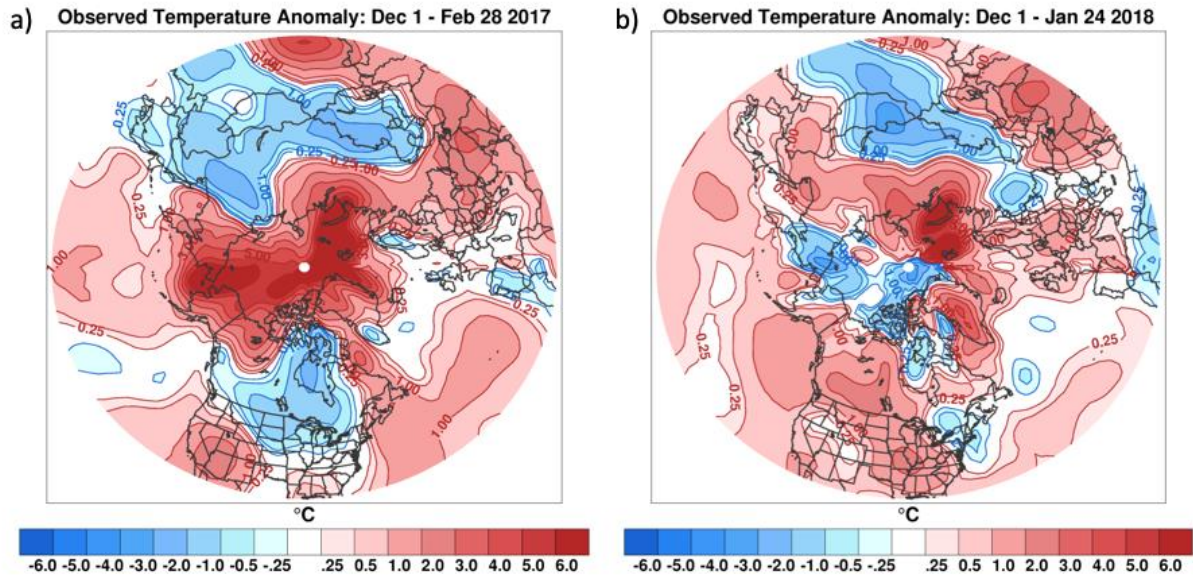
anomalies and relatively cold temperatures downstream across Siberia and into Northeast Asia over the next two weeks. Also, ridging/positive geopotential height anomalies is predicted with relatively mild temperatures across Southern Asia including the Middle East and Southeast Asia. Regional troughing/negative geopotential height anomalies across the northern India subcontinent are predicted to result in normal to below normal temperatures across Northern India and Pakistan.

- This week ridging/positive geopotential height anomalies centered along the West Coast of North America and mild temperatures are forcing troughing/negative geopotential height anomalies and relatively cold temperatures across eastern North America. However, the pattern is predicted to flip for next week with troughing/negative geopotential height anomalies and colder temperatures for western North America and ridging/positive geopotential height anomalies with milder temperatures for eastern North America including the Eastern United States (US).
- In the Impacts section, I discuss the implications for the surprisingly cold Arctic this winter.

### ***Impacts***

Trying to understand and predict the weather is continuously humbling – just when you feel that you figured a new phenomenon out or take a certain outcome as a given, Mother Nature throws you a surprise. I can appreciate that the public and the media do not consider it newsworthy when the Arctic and Siberia are cold in winter. But I strongly believe that these two regions are on the frontlines of climate change and temperature swings in these regions have implications for the weather across the Northern Hemisphere.

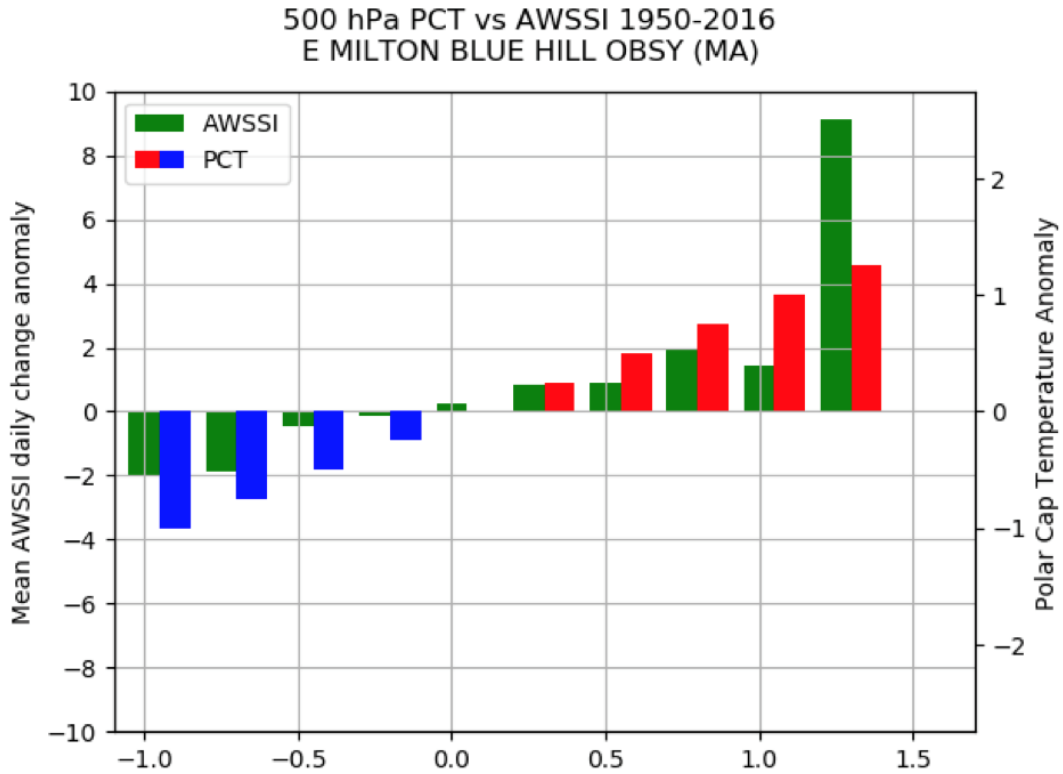
The Arctic has been the “canary in the coal mine” about the impacts of climate change with the greatest warming across the globe observed in the Arctic and the dramatic retreat of sea ice and even warm season snow cover recorded by satellites. The Arctic has warmed at least as twice as fast as any other region of the globe and the accelerating warming of the Arctic relative to the rest of the globe but especially the Northern Hemisphere (NH) mid-latitudes is known as Arctic amplification. The cause of Arctic amplification is surprisingly complex and not well understood but the cause is at least partially related to Arctic sea ice and snow cover melt. Certainly, heading into this winter, I was very confident that we would observe an anomalously warm Arctic this winter especially coming off of last winter where the Arctic was record warm (see **Figure i**) and sea ice was record low extent.



**Figure i.** a) Observed surface temperature anomalies ( $^{\circ}\text{C}$ ; shading) from 1 December 2017 - 28 February 2018 and b) Observed surface temperature anomalies ( $^{\circ}\text{C}$ ; shading) from 1 December 2018 - 24 January 2019.

