

# Arctic Oscillation and Polar Vortex Analysis and Forecasts

*March 30, 2026*

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. In late Spring, we transition to a spring/summer schedule, which is once every two weeks. Snow accumulation forecasts will be replaced by precipitation forecasts. Also, there will be less emphasis on ice and snow boundary conditions and their influence on hemispheric weather.

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

## Summary

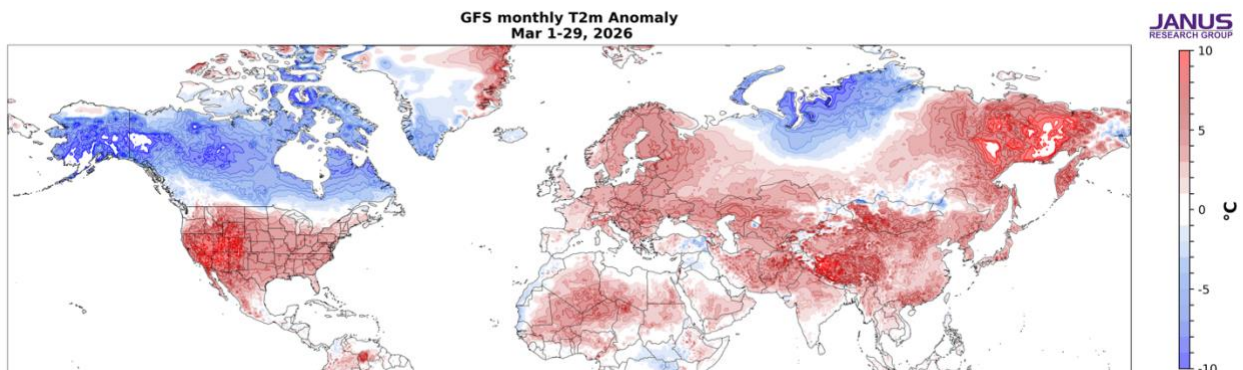
- The Arctic Oscillation (AO) is currently positive as pressure/geopotential height anomalies across the Arctic are currently mostly negative and the AO is predicted to remain positive the next two weeks as pressure/geopotential height anomalies are predicted to remain mostly negative the next two weeks. The North Atlantic Oscillation (NAO) is currently positive with negative pressure/geopotential height anomalies across Greenland, and the NAO is predicted to remain positive to neutral the next two weeks as pressure/geopotential height anomalies are predicted to remain mostly negative across Greenland the next two weeks.
- Troughing/negative geopotential height anomalies across Greenland will support ridging/positive geopotential height anomalies across much of Europe the next two weeks with the exception of troughing/negative geopotential height anomalies first centered near Italy and then sliding into the eastern Mediterranean. This pattern will favor normal to above normal temperatures across much of Europe including the United Kingdom (UK) the next two weeks except for Central Europe this week and then next week across Southeastern Europe but mostly Turkey.
- The general pattern across Asia over the next two weeks is ridging/positive geopotential height anomalies across much of Asia and centered in Western Asia supporting troughing/negative geopotential height anomalies across Western Siberia and into

Northeast Asia the next two weeks. This pattern favors mostly normal to above normal temperatures across much of Asia focused on Western Asia with normal to below normal temperatures mostly limited to Western Siberia and into Northeast Asia the next two weeks and the Middle East next week.

- The predicted atmospheric pattern across North America the next two weeks is persistent troughing/negative geopotential height anomalies across much of Canada with ridging/positive geopotential height anomalies United States (US). This pattern will support normal to below normal temperatures in eastern Alaska and much of Canada with normal to above normal temperatures across the US but especially the Eastern US.
- Polar vortex (PV) is recovering from a second split this week with the Final Warming in the coming weeks but will any of it impact our weather? My thoughts are below.

## Plain Language Summary

About a month into meteorological spring can be summed up as relatively cold temperatures for Northwestern Siberia, Alaska and much of Canada and mild to very mild for the mid-latitudes and across the population centers of the Northern Hemisphere including the US, Europe and East Asia (see **Figure**). The forecast for the next two weeks can be summarized as more of the same with cold predicted for parts of Siberia, Alaska and Canada but mild in the US, most of Europe and East Asia (see **Figures 3, 6 and 9**). The polar vortex (PV) is wrapping up a second PV split. I did think that the second PV split could be the Final Warming but the PV lives yet for another day and the Final Warming is looking to take place sometime in April. But do the machinations of the PV mean anything more than academic? Models are schizophrenic about whether the PV split will have any impact on our weather. Hard to know the answer but I try my best to share what I think will happen below.



**Figure.** Estimate of the observed surface temperatures ( $^{\circ}\text{C}$ ; shading) from 01 Mar to 29 Mar 2026 based on GFS initializations and the GFS forecast from the 30 Mar 2026 run.

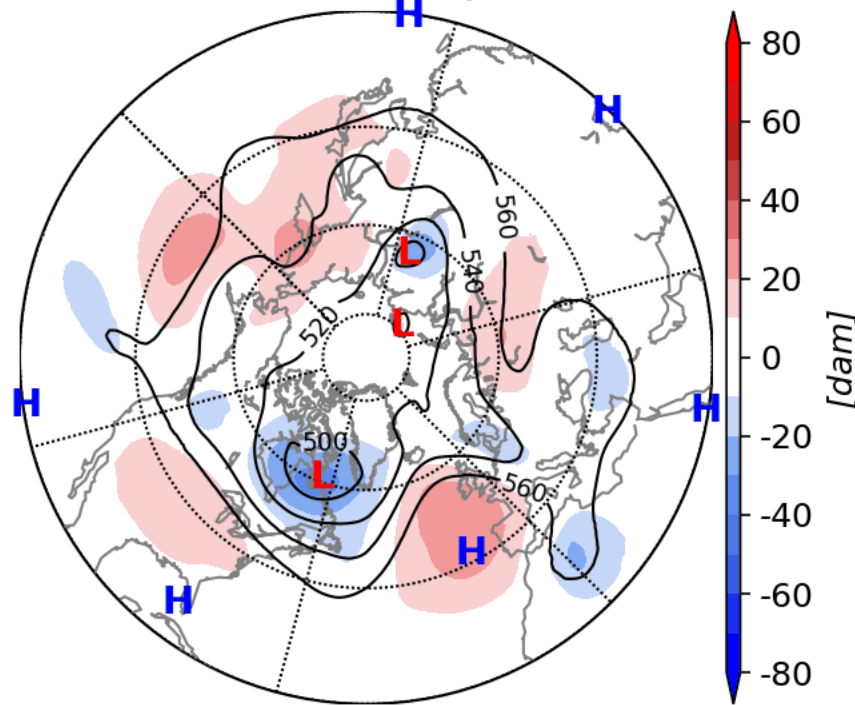
## Impacts

We can debate how the winter truly was across the Northern Hemisphere (NH) but there is little doubt that severe winter weather dominated the headlines and the tone was more about the surprise of the severity of the winter rather than, yes it is mild or milder than as expected. One notable exception would be the Western US. During meteorological winter the polar vortex (PV) vacillated among stronger than normal, Canadian warmings and my personal, favorite stretched PVs. What was missing were sudden stratospheric warmings (SSW - defined as a reversal of the wind from westerly to easterly at 60°N and 10 hPa) including PV splits.

Since the beginning of meteorological spring it's been all about PV splits. PV splits receives the most hype related to an increase in severe winter weather yet looking at the surface temperature anomalies across the NH (see **Figure** above) relatively cold temperatures have receded from most population centers and is hanging on for dear life in its last holdout of Alaska and Canada. You could argue with me, well it's March the sun is strong and therefore things would have been different in January but I don't buy that argument. If wave reflection/stretched PVs had occurred for most of the month instead (I think there was one when the historic Midwest blizzard occurred), this could have been a very different March. I have shared previously in the blog over the past several months, I am just not that excited anymore by split PVs and given a choice between a PV split and PV stretch, give me a stretched PV. Whether the classical atmospheric circulation response to a PV split, actually occurs is more uncertain than people realize and the only guarantee is an extended period of mild to very mild temperatures in the Eastern US. Whether this was always the case or is more of a recent trend, I don't know but before we completely turn the page on winter 2025/26, I think this is one of the most important lessons to take away. Of course all this is my opinion only and I am sure for the next PV split the hype machine will be in full gear. So in summary, the stretched PV may be more mundane, the everyman PV behavior but you pretty much know what you are getting and the impacts I believe are under-appreciated. SSWs and especially PV splits are high risk, high reward as far as producing severe winter weather. If you are a mild winter weather enthusiast, there is more reason to get excited because in the overwhelming number of events the only certainty is an extended period of mild to very mild weather.

I will climb off my soapbox and try to figure it will it or won't the PV split change the NH pattern. Maybe my rant was a delay tactic from a challenging forecast. For most of the two weeks the mid-tropospheric circulation is characterized by low pressure centered near the North Pole and truly dominating the high-latitudes with high-pressure ridging floating around the mid-latitudes (see **Figure i**). This is a classical positive AO circulation regime. This week once again the dominant high latitude blocking will be centered in the western North Pacific sector, its favorite perch of the entire winter. Then we can observe ridging in the Western then the Eastern US, Europe, Western and then Eastern Asia. No signs of blocking in the North Atlantic sector especially near Greenland the most anticipated response to not one but two PV splits.

