



Environment and
Climate Change Canada

Environnement et
Changement climatique Canada

Canada

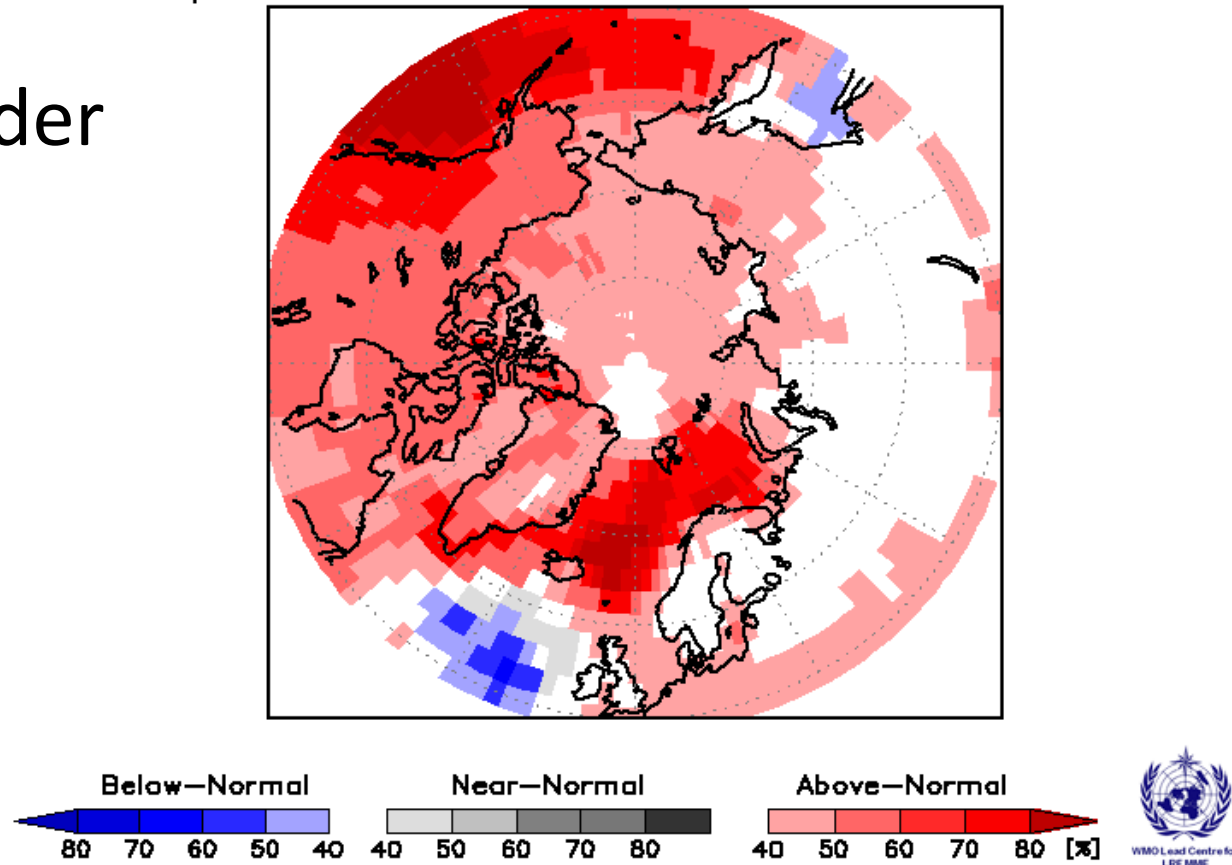
PARCOF-3: Verification of the February- March-April 2019 season