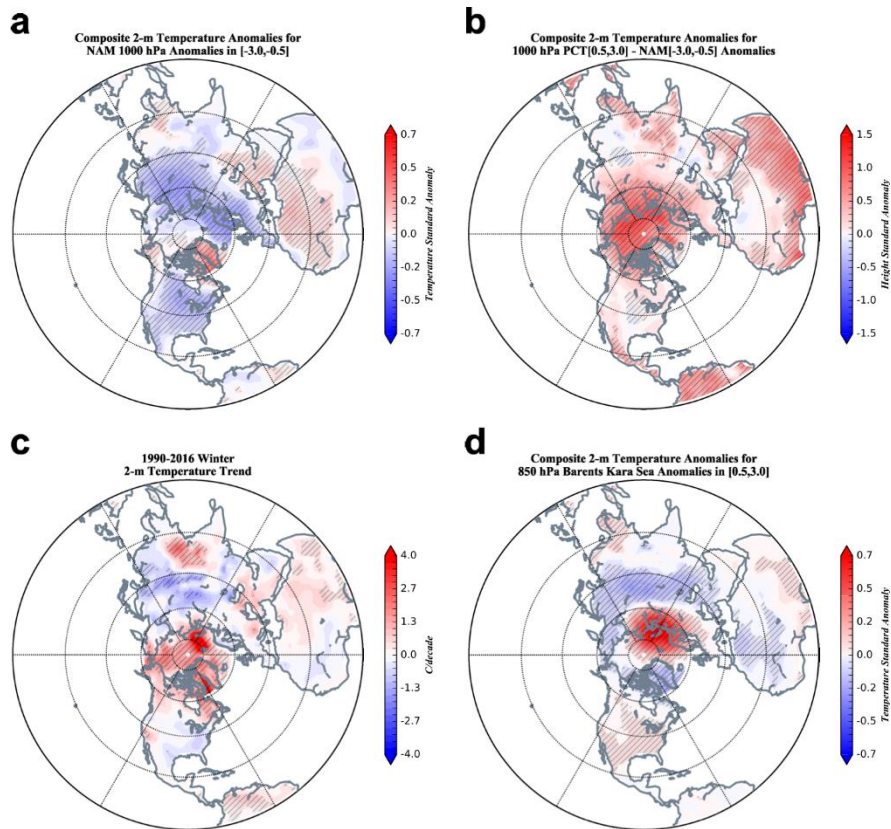
But the Arctic was surprisingly cold last summer that prevented a new record low minimum for sea ice extent in September. Since then it has been at least strategically cold in regions across the Arctic this fall and winter that allowed sea ice to grow more extensive this winter in the Arctic basin compared to recent winters except in the Barents-Kara Seas. But even more surprising to me has been how cold the Arctic has consistently been this winter, especially when compared to recent winters. The only region in the Arctic Ocean basin that has been consistently warm is the Barents-Kara Seas (**Figure i**).

When I published my paper on Arctic warming and severe winter weather in the US ([Cohen et al. 2018](#)) I was certainly hoping that this winter would support or at least be consistent with those findings. I think the winter so far has been consistent with those findings, but not as I expected heading into this winter. I already showed that for many Northeastern cities the frequency of severe winter weather increases as the Arctic warms using Boston as an example (**Figure ii**). I do think that the lack of snowfall in the Northeastern cities, the transient only cold is tied to the relatively cold Arctic basin. Prior to the winter I was telling anybody who would listen that we are living the golden era of nor'easters and I do think the warm Arctic has been at least partially responsible. But this has not been the case this winter so far and is contributing to the snow drought in the I95 corridor.



**Figure ii.** The departure from the winter average in daily change in the AWSSI (Accumulated Winter Season Severity Index see <https://mrcc.illinois.edu/gismaps/awssi.htm>) for Blue Hills (near Boston) with corresponding polar cap temperature at 500 hPa during December - February.

But also shown in the paper are NH temperature anomalies when the Arctic warming is mostly confined to the Barents-Kara Seas. It is cold in Central Asia but warm in the Eastern US (**Figure iiid**). So far this winter temperature anomalies have been consistent with Arctic warming mostly focused in the Barents-Kara Seas.



**Figure iii.** Arctic amplification is more closely associated with polar cap temperature than annular mode or warming in the Barents–Kara seas. **a** Surface temperature anomalies associated with the negative phase of the AO, **b** difference in surface temperature anomalies associated with positive polar cap temperatures at 1000 hPa and the negative AO, **c** Northern Hemisphere surface temperatures trends in era of Arctic amplification (1990–2016), **d** association between surface temperature anomalies across the NH and in the Barents–Kara seas. Climatological averages computed over the period 1981–2010. Note differences in scales. Hatching in all figures represents those values found to be statistically significant above 95%.

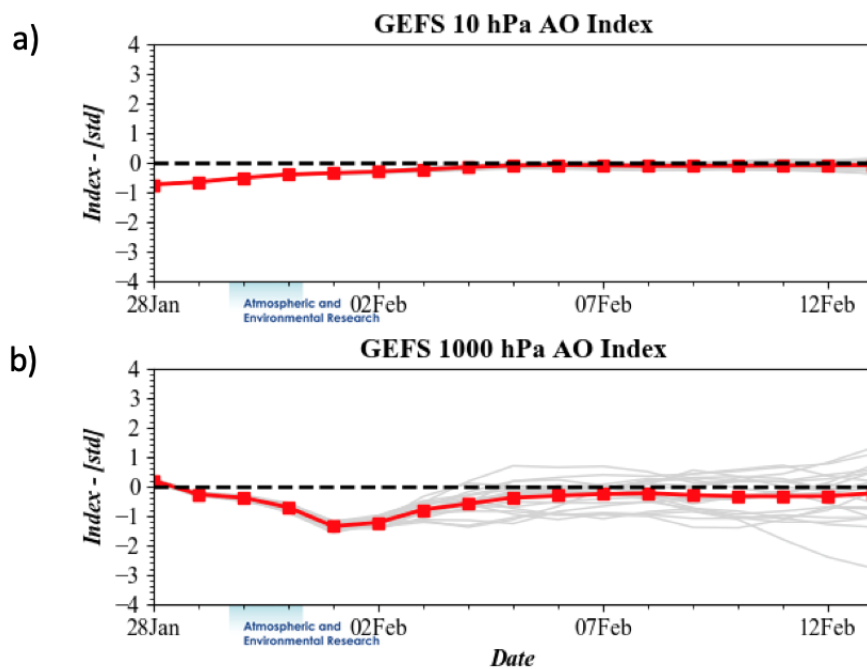
In last week's blog I discussed that the temperatures in the stratosphere were suggestive of cold temperatures focused in Siberia and western North America. This idea is now being predicted by the weather models. However as can be seen by the temperature forecasts below, the warming in the tropospheric Arctic is predicted to become more focused across Greenland with time. This would be more consistent with **Figure iii.a**. The models are predicting more extensive cold across the NH heading into the second week of February consistent with **Figure iii.a**. So even though February is predicted to start mild in the Eastern US, I do expect at least periodic return of cold temperatures to the Eastern US most likely to coincide with future dripping of positive polar cap geopotential height anomalies from the lower stratosphere to the surface in the coming weeks.

Today I mostly concentrated on the Arctic, but I do plan to discuss Siberia later in the winter.