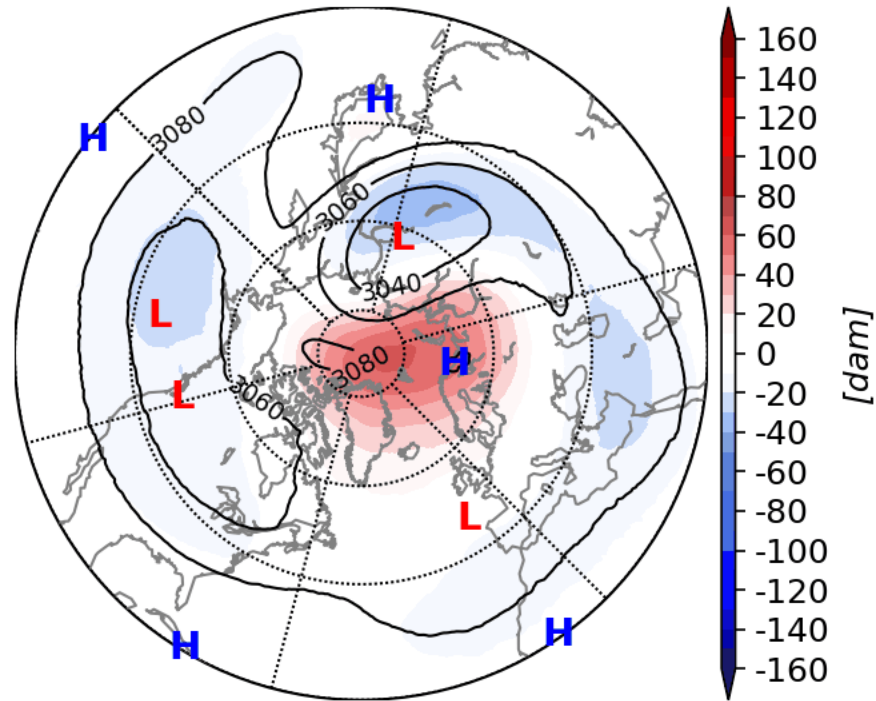
## Initialized 00Z 500 hPa HGT/HGTa 30-Mar-2026



**Figure i.** Initialized 500 mb geopotential heights (dam; contours) and decameter anomalies (dam; shading) across the Northern Hemisphere for 30 Mar 2026 and forecasted from 31 Mar 2026 to 14 Apr 2026. The forecasts are from the 00Z 30 Mar 2026 GFS model.

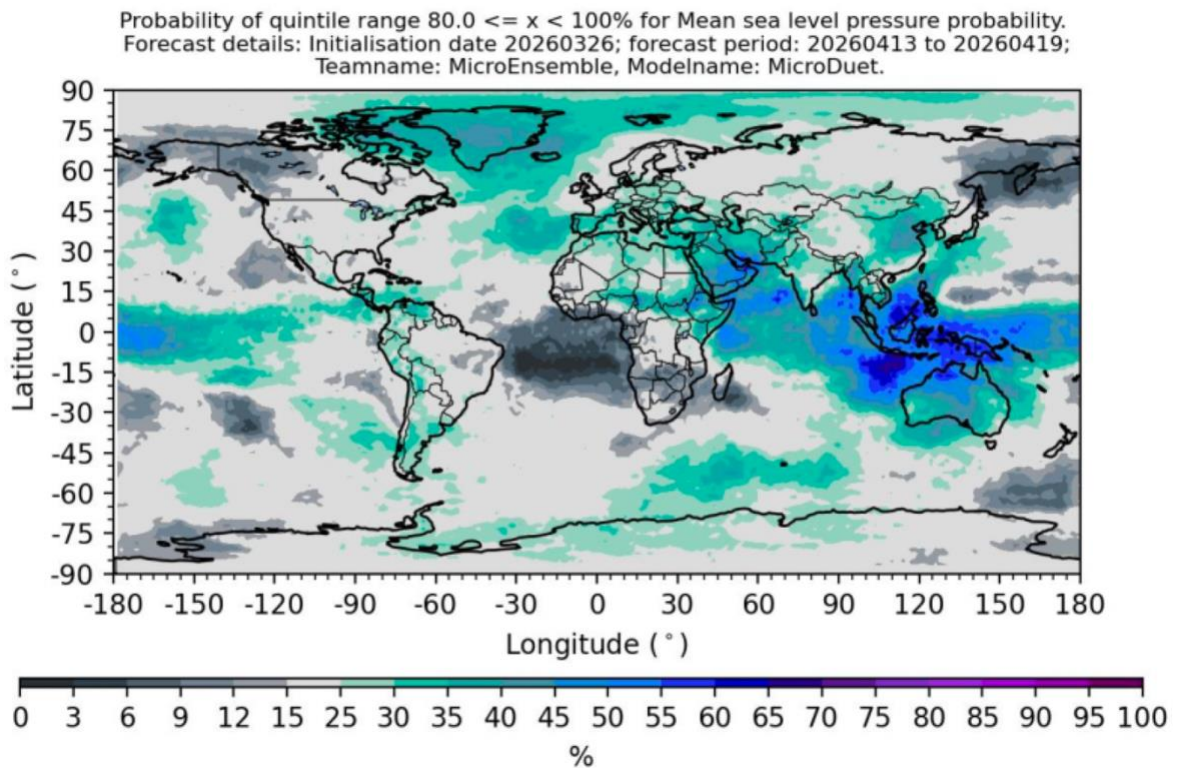
**Figure ii** presents the latest PV animation. The PV seems to remain in a split throughout the animation but it is hard to clearly see with the PV becoming diffuse as this time of year the PV is racing towards its demise or Final Warming. At first the major PV center is over Siberia with the minor PV center over Canada. But then the major PV center appears to stretch over the North Pole towards Canada and re-establish itself over Canada while the minor PV center is displaced to Eurasia. I would expect the cold air to follow the major PV center even if the models predict otherwise. I am thinking mostly about Canada if the the model predictions are correct about the major PV center re-establishing in Canada.

## Initialized 00Z 10 hPa HGT/HGTa 30-Mar-2026



**Figure ii.** Forecasted average 10 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere for 30 Mar 2026 and forecasted from 31 Mar 2026 to 14 Apr 2026. The forecasts are from the 00Z 30 Mar 2026 GFS model.

I think the most intriguing question for the month of April is - will the PV split flip the positive AO/NAO related to widespread mild temperatures across the NH including much of Europe, Asia and the US to a negative AO/NAO and spreading of cooler weather across the NH mid-latitudes. The latest model trends have been to back off a positive to negative AO/NAO transition. The latest polar cap geopotential height anomalies (PCHs) plot shown in **Figure 11** looks to me to throw cold water on any such expectation. I don't think that the the forecast looks all that realistic with warm positive PCHs simply dissipating in place in the lower stratosphere but I don't really know. I have been using all the AI models at my disposal to say Greenland blocking will more likely occur than not in April, though for now those predictions are looking to crash and burn. Our AI model competing in ECMWFs AI subseasonal weather forecast is sticking to its forecast of Greenland blocking in mid-April (see **Figure iii**), so if nothing else it is consistent even if it is consistently wrong. Also it is important to point out the information for the model only goes up to 26 March 2026, so it lacks any new information since last Thursday. It will be interesting to watch if a transition ever takes place, though obviously the stakes are not as high in April as in January or February where Greenland blocking can result in hazardous weather and now it is more of a nuisance for the Eastern US and Northern Europe.