Marko Markovic
Meteorological Service of Canada



Seasonal forecast over the Arctic, Feb-March-April 2019

A reminder

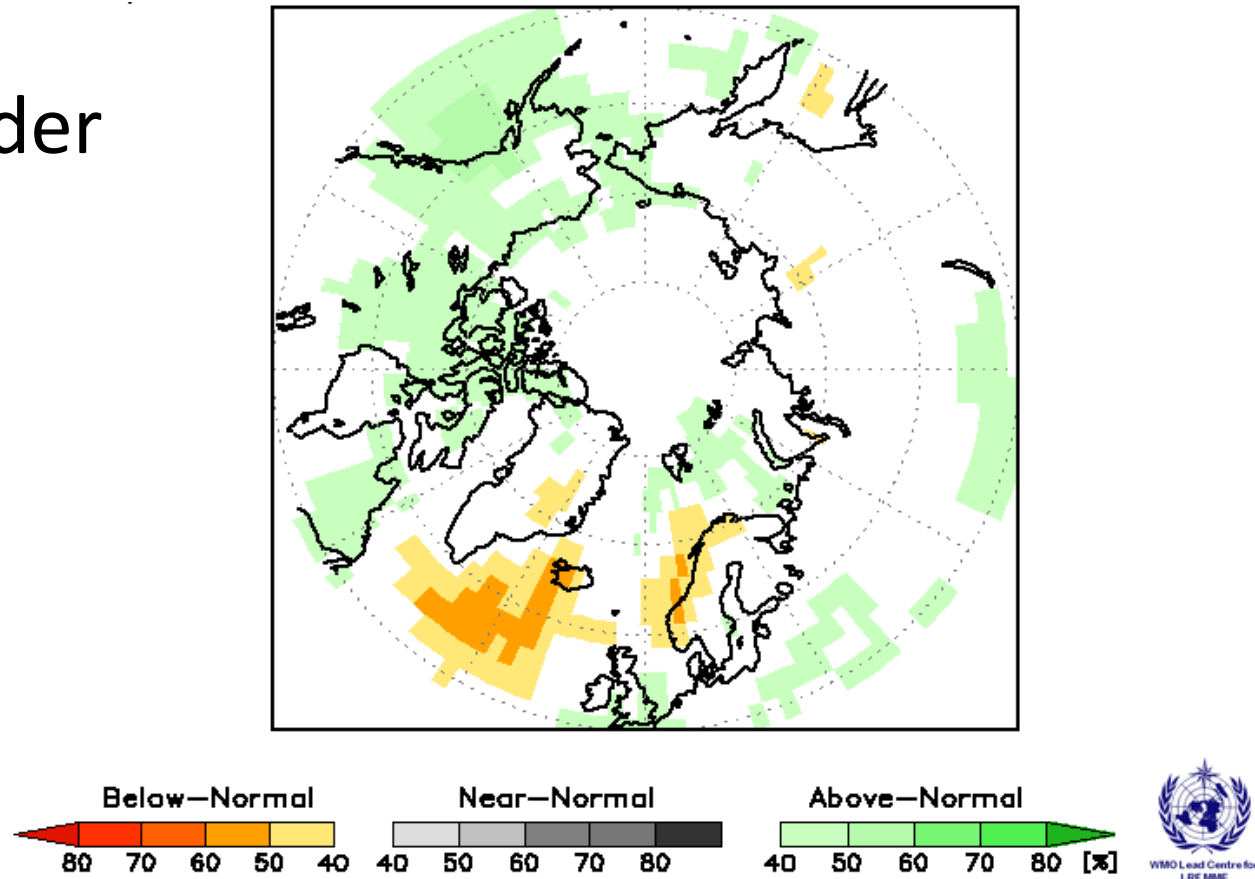


Considering multi-model ensemble forecast and a limited model skill over the Arctic:

Temperature: There is probability of at least 40% or more that the temperature will be above normal over the North American, central and eastern Russian Arctic and over the north Scandinavia.

Seasonal forecast over the Arctic, Feb-March-April 2019

A reminder

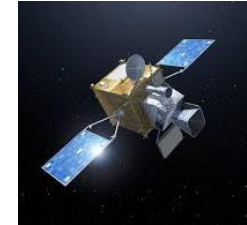


Considering multi-model ensemble forecast and a limited model skill over the Arctic:

Precipitation: Mostly equal chances were expected over the Russian Arctic. Over the N. America above normal precipitation was forecasted, over northern and western Scandinavia and Island we were expecting below normal precipitation.

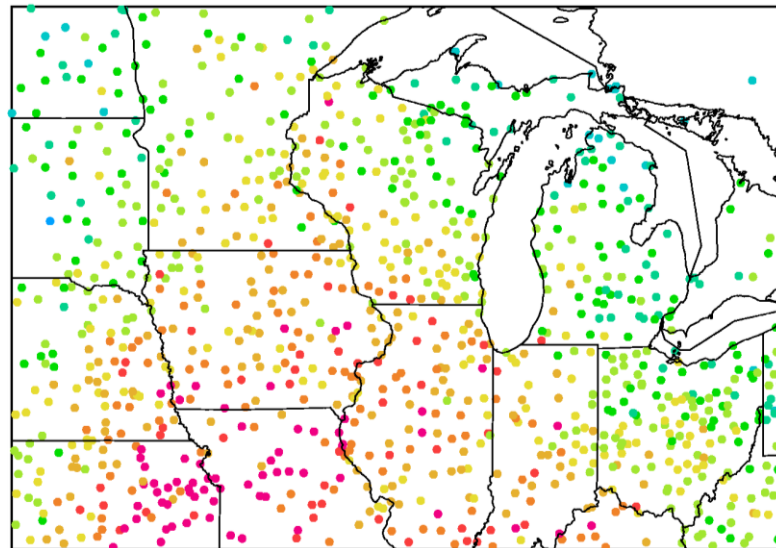
How do we verify seasonal forecasts?

- We need observations!



- Unfortunately we can not measure temperature or precipitation on every single point over the globe.
- This is why we use statistical techniques to interpolate measured variables over the regions where we can measure. The results is called **the re-analysis**.

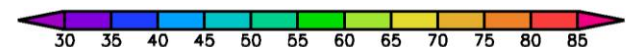
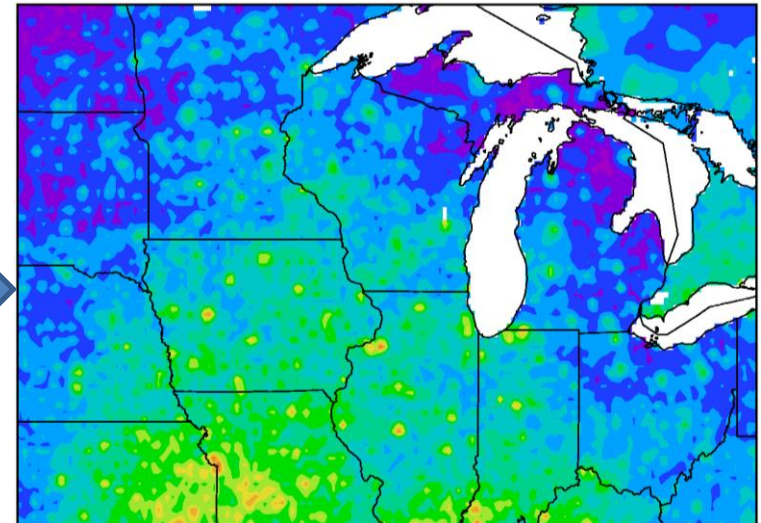
2) station observations Precipitation



Data
assimilation