### ***Near Term Conditions***

1-5 day

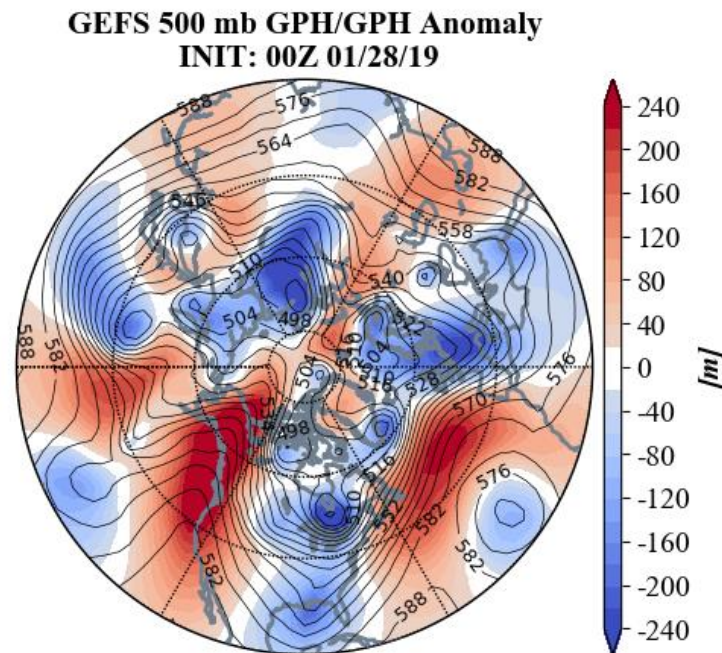
The AO is currently neutral (**Figure 1**), with mixed geopotential height anomalies across the Arctic (**Figure 2**). Geopotential height anomalies are mixed across Iceland and Greenland but positive across the mid-latitudes of the North Atlantic (**Figure 2**) and therefore the NAO is positive.



**Figure 1.** (a) The predicted daily-mean AO at 10 hPa from the 00Z 28 January 2019 GFS ensemble. (b) The predicted daily-mean near-surface AO from the 00Z 28 January 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.

Currently ridging/positive geopotential height anomalies centered south of Iceland and Greenland (**Figure 2**) are forcing troughing/negative geopotential height anomalies downstream across much of Europe with the greatest negative departures focused across Western Europe (**Figure 3**). With low heights and mostly northerly flow of air dominating, normal to below normal temperatures are widespread across Western Europe including the UK while southwesterly winds are bringing normal to above normal temperatures for Eastern Europe (**Figure 3**). Ridging/positive geopotential height anomalies in Western Russia and the Barents-Kara Seas are forcing troughing/negative

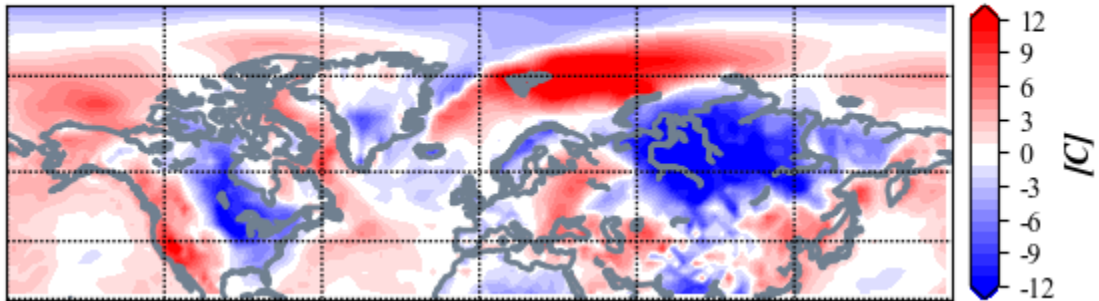
geopotential height anomalies downstream across all of Siberia and into Northeast Asia with ridging/positive geopotential height anomalies widespread across Southern Asia (**Figure 2**). This pattern is predicted to yield widespread normal to below normal temperature for Siberia and Northeast Asia with normal to above normal temperatures across Western Russia and much of Southern Asia including the Middle East and Southeast Asia (**Figure 3**). However, regional troughing/negative geopotential height anomalies across the northern India subcontinent (**Figure 2**), are predicted to result in normal to below normal temperatures across Northern India and Pakistan (**Figure 3**).



**Figure 2.** Observed 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) for 00Z 28 January 2019.

Ridging/positive geopotential height anomalies across Alaska, the Gulf of Alaska and the West Coast of North America are forcing downstream troughing/negative geopotential height anomalies across eastern North America (**Figure 2**). This pattern is predicted to result in normal to above normal temperatures for Alaska, Western Canada and the Western US with normal to below normal temperatures for Eastern Canada and the Eastern US (**Figure 3**).

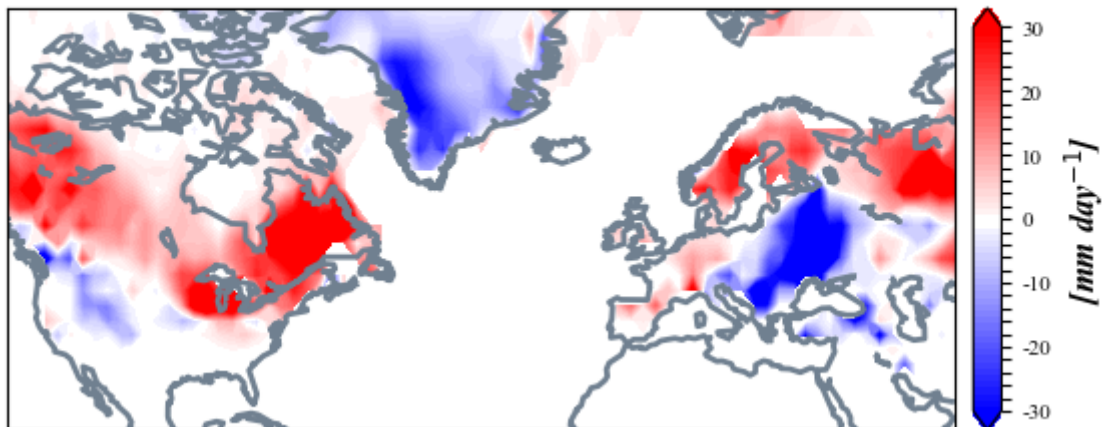
**GEFS 1-5 Day Forecast T2m Anomaly**  
**INIT: 00Z 01/28/19 FCST: 01/29/19 to 02/02/19**



**Figure 3.** Forecasted surface temperature anomalies ( $^{\circ}\text{C}$ ; shading) from 29 January– 2 February 2019. The forecast is from the 00Z 28 January 2019 GFS ensemble.

Trouthing and/or cold temperatures will bring widespread new snowfall to Western Europe including the UK, Scandinavia, Northern and Eastern Asia (**Figure 4**). Across North America, troughing and cold temperatures will bring widespread new snowfall across Canada and the Northeastern US (**Figure 4**). Milder temperatures will result in snowmelt across parts of Eastern Europe and the Western US (**Figure 4**).

**GEFS 1-5 Day Forecast Mean 24-hour Snow Depth Change**  
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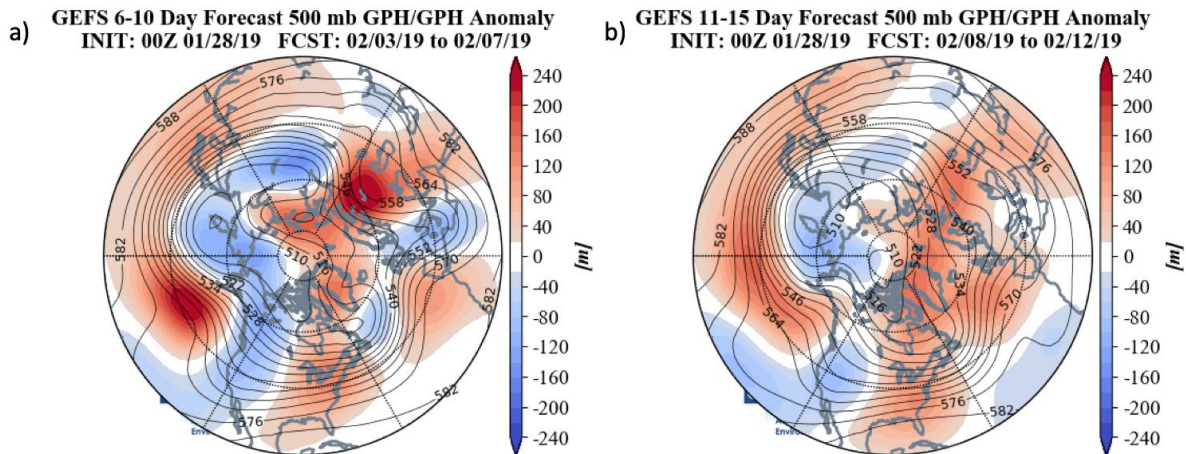
**Figure 4.** Forecasted snowfall anomalies ( $\text{mm}/\text{day}$ ; shading) from 29 January– 2 February 2019. The forecast is from the 00Z 28 January 2019 GFS ensemble. I changed the projection to provide better resolution to regions of interest.