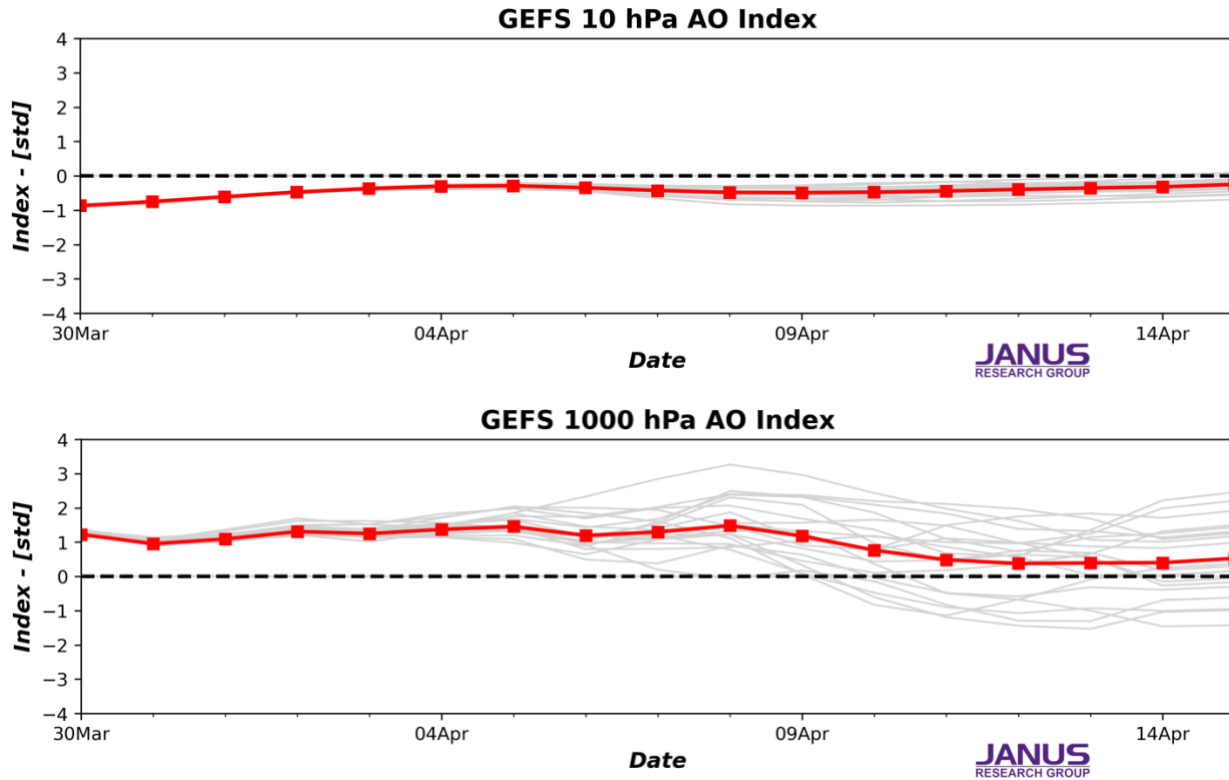


**Figure ii. a)** Predicted probability of highest 20 percent or top quintile for mean sea level pressure for the week of 13 April to 19 April 2026. Model initialized with data from 26 March 2026. Forecast posted at <https://aiweatherquest.ecmwf.int/>.

## Near-Term

### This week

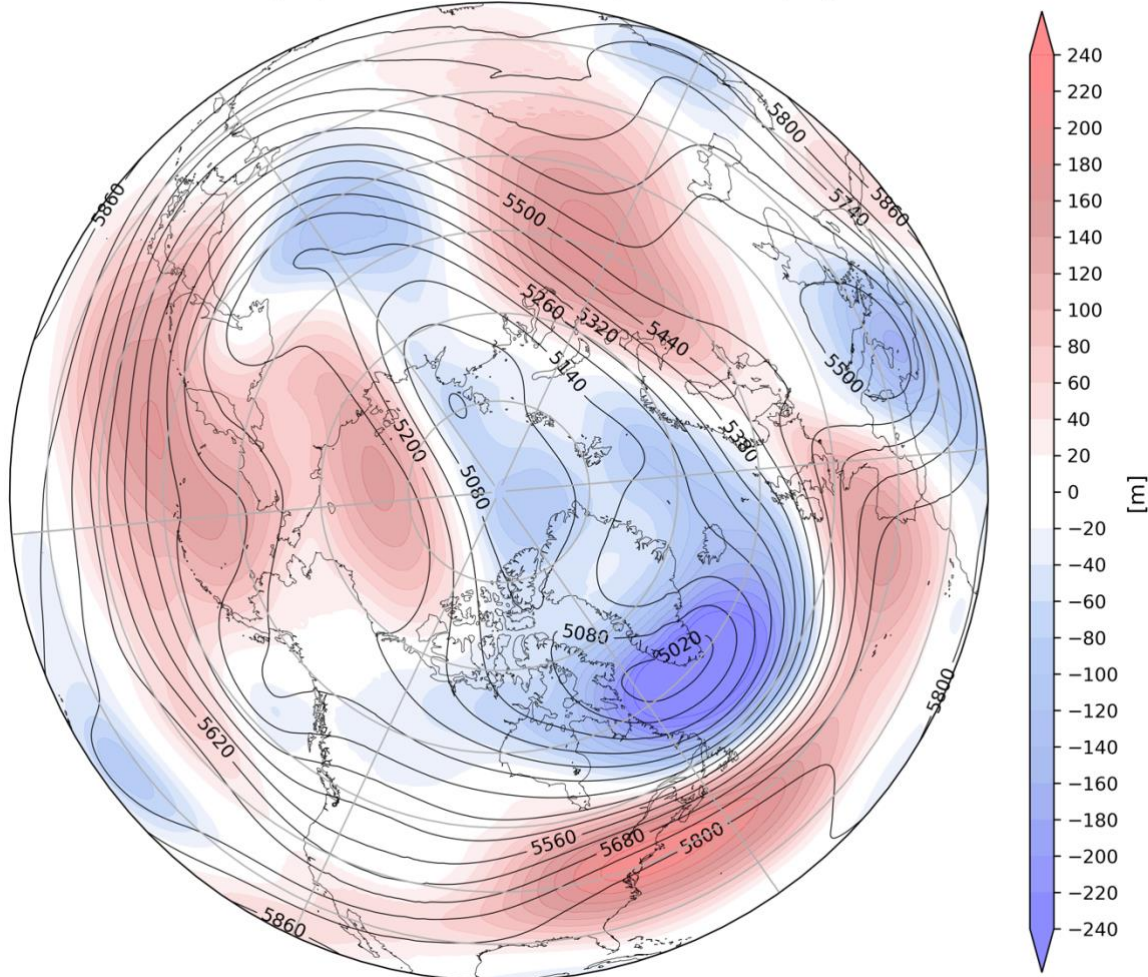
The AO is predicted to be positive this week (**Figure 1**) with mostly negative geopotential height anomalies currently across the Arctic and mixed geopotential height anomalies across the mid-latitudes of the NH (**Figure 2**). With predicted negative geopotential height anomalies across Greenland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



**Figure 1.** The predicted daily-mean AO at a) 10 hPa and b) 1000 hPa from the 00Z 30 Mar 2026 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.

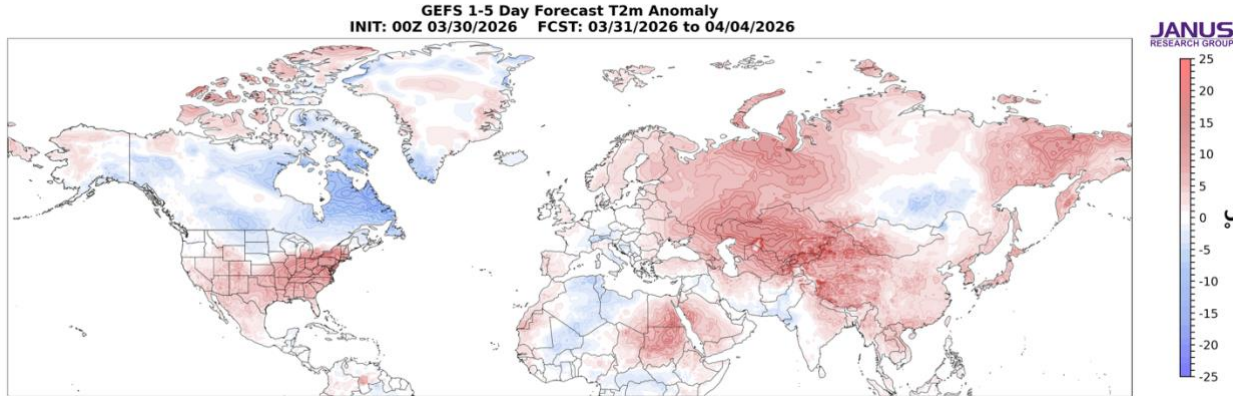
Trouching/negative geopotential height anomalies across Greenland will support widespread ridging/positive geopotential height anomalies across Northern Europe with trouching/negative geopotential height anomalies across the Mediterranean Sea centered on Italy (**Figure 2**). This pattern will support normal to above normal temperatures across much of Europe including the UK with normal to below normal temperatures across Central Europe and along the Mediterranean coast this week (**Figure 3**). This week the general pattern across Asia is ridging/positive geopotential height anomalies across Western and Eastern Asia bookending trouching/negative geopotential height anomalies in Central Asia centered on Western Siberia this week (**Figure 2**). This pattern favors widepserad normal to above normal temperatures across most of Asia with normal to below normal temperatures limited to Western Siberia and into parts of Northeast Asia this week (**Figure 3**).

**GEFS 1-5 Day Forecast 500 hPa Anomaly**  
INIT: 00Z 03/30/2026 FCST: 03/31/2026 to 04/04/2026



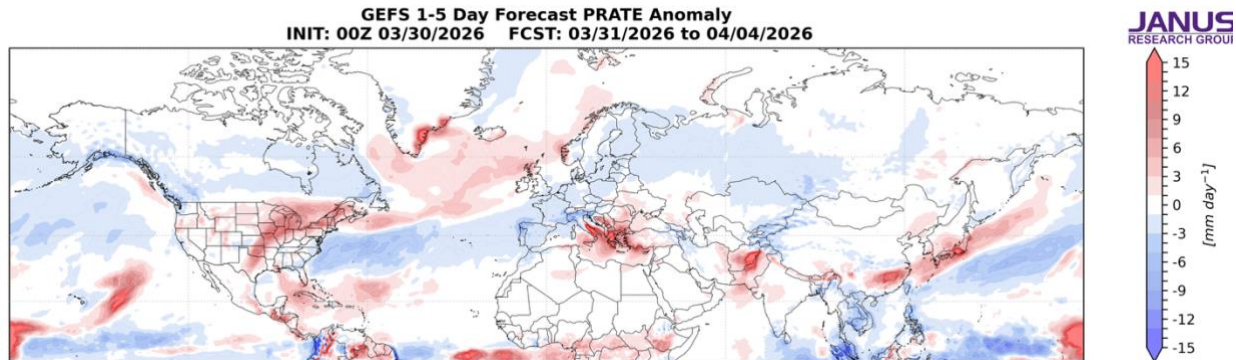
**Figure 2.** Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 31 Mar 2026 to 4 Apr 2026. The forecasts are from the 00Z 30 Mar 2026 GFS ensemble.

The predicted pattern across North America this week is troughing/negative geopotential height anomalies across eastern Alaska and Canada with ridging/positive geopotential height anomalies across the US but centered in the Eastern US this week (**Figure 2**). This pattern will favor normal to below normal temperatures across eastern Alaska, much of Canada and into the US Northern Plains with normal to above normal temperatures across much of the US but focused in the Eastern US this week (**Figure 3**).



**Figure 3.** Forecasted surface temperature anomalies ( $^{\circ}\text{C}$ ; shading) from 31 Mar 2026 to 4 Apr 2026. The forecasts are from the 00Z 30 Mar 2026 GFS ensemble.

Troughing will support new rainfall across Southeastern Europe, Central Asia and East Asia with mostly dry conditions across much of Europe and Asia (**Figure 4**). Troughing will support new rainfall stretching from the Southern Plains, into the Great Lakes and into New England and the Northwestern US with mostly dry conditions across much of North America this week (**Figure 4**).

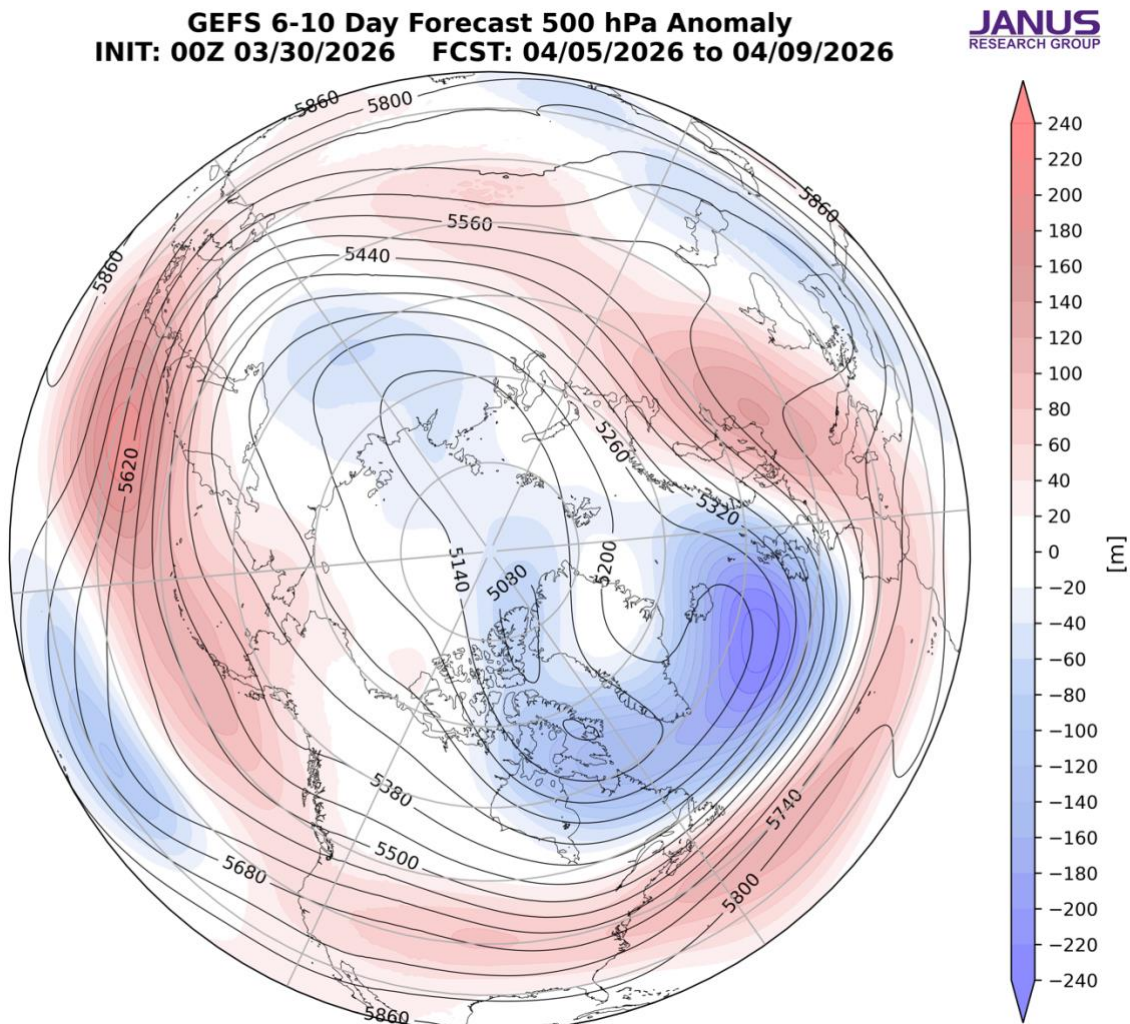


**Figure 4.** Forecasted precipitation ( $\text{mm}/\text{day}$ ; shading) from 31 Mar 2026 to 4 Apr 2026. The forecasts are from the 00Z 30 Mar 2026 GFS ensemble.

## Near-Mid Term

### Next week

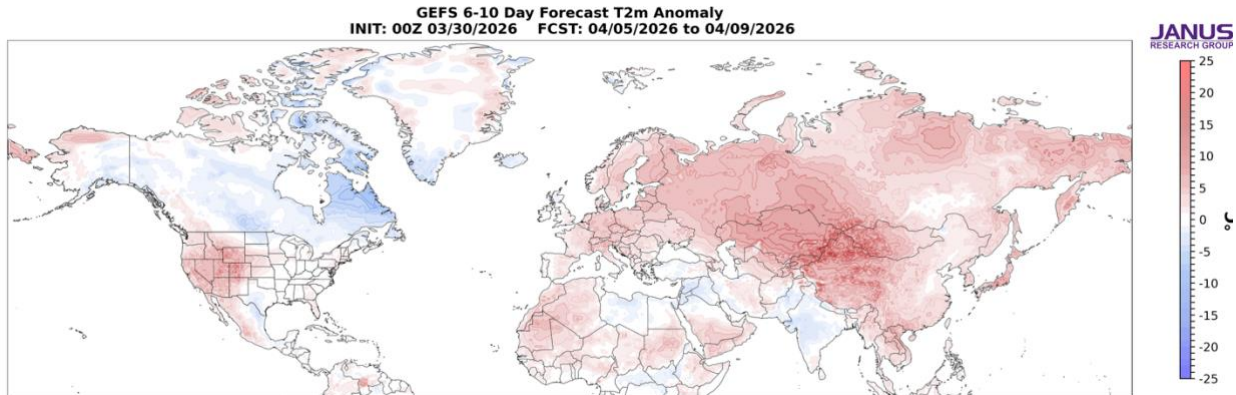
With geopotential height anomalies remaining mixed to mostly negative across the Arctic and with mixed geopotential height anomalies across the mid-latitudes this period (**Figure 5**), the AO will likely be neutral to positive this period (**Figure 1**). With mostly negative pressure/geopotential height anomalies across Greenland (**Figure 5**), the NAO will likely be positive this period.



**Figure 5.** Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 5 Apr 2026 to 9 Apr 2026. The forecasts are from the 00Z 30 Mar 2026 GFS ensemble.