*Mid-Term*

*6-10 day*



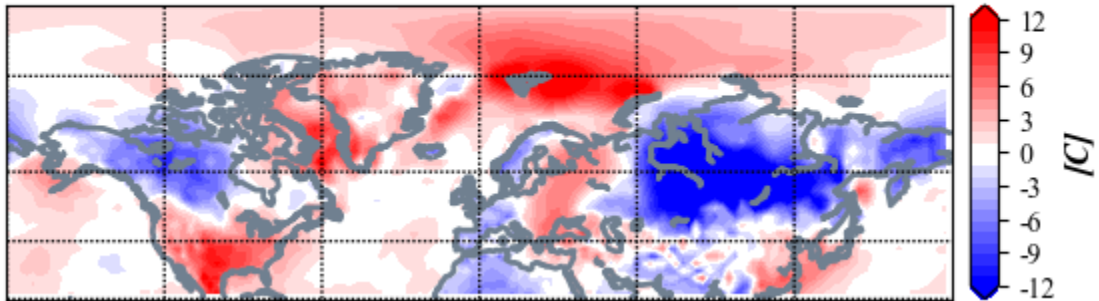
The AO is predicted to turn slightly negative next week (**Figure 1**) with positive geopotential height anomalies across the North Atlantic side of the Arctic and negative geopotential height anomalies across the North Pacific side of the Arctic (**Figure 5a**). And with positive but weak geopotential height anomalies across Greenland, the NAO will likely be near neutral as well next week.



**Figure 5.** (a) Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 3 – 7 February 2019. (b) Same as (a) except averaged from 8 – 12 February 2019. The forecasts are from the 28 January 2019 00z GFS ensemble.

Ridging/positive geopotential height anomalies centered south of Iceland are predicted to continue to force downstream troughing/negative geopotential height anomalies across Western and Central Europe this period (**Figure 5a**). Induced northerly flow is likely to result in a normal to below normal temperatures for Western Europe including the UK while a persistent southwesterly flow of milder air will favor normal to above normal temperatures for Eastern Europe (**Figure 6**). Amplifying ridging/positive geopotential height anomalies in Western Russia and into the Laptev Sea are forcing troughing/negative geopotential height anomalies downstream across Siberia and into Northeast Asia with ridging/positive geopotential height anomalies widespread across Southern Asia (**Figure 5a**). This is predicted to yield normal to below normal temperatures for most of Siberia and into Northeast Asia with normal to above normal temperatures for Western Russia, the Middle East and Southeast Asia (**Figure 6**). Some residual troughing/negative geopotential height anomalies across Northern India (**Figure 5a**) are predicted to yield normal to below normal temperatures for Northern India and possibly into Pakistan (**Figure 6**).

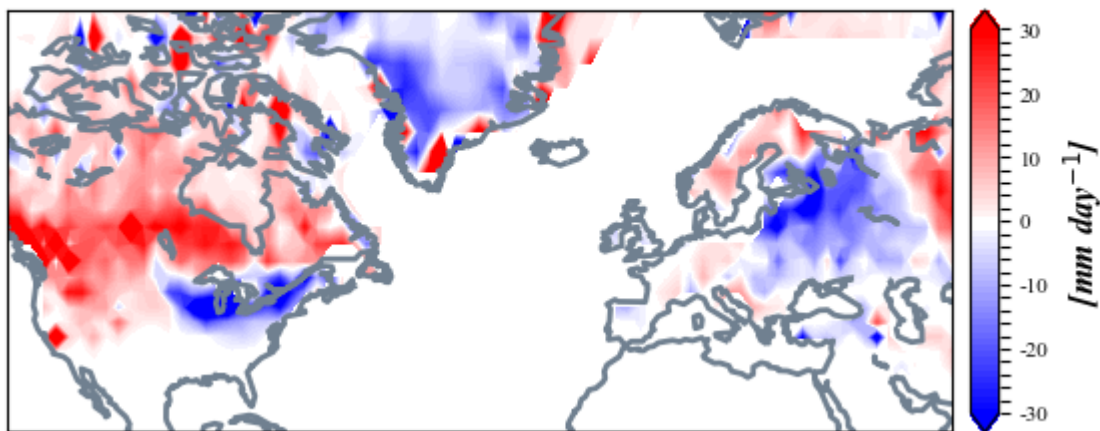
**GEFS 6-10 Day Forecast T2m Anomaly**  
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**Figure 6.** Forecasted surface temperature anomalies ( $^{\circ}\text{C}$ ; shading) from 3 – 7 February 2019. The forecasts are from the 00Z 28 January 2019 GFS ensemble.

Ridging/positive geopotential height anomalies are predicted to drift west to south of the Aleutians with deepening troughing/negative geopotential height anomalies in Western Canada and the Western US with more ridging/positive geopotential height anomalies in eastern North America (**Figure 5a**). The resultant temperature anomalies across North America are predicted to be normal to below normal temperatures across Alaska, much of Canada and the US West Coast with normal to above normal temperatures for the US from the Rockies to the Atlantic coast (**Figure 6**).

**GEFS 6-10 Day Forecast Mean 24-hour Snow Depth Change**  
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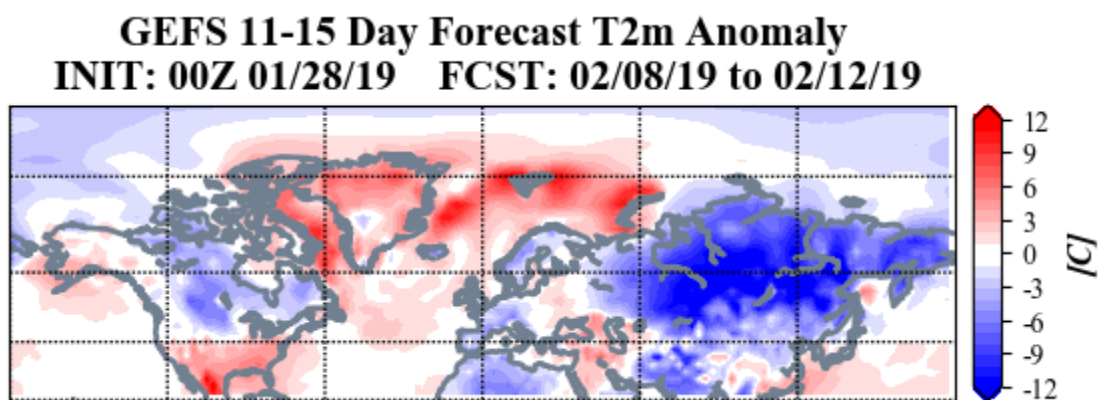
**Figure 7.** Forecasted snowfall anomalies ( $\text{mm}/\text{day}$ ; shading) from 3 – 7 February 2019. The forecasts are from the 00Z 28 January 2019 GFS ensemble. I changed the projection to provide better resolution to regions of interest.