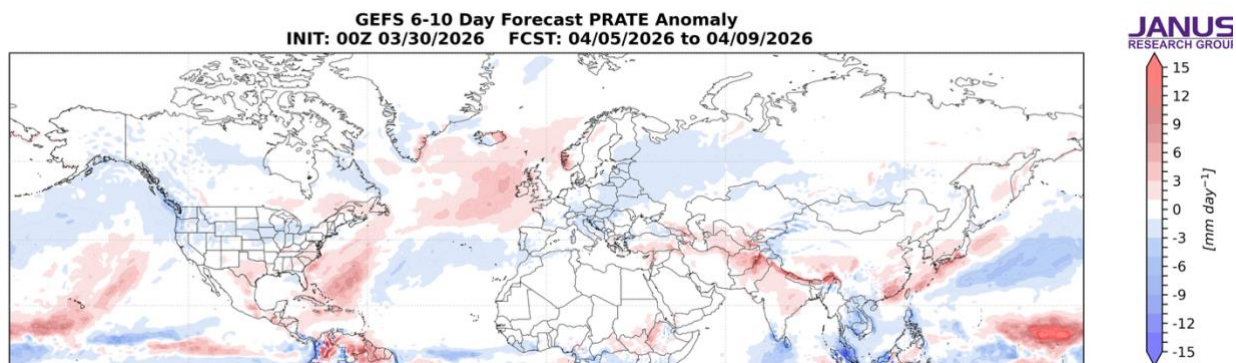
Persistent troughing/negative geopotential height anomalies across Greenland will continue to support widespread ridging/positive geopotential height anomalies across Europe with troughing/negative geopotential height anomalies in the Eastern Mediterranean this period (**Figure 5**). The pattern will support widespread normal to above normal

temperatures across Europe including the UK with the exception of normal to below normal temperatures mostly limited to Turkey this period (**Figure 6**). Across Asia the persistent pattern of widespread ridging/positive geopotential height anomalies across much of Asia with troughing/negative geopotential height anomalies centered on Western Siberia and into Northeast Asia is predicted to continue this period (**Figure 5**). This pattern favors widespread normal to above normal temperatures widespread across much of Asia especially Central Asia with normal to below normal temperatures limited to regionally parts of Western Siberia and Northeast Asia this period (**Figure 6**).



**Figure 6.** Forecasted surface temperature anomalies ( $^{\circ}\text{C}$ ; shading) from 5 Apr 2026 to 9 Apr 2026. The forecasts are from the 00Z 30 Mar 2026 GFS ensemble.

Across North America the persistent pattern of ridging/positive geopotential height anomalies across the US with troughing/negative geopotential height anomalies across Canada is predicted to continue this period (**Figure 5**). This pattern will favor normal to below normal temperatures across eastern Alaska, much of Canada and into the US Upper Midwest with normal to above normal temperatures across much of the US but once again especially the Western US (**Figure 6**).



**Figure 7.** Forecasted rainfall rate (mm/day; shading) from 5 Apr 2026 to 9 Apr 2026. The forecasts are from the 00Z 30 Mar 2026 GFS ensemble.

Troughing will support new rainfall across Ireland, Turkey, Central Asia and East Asia with mostly dry conditions across much of Europe and Asia (**Figure 7**). Troughing will support new rainfall

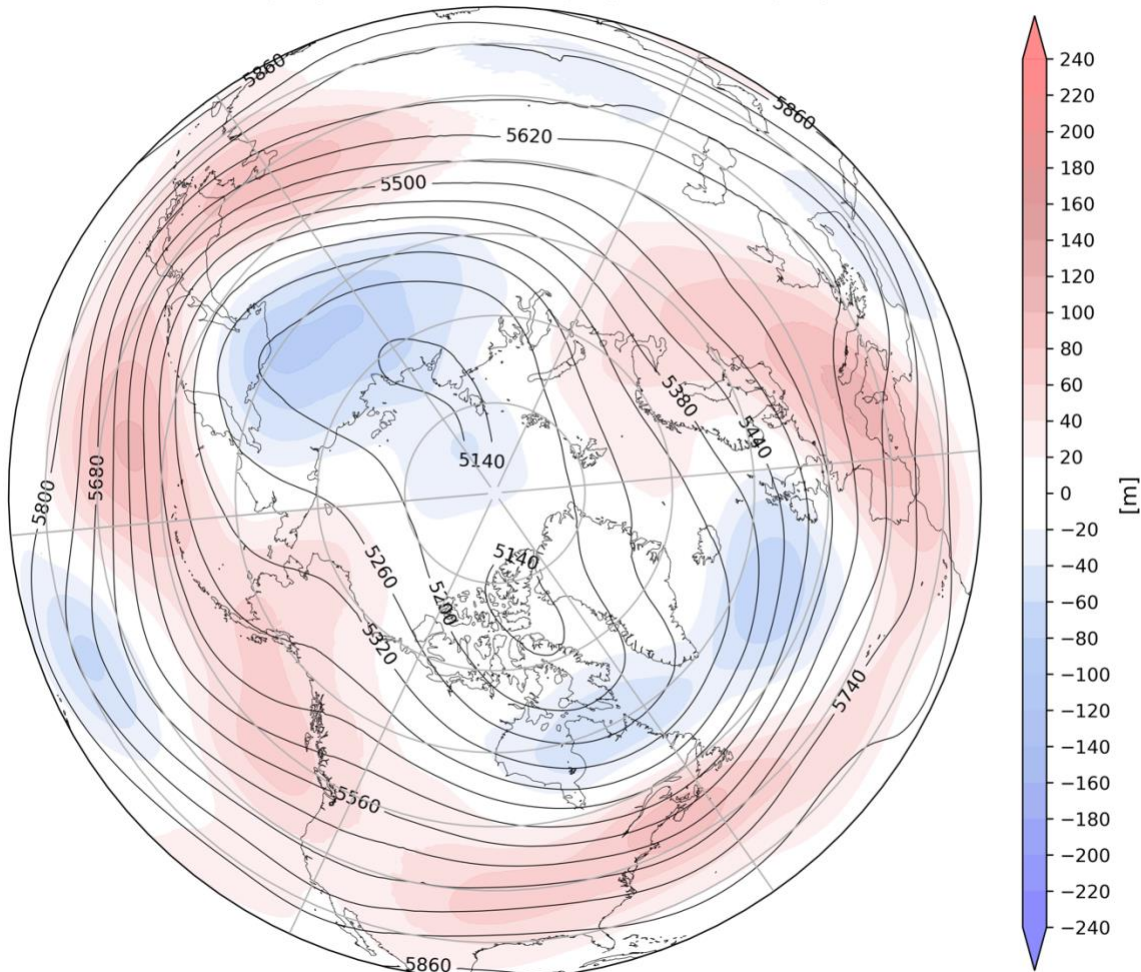
stretching from the Southeastern US and the Canadian Maritimes with mostly dry conditions across much of North America this week (**Figure 7**).

## Mid Term

### Week Two

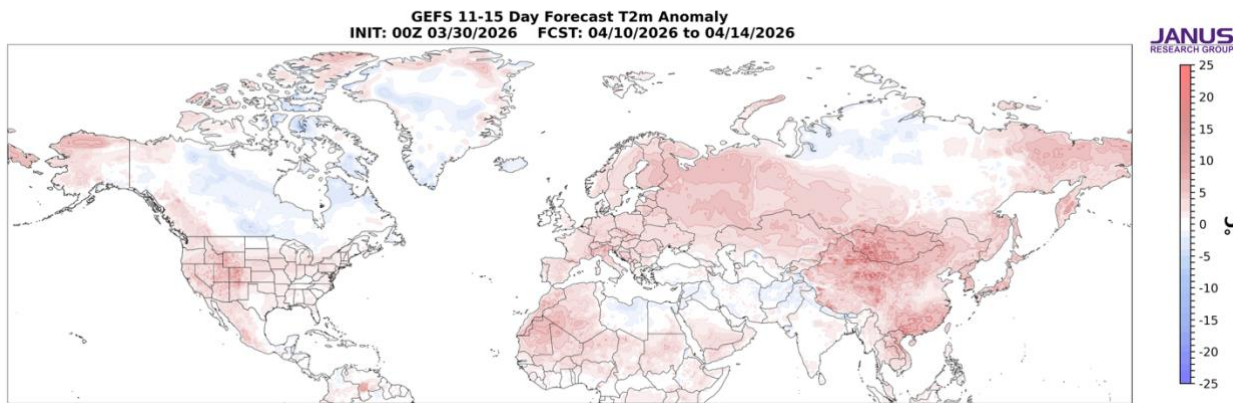
With predicted mixed to mostly negative to mixed geopotential height anomalies across the Arctic and mixed geopotential height anomalies across the mid-latitudes this period (**Figure 8**), the AO will likely be neutral to positive this period (**Figure 1**). With predicted mixed to negative pressure/geopotential height anomalies across Greenland (**Figure 8**), the NAO will likely remain near neutral to positive this period.

**GEFS 11-15 Day Forecast 500 hPa Anomaly**  
INIT: 00Z 03/30/2026 FCST: 04/10/2026 to 04/14/2026



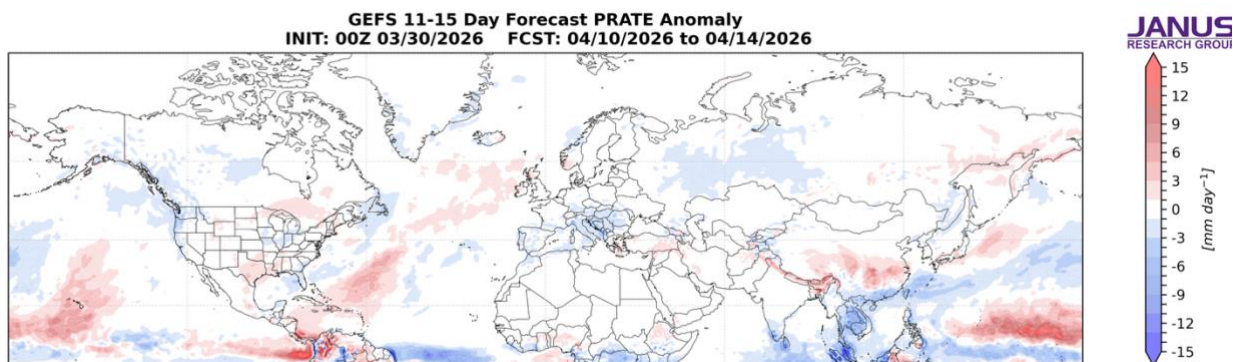
**Figure 8.** Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere from 10 Apr to 14 Apr 2026. The forecasts are from the 00Z 30 Mar 2026 GFS ensemble.

Persistent troughing/negative geopotential height anomalies across Greenland will continue to support widespread ridging/positive geopotential height anomalies across Europe this period (**Figure 8**). This pattern should favor widespread normal to above normal temperatures across much of Europe including the UK this period (**Figures 9**). Ridging/positive geopotential height anomalies are predicted to persist across Northwestern and Southeastern Asia supporting troughing/negative geopotential height anomalies across Western Siberia and into Northeastern Asia this period (**Figure 8**). This pattern favors widespread normal to above normal temperatures across Asia including Northwestern Asia, Eastern Siberia, Central and Eastern Asia and the Tibetan Plateau normal to below normal temperatures mostly limited to Southwestern Asia, Western Siberia and into Northeastern Asia with this period (**Figure 9**).



**Figure 9.** Forecasted surface temperature anomalies ( $^{\circ}\text{C}$ ; shading) from 10 Apr to 14 Apr 2026. The forecasts are from the 00Z 30 Mar 2026 GFS ensemble.

The persistent pattern of ridging/positive geopotential height anomalies across the US including Alaska with troughing/negative geopotential height anomalies across Canada is yet again predicted to continue this period (**Figure 8**). This pattern supports normal to below normal temperatures across much of Canada and possibly the Northeastern US with normal to above normal temperatures across Alaska and much of the US this period (**Figure 9**).



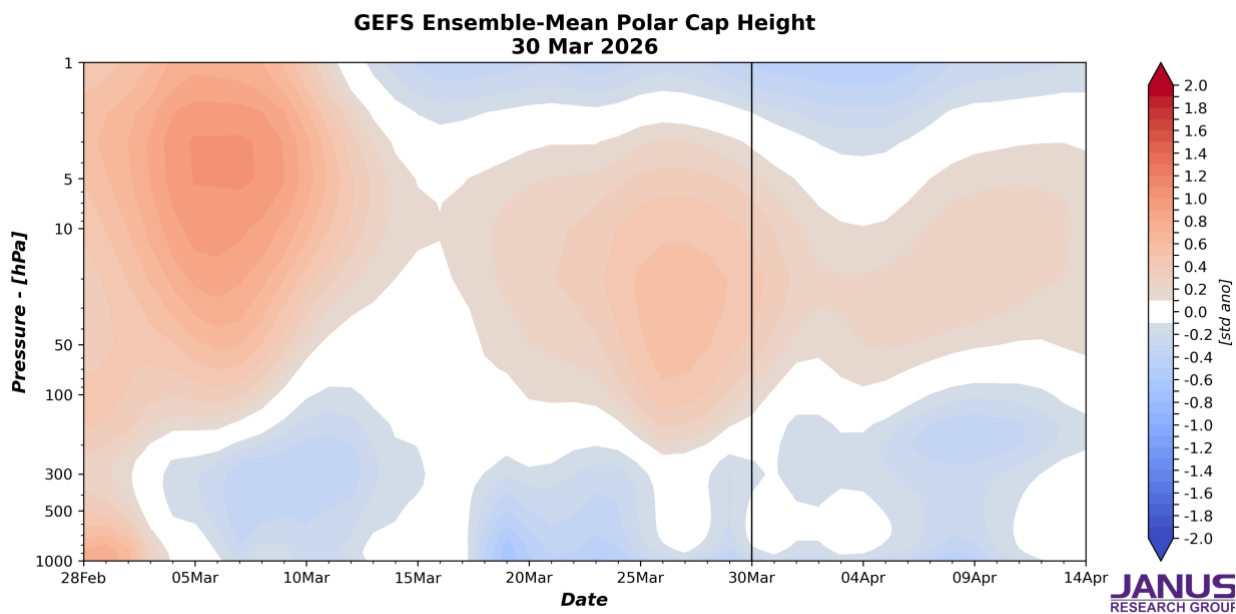
**Figure 10.** Forecasted rainfall (mm/day; shading) from 10 Apr to 14 Apr 2026. The forecasts are from the 00Z 30 Mar 2026 GFS ensemble.

Trouthing will support new rainfall across Turkey, Central Asia, the Tibetan Plateau and China with mostly dry conditions across much of Europe and Asia (**Figure 10**). Trouthing will support new rainfall in the Southern Plains, the Great Lakes and New England with mostly dry conditions across much of North America this week (**Figure 10**).

## Longer Term

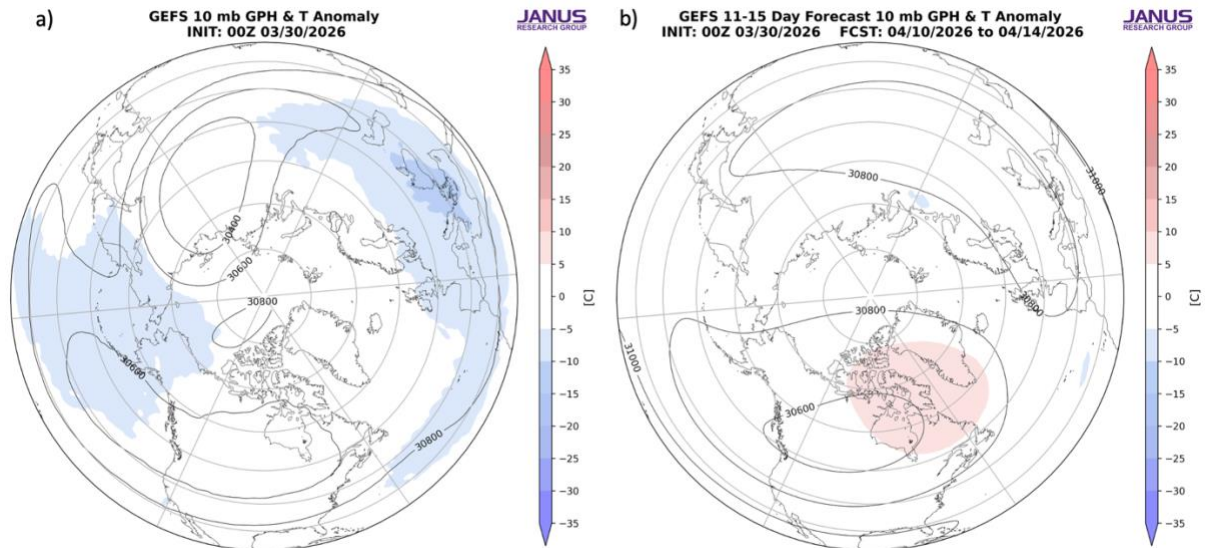
### 30-day

Today's polar cap geopotential height anomalies (PCHs) plot currently shows cold/negative PCHs in the upper stratosphere and the troposphere and in the mid to lower stratosphere (**Figure 11**). Then next week cold/negative PCHs in the troposphere are predicted to deepen while warm/positive PCHs in the stratosphere weaken.