Trouching and cold air will bring the potential for new snowfall across Western and Northern Europe, Northern and Central Asia (**Figure 7**). Across North America, new snowfall is possible in Alaska, much of Canada and the Western US (**Figure 7**). Increasingly milder temperatures could result in snowmelt in parts of the UK, Eastern Europe and the Northeastern US (**Figure 7**).

*11-15 day*

With mostly positive geopotential height anomalies predicted for the North Atlantic side of the Arctic (**Figure 5b**), the AO is likely to be neutral to negative this period (**Figure 1**). With positive pressure/geopotential height anomalies across Greenland, the NAO is predicted to remain neutral to slightly negative this period as well (**Figure 1**).

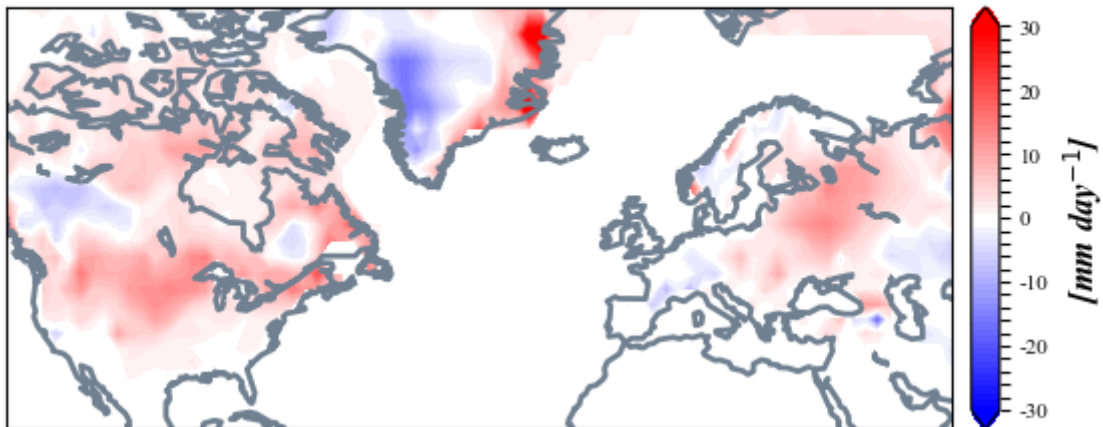
Ridging/positive geopotential height anomalies across Greenland to the Laptev Sea are predicted to persist troughing/negative geopotential height anomalies for much of Europe, though weaker than previously (**Figure 5b**). Low heights and northerly flow are likely to result in normal to below normal temperatures for much of Western and Central Europe including the UK while persistent southwesterly flow of air will likely persist relatively mild temperatures for Eastern Europe (**Figure 8**). Widespread troughing/negative geopotential height anomalies are predicted to persist across Siberia and extend into Northeast Asia with ridging/positive geopotential height anomalies predicted for Southern Asia (**Figure 5b**). This pattern favors normal to below normal temperatures for all of Northern Asia, but especially Siberia with normal to above normal temperatures for Southern Asia including the Middle East and Southeast Asia (**Figure 8**). Some residual troughing/negative geopotential height anomalies across Northern India (**Figure 5a**) are predicted to yield normal to below normal temperatures for Central Asia, Northern India and Pakistan (**Figure 6**).



**Figure 8.** Forecasted surface temperature anomalies ( $^{\circ}\text{C}$ ; shading) from 8 – 12 February 2019. The forecasts are from the 00Z 28 January 2019 GFS ensemble.

Ridging/negative geopotential height anomalies previously centered south of the Aleutians will drift to near the Dateline but will continue to support troughing/negative geopotential height anomalies across western North America with ongoing ridging/negative geopotential height anomalies across eastern North America (**Figure 5b**). This will favor normal to below normal temperatures across Alaska, much of Canada, the US along the Canadian border and the Western US with normal to above normal temperatures for the US east of the Rockies south of 40°N (**Figure 8**).

**GEFS 11-15 Day Forecast Mean 24-hour Snow Depth Change**  
**INIT: 00Z 01/28/19 FCST: 02/08/19 to 02/12/19**



**Figure 9.** Forecasted snowfall anomalies (mm/day; shading) from 8 – 12 February 2019. The forecasts are from the 00Z 21 January 2019 GFS ensemble. I changed the projection to provide better resolution to regions of interest.

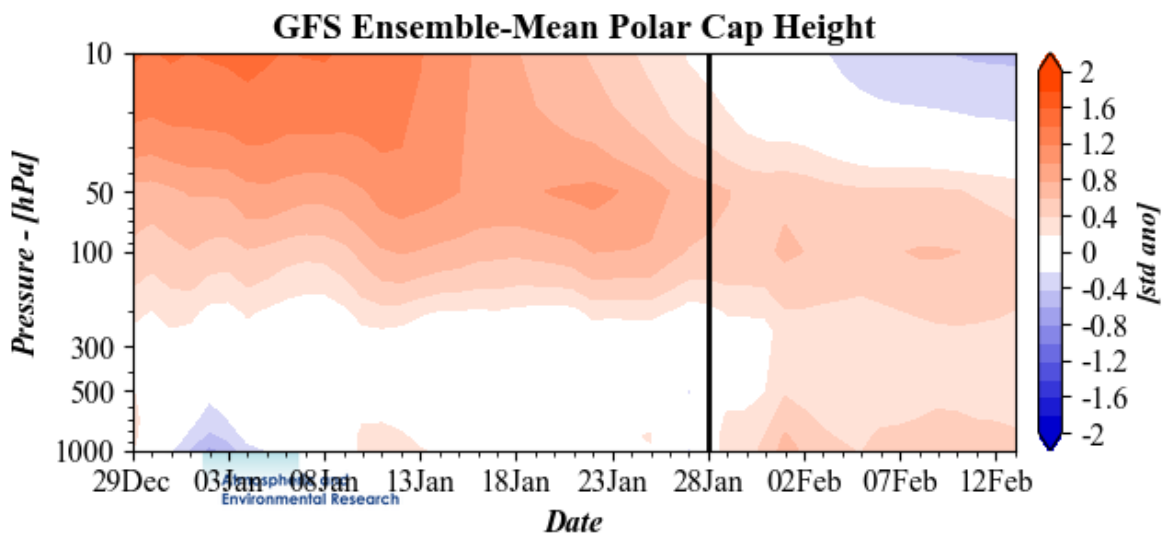
Once again additional snowfall is possible across much of northern Eurasia including Siberia, Northwestern Asia, Scandinavia, Eastern and even possibly Central Europe (**Figure 9**). Cold temperatures across Alaska, Canada and even the Northern US will also support potentially new snowfall (**Figure 9**). Mild temperatures could result in snowmelt across Western Europe and parts of Western Canada (**Figure 9**).