**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 17 Mar 2026 GFS ensemble.

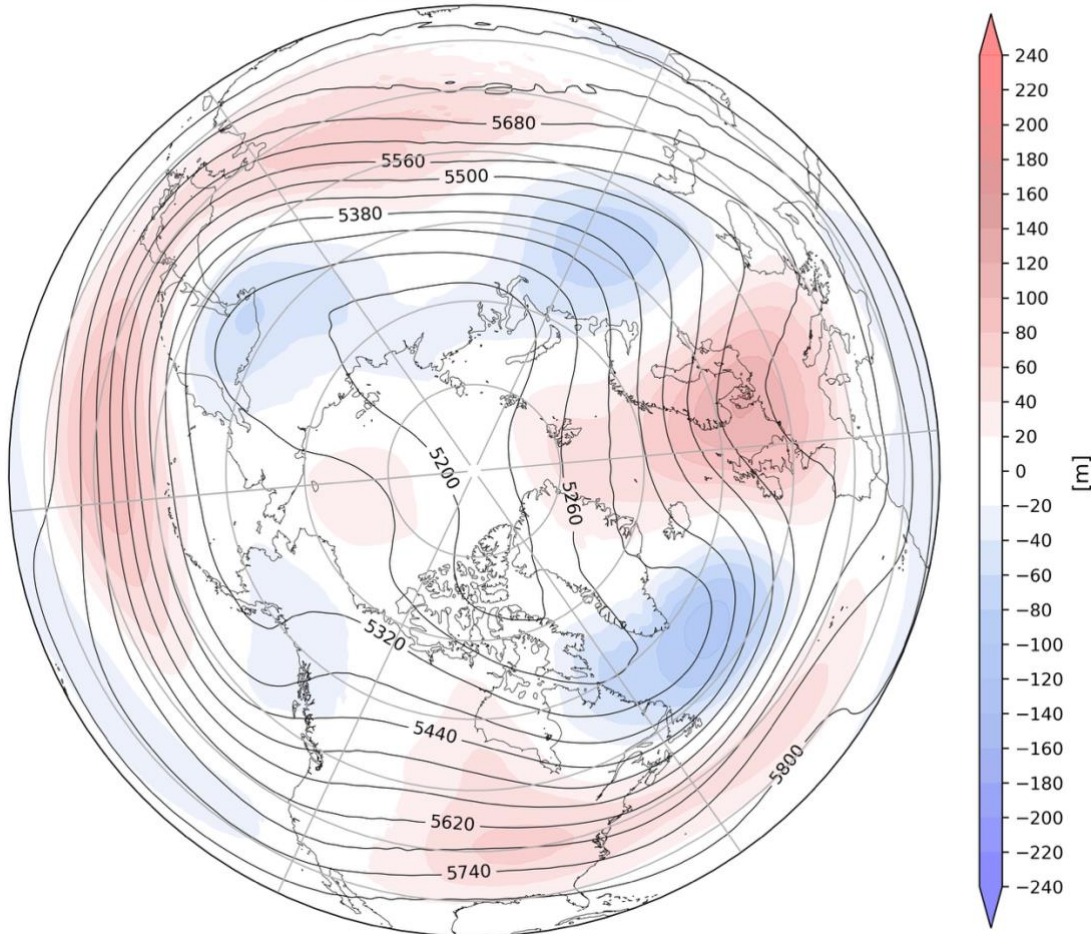
The predicted cold/negative PCHs in the lower troposphere the next two weeks (**Figure 11**) are consistent with the predicted positive AO the next two weeks (**Figure 1**).



**Figure 12.** Observed 10 mb geopotential heights (dam; contours) and temperature anomalies ( $^{\circ}\text{C}$ ; shading) across the Northern Hemisphere averaged from 17 Mar. (b) Same as (a) except forecasted averaged from 28 Mar to 1 Apr 2026. The forecasts are from the 00Z 17 Mar 2026 GFS ensemble.

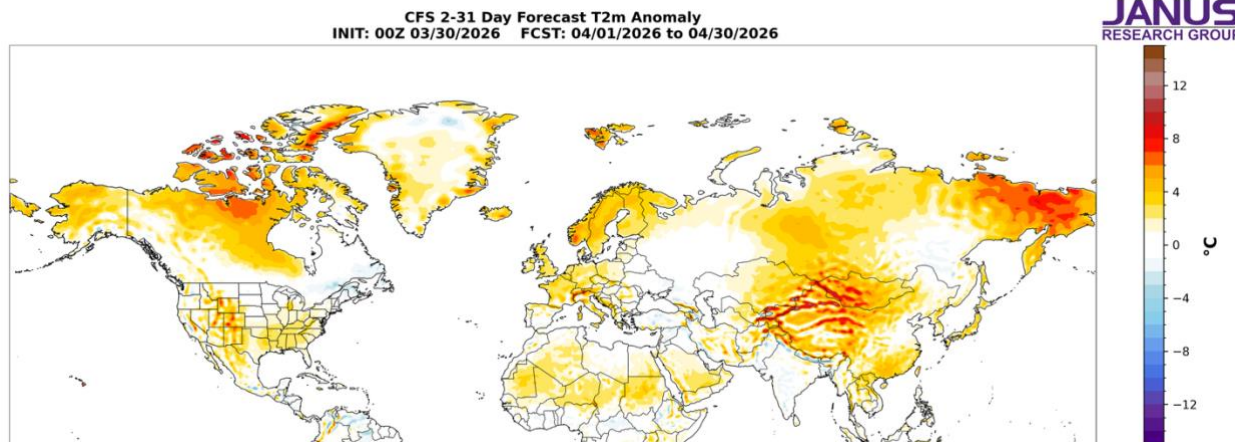
This week the polar vortex (PV) remains split with the major PV center centered over Siberia and the minor PV center over Canada separated by high pressure centered near the North Pole with cold temperatures focused over Southern Eurasia and relatively warm temperatures centered over East Asia and the US in the polar stratosphere (**Figure 12a**). Then during the second week of April, the major PV center is predicted to slide into Canada with a second minor PV center over western Eurasia with cold temperatures over Northern Europe and the North Pacific in the polar stratosphere (**Figure 12b**). The stratospheric AO in **Figure 1** this week is predicted to remain negative the next two weeks with the PV split.

**CFS 500 hPa Forecast Anomaly Apr 2026**  
**Valid as of 30 Mar 2026**



**Figure 13.** Forecasted average 500 mb geopotential heights (dam; contours) and geopotential height anomalies (m; shading) across the Northern Hemisphere for Apr 2026. The forecasts are from the 00Z 30 Mar 2025 CFS.

I include in this week's blog the monthly 500 hPa geopotential heights (**Figure 13**) and surface temperatures for April (**Figure 14**) from the Climate Forecast System (CFS; the plots represent yesterday's four ensemble members). I do want to emphasize unless I say otherwise, I find the CFS forecasts of low confidence and most often don't match my own thinking. The forecast for the troposphere is ridging stretching from Greenland to Scandinavia, Eastern Asia, south of the Aleutians and the Eastern US with troughing in the Mediterranean, across Northern and into Northeastern Asia, Alaska, Western Canada and Baffin Bay into the Canadian Maritimes (**Figure 13**). This pattern favors seasonable to relatively warm temperatures across Europe, Siberia, Central and Eastern Asia, including the Middle East, China the Tibetan Plateau, Pakistan and Afghanistan, Eastern Siberia, Alaska, Western and Northern Canada and the Southern US with seasonable to relatively cool temperatures across Western Asia, Northeast Asia, Alaska, Eastern and Southern Canada and the Northeastern US (**Figure 14**).