*Longer Term*

*30-day*

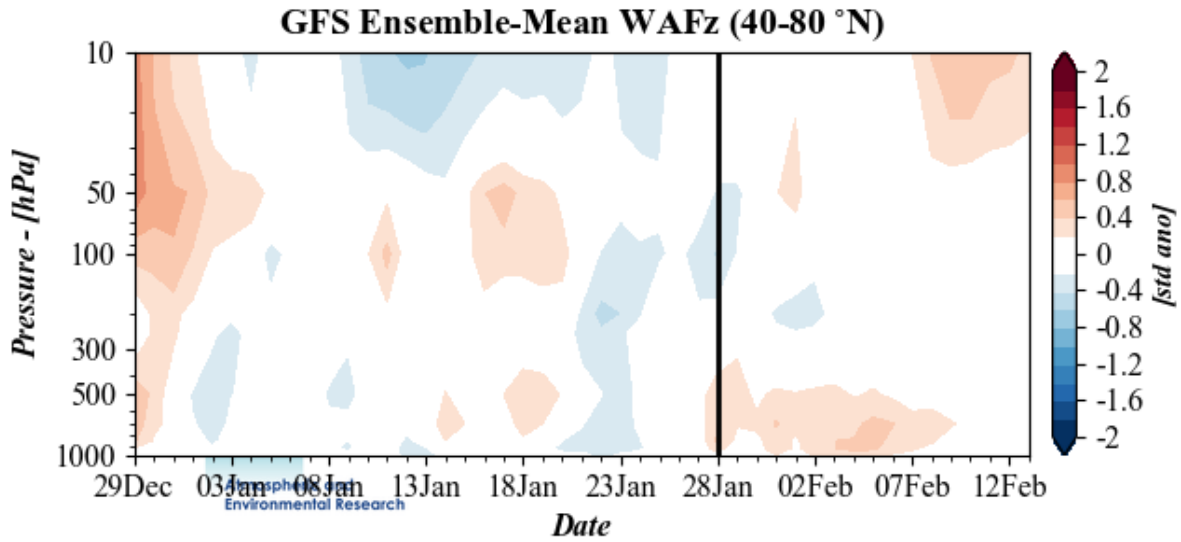
The latest plot of the polar cap geopotential heights (PCHs) shows in general predicted normal to above normal PCHs in the troposphere and the lower stratosphere with normal to below normal PCHs in the mid stratosphere (**Figure 10**). The above normal PCHs in the troposphere are consistent with a predicted near neutral to negative AO the next two weeks (**Figure 1**). The below normal PCHs in the mid stratosphere are consistent with a return to near neutral stratospheric AO for the next two weeks (**Figure**

1). The positive PCHs in the lower stratosphere and troposphere are related to downward propagation of circulation anomalies related to the sudden stratospheric warming (SSW) and a major mid-winter warming (MMW; where the zonal mean zonal wind reverses from westerly to easterly at 60°N and 10 hPa) earlier this month. The strongest positive stratospheric PCHs are no longer in the mid-stratosphere but are in the lower stratosphere and should continue to propagate down. So far and in the near term only weak “dripping” of the positive PCHs through the troposphere to the surface are seen in the plot. There have been two relatively minor drips since the second week of January. However, a more substantial “drip” is predicted starting this week and into early February.



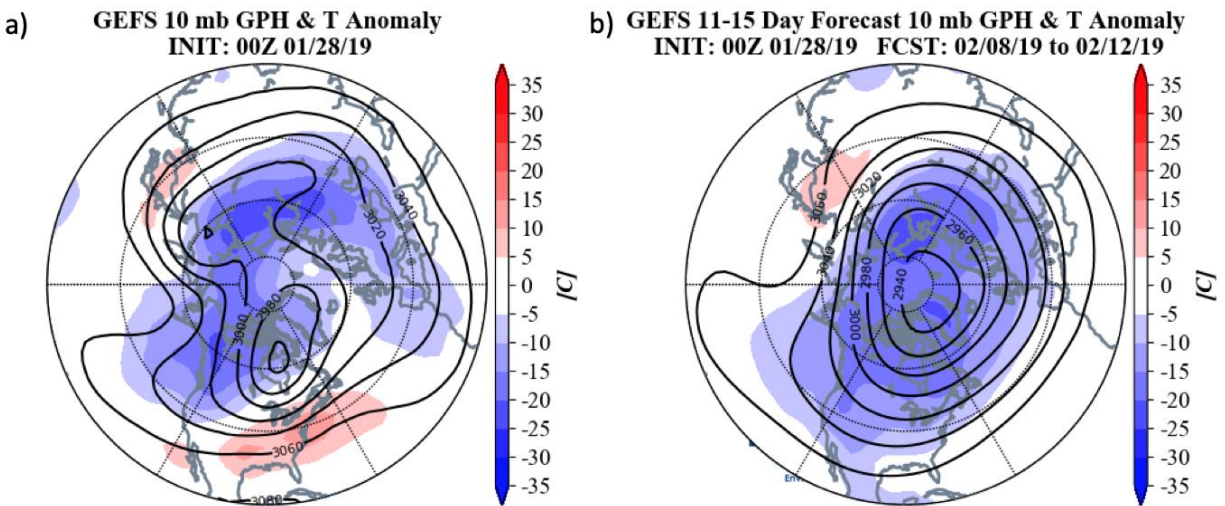
**Figure 10.** Observed and predicted daily polar cap height (i.e, area-averaged geopotential heights poleward of 60°N) standardized anomalies. The forecasts are from the 00Z 28 January 2019 GFS ensemble.

Now that the winds have returned to westerly in the mid stratosphere the plot of Wave Activity Flux (WAFz) or poleward heat transport shows more active WAFz (**Figure 11**). Though for now no new substantial disruption of the stratospheric PV is predicted.



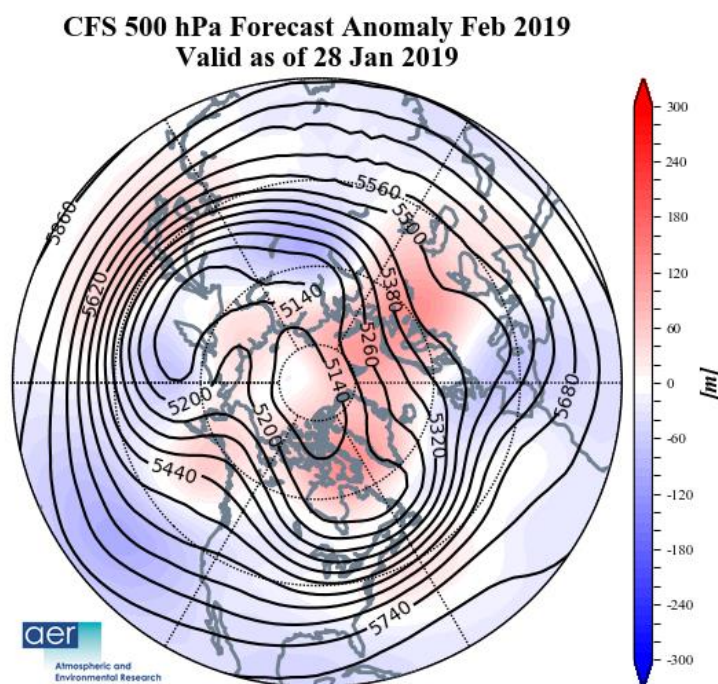
**Figure 11.** Observed and predicted daily vertical component of the wave activity flux (WAFz) standardized anomalies, averaged poleward of 40-80°N. The forecast is from the 00Z 28 January 2019 GFS ensemble.

Currently the stratospheric PV remains split into two pieces or daughter vortices. The major daughter vortex is now centered over Hudson Bay and a minor daughter vortex is centered over Eastern Siberia (**Figure 12**). The two daughter vortices are predicted to coalesce and merge into one main vortex near its climatological position of the North Pole. As I discussed in last week’s blog the cold temperatures in the stratosphere are focused in Siberia and western North America and could be a sign where the coldest temperatures at the surface may be focused as well during the month of February. However, this week the cold is predicted to spread into eastern North America as well.



**Figure 12. (a)** Analyzed 10 mb geopotential heights (dam; contours) and temperature anomalies ( $^{\circ}\text{C}$ ; shading) across the Northern Hemisphere for 28 January 2019. **(b)** Same as **(a)** except forecasted averaged from 8 – 12 February 2019. The forecasts are from the 00Z 28 January 2019 GFS operational model.

With the descent of the peak positive PCHs from the mid to lower stratosphere confidence is increasing that the PV disruption will have a significant and extended impact on the NH weather. I expect the warm/positive PCHS to continue to “drip” down into the troposphere in February as well. A sudden stratospheric warming not only leads to a warm Arctic in the stratosphere but also at the surface as well. So far that has not happened. A warmer Arctic favors more severe winter weather in the NH midlatitudes including the Eastern US. I do think there still remains uncertainty how warm much the Arctic warms in the lower troposphere and surface and could play a major role in the duration and magnitude of the weather impacts of the PV split as discussed in the *Impacts* section. However, the models are predicting more blocking and warming near Greenland. If blocking sets setup near Greenland winter weather could be more consistent.

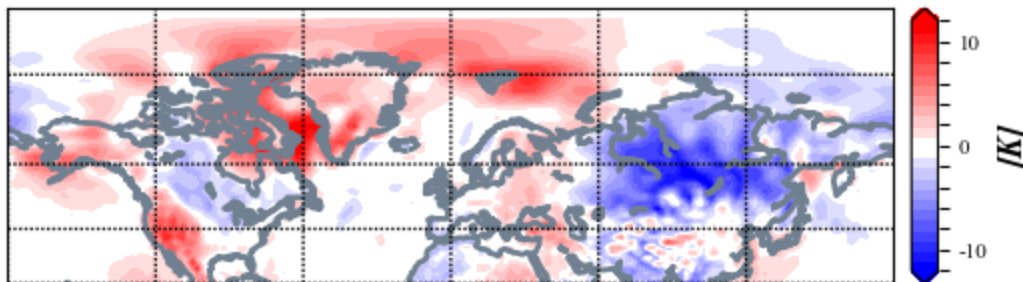


**Figure 13.** Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere for February 2019. The forecasts are from the 21 January 2019 CFS.

I include in this week’s blog the monthly 500 hPa geopotential heights (**Figure 13**) and the surface temperatures (**Figure 14**) forecast for February from the Climate Forecast System (CFS; the plots represent yesterday’s four ensemble members). The forecast

for the troposphere is ridging centered near Alaska, Greenland, the Barents-Kara Seas, Western Russia and Southeast Asia with troughs across eastern North America, Western Europe and Siberia (**Figure 13**). This pattern favors cold temperatures for Western Europe, Northern Asia especially Siberia, Northeast Asia, Eastern Canada and the Eastern US with relatively mild temperatures for Eastern Europe, the Middle East, Southeast Asia and much of western North America (**Figure 14**). This forecast is consistent with expectations following an SSW and recently the CFS forecast has shown better consistency.

### CFS T2m Forecast Anomaly Feb 2019 Valid as of 28 Jan 2019



**Figure 14.** Forecasted average surface temperature anomalies ( $^{\circ}\text{C}$ ; shading) across the Northern Hemisphere for February 2019. The forecasts are from the 28 January 2019 CFS.

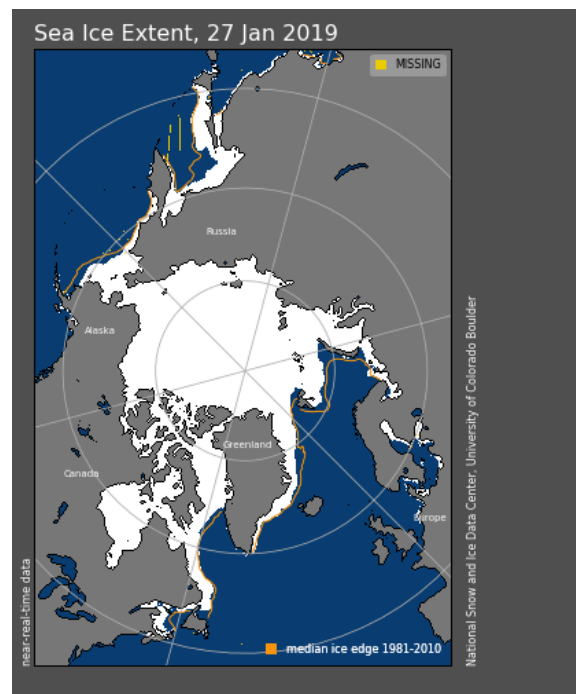
#### *Surface Boundary Conditions*

#### *Arctic Sea Ice*

Arctic sea ice growth rate continues at a slow rate and remains well below normal but higher than recent years. However the negative sea ice anomalies are now mostly confined to one region - the Barents-Kara Seas (**Figure 13**) though it is below normal in the Sea of Okhotsk as well. Some research shows low sea ice in the Sea of Okhotsk favors a positive AO/NAO. Normal to above normal sea ice in and around Greenland and the Canadian Archipelagos may favor a positive 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. However it is looking more and more like the greatest negative anomalies are going to persist in the Barents-Kara Seas this winter and this may be the region most favored for ridging/blocking during the winter months. I expect that the forecasts of lower heights and colder temperatures



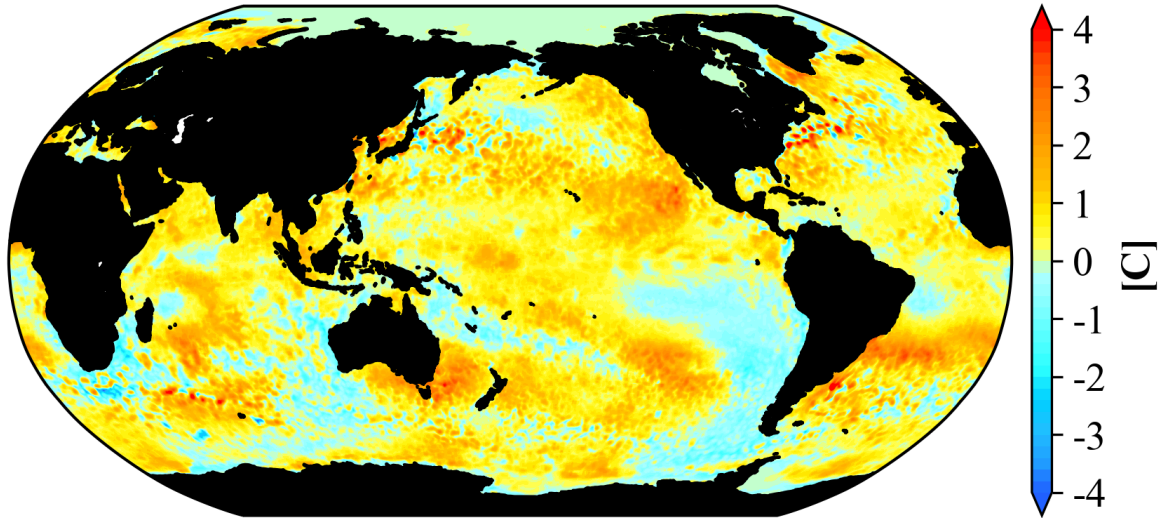
near Alaska will continue to help sea ice grow in the Chukchi and Bering seas in the near term.