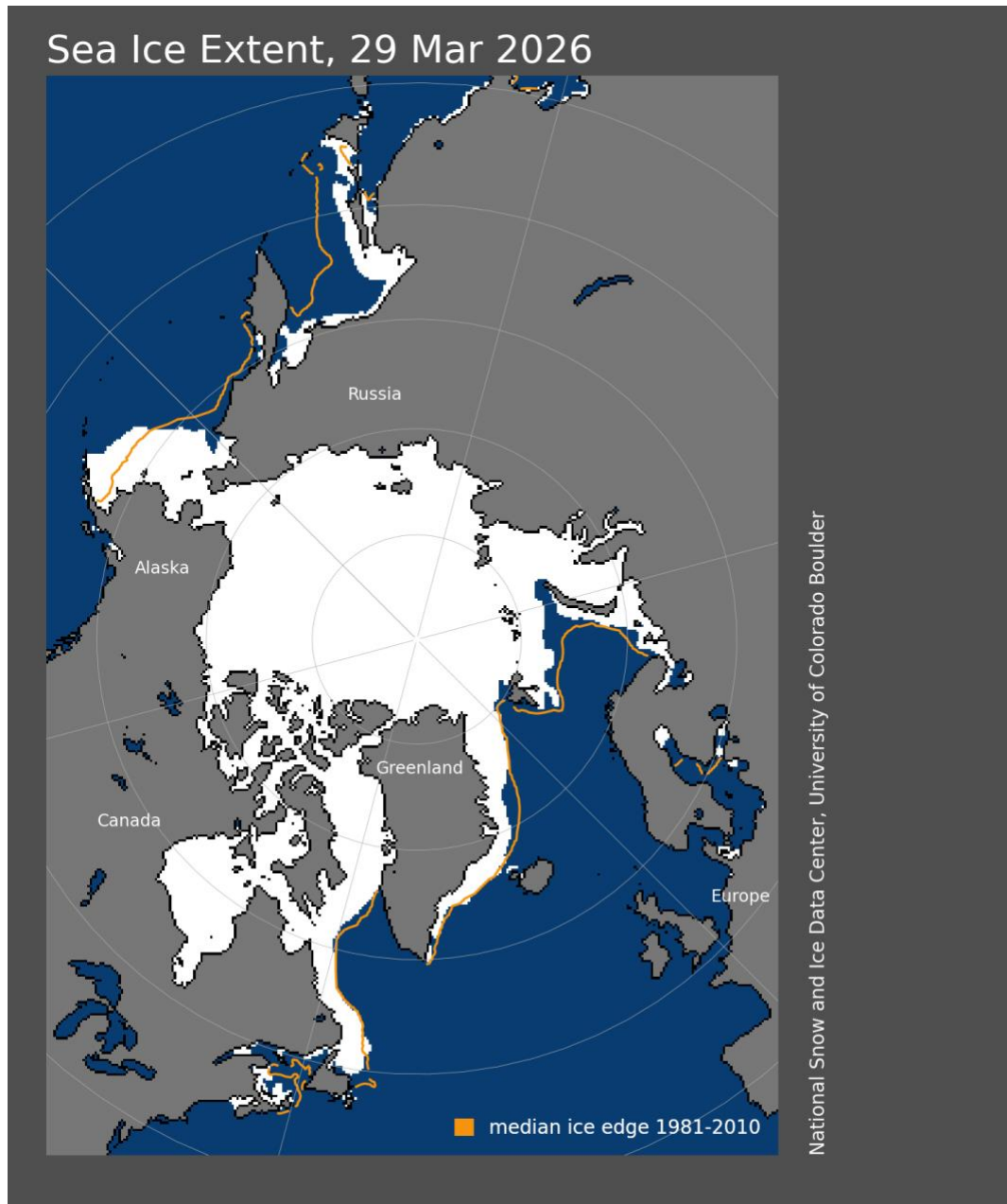


**Figure 14.** Forecasted average surface temperature anomalies ( $^{\circ}\text{C}$ ; shading) across the Northern Hemisphere for Apr 2026. The forecasts are from the CFS 00Z 30 Mar 2025.

## Boundary Forcings

### Arctic Sea Ice

This is the last post on Arctic sea ice until the fall. Arctic sea ice extent has tied the lowest annual maximum extent on record. Current conditions are shown in **Figure 15**. Arctic sea ice anomalies are below normal in the Barents-Kara and Okhotsk Seas with above normal anomalies in the Bering Sea related to the cold Alaskan winter (see **Figure 15**).

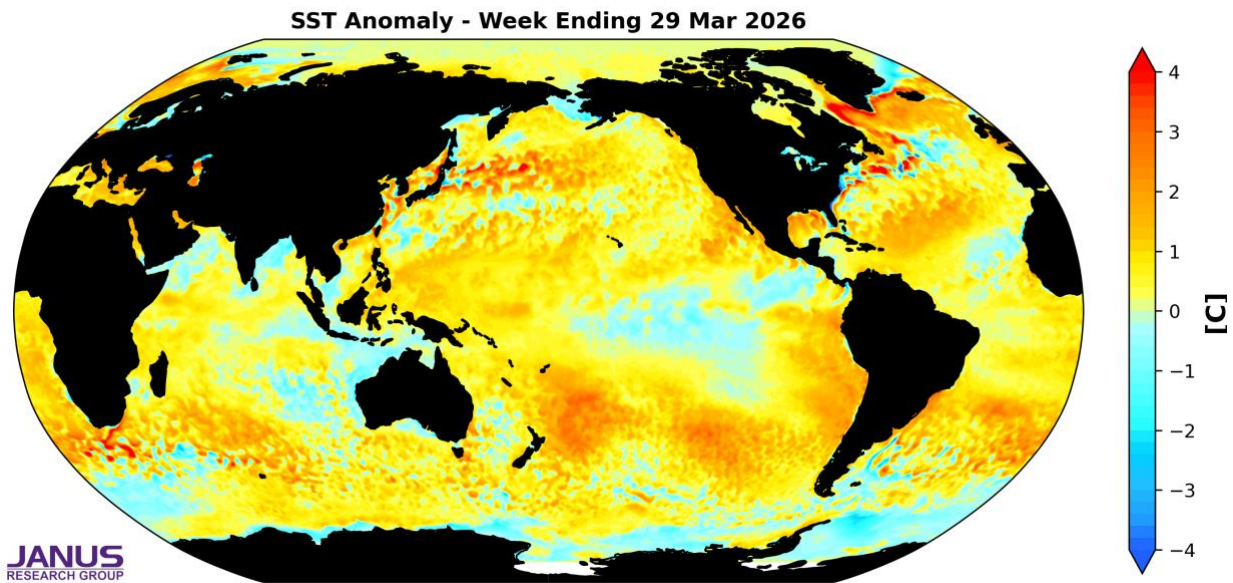


**Figure 15.** Arctic sea ice cover extent for 29 Mar 2026. White depicts ice covered areas and the orange contour the climatological extent of Arctic sea ice for the date. Plot taken from: <https://nsidc.org/sea-ice-today>

### SSTs/El Niño/Southern Oscillation

Equatorial Pacific sea surface temperatures (SSTs) anomalies are below normal, along the equatorial Pacific (**Figure 15**) consistent with La Niña conditions for much of the winter, however the cold anomalies are waning and warming has appeared near the South American coast, signs of a developing El Niño conditions. Observed SSTs across the NH

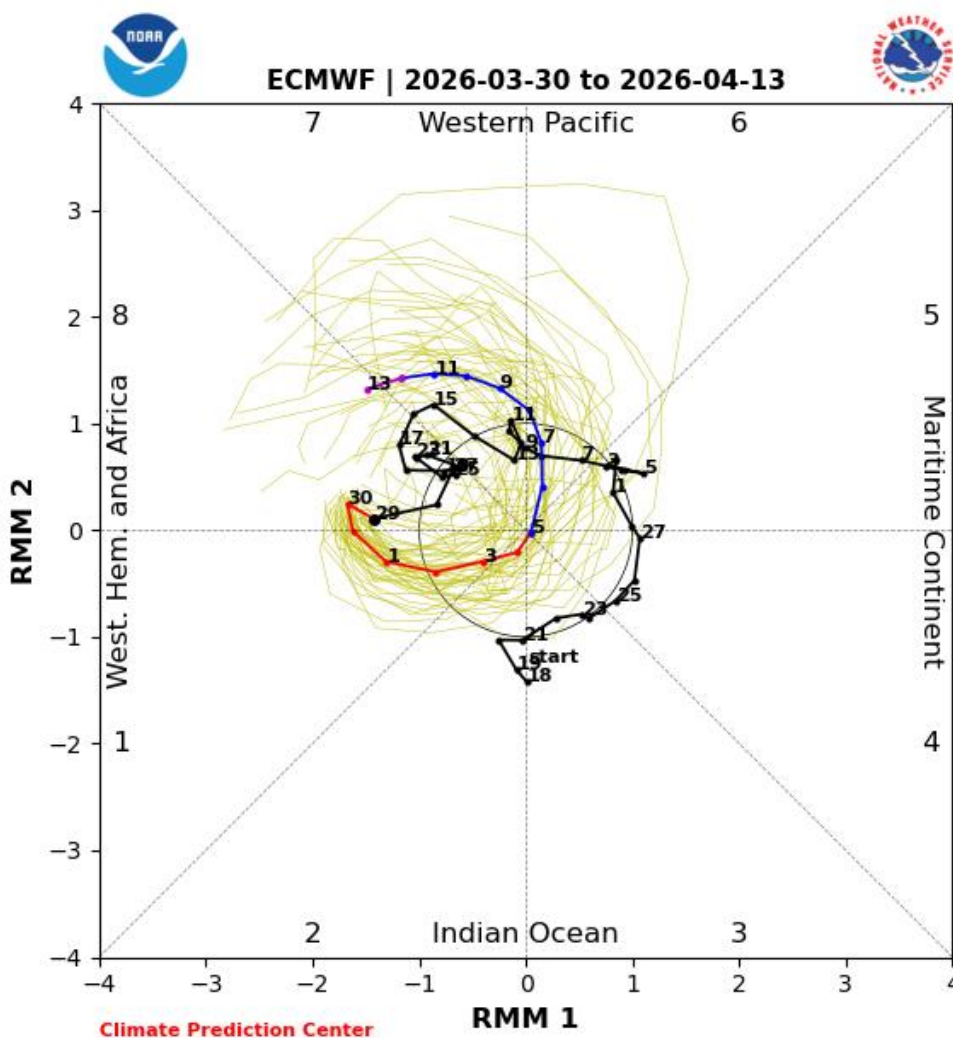
remain well above normal especially in the North Pacific and much of the North Atlantic, though below normal SSTs exist regionally especially in the South Pacific.



**Figure 16.** The latest daily-mean global SST anomalies for week ending 29 Mar 2026.

### **Madden Julian Oscillation**

Currently the Madden Julian Oscillation (MJO) is currently in phase eight (**Figure 17**) and the forecasts are for the MJO to quickly move into phase seven, then weaken to where no phase is favored and re-emerge in phase eight yet again over the next two weeks (**Figure 17**). Phases seven and eight favor ridging across Canada with troughing across the US especially the Eastern US, the opposite of forecasts and therefore, it seems that the MJO is having little influence on North American weather this week and next week. But admittedly this is outside of my expertise.



**Figure 17.** Past and forecast values of the MJO index. Forecast values from the 00Z 30 Mar 2026 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 <https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/CLIVAR/ecmf.shtml>

**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. [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!