**Figure 15.** Observed Arctic sea ice extent on 27 January 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).

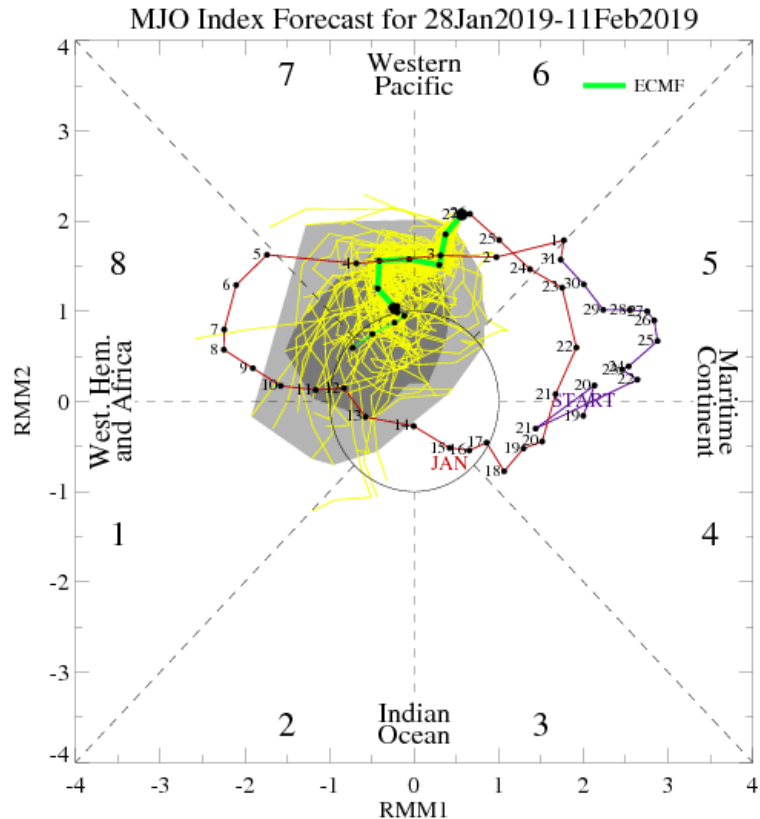
Equatorial Pacific sea surface temperatures (SSTs) anomalies remain warm but no longer support El Niño conditions (**Figure 13**). Observed SSTs across the NH remain well above normal though below normal SSTs exist regionally. Cold SSTs south of Iceland and in the subtropics of the North Atlantic with above normal SSTs in the mid-latitudes are thought to favor a positive winter NAO.

## SST Anomaly - Week Ending 27 Jan 2019



**Figure 16.** The latest weekly-mean global SST anomalies (ending 27 January 2019). Data from NOAA OI High-Resolution dataset. (Updated from [https://www.ospo.noaa.gov/Products/ocean/sst/anomaly/anim\\_full.html](https://www.ospo.noaa.gov/Products/ocean/sst/anomaly/anim_full.html) due to US Government shutdown).

Currently phase six of the Madden Julian Oscillation (MJO) is favored (**Figure 14**). However the MJO is expected to transition to phase seven and then weaken where no phase is favored over the next two weeks. MJO phases 6-7 favor ridging over eastern North America with mild temperatures and troughing over western North America with cold temperatures. The predicted weather pattern across North America is consistent with MJO forcing of North American weather next week.

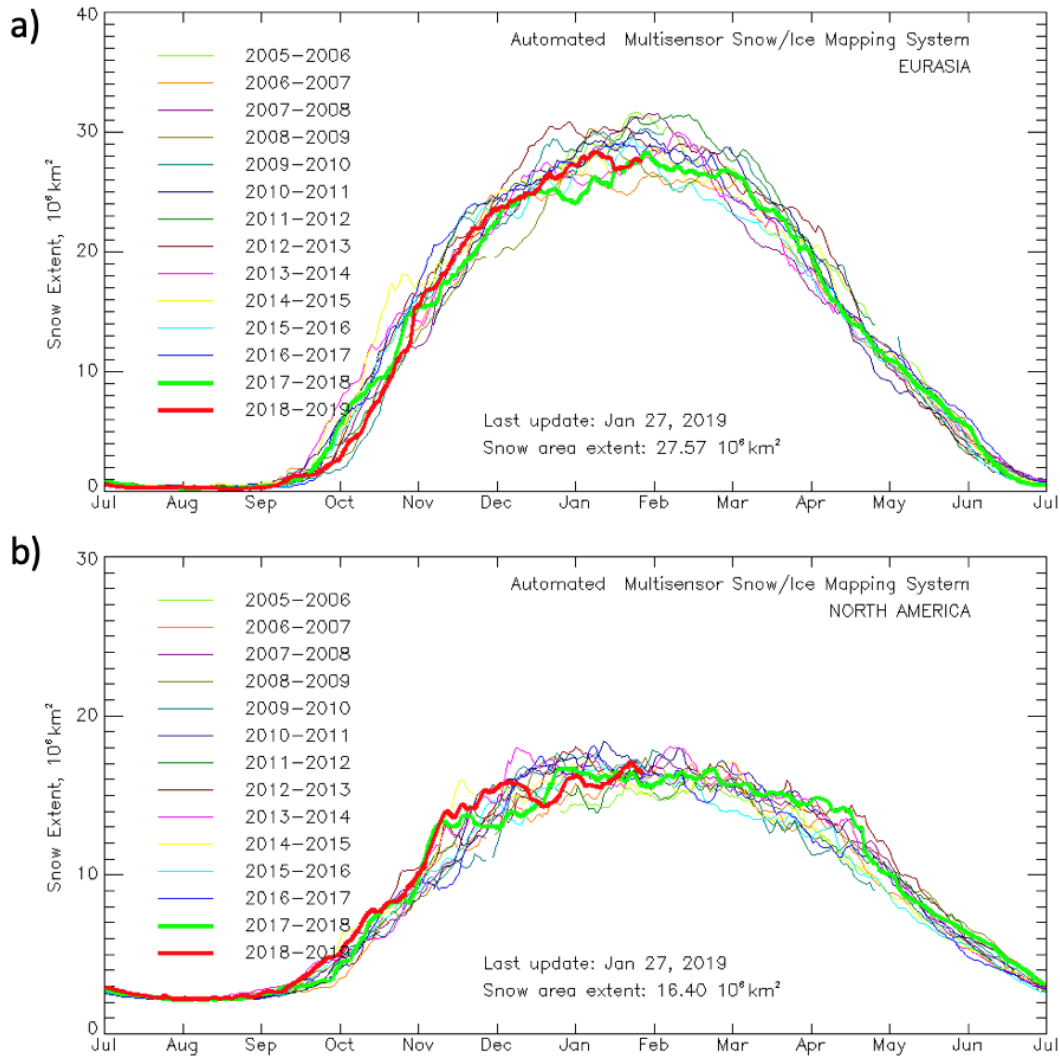


**Figure 17.** Past and forecast values of the MJO index. Forecast values from the 00Z 28 January 2019 ECMWF model. Yellow lines indicate individual ensemble-member forecasts, with the green line showing the ensemble-mean. A measure of the model “spread” is denoted by the gray shading. Sector numbers 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 has stalled across Eurasia and is now near decadal means. Snow cover advance could advance further as cold temperatures become more widespread across Eurasia next week. Above normal snow cover extent this past 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 18.** Observed Eurasian (top) and North American (bottom) snow cover extent through 27 January 2019. Image source:

[https://www.star.nesdis.noaa.gov/smcd/emb/snow/HTML/snow\\_extent\\_plots.html](https://www.star.nesdis.noaa.gov/smcd/emb/snow/HTML/snow_extent_plots.html)

North American snow cover has pulled back once again back to near decadal means and could retreat further with milder temperatures predicted for next week. The early advance of snow cover across Canada this fall, has likely contributed to an early start to winter across the Northern US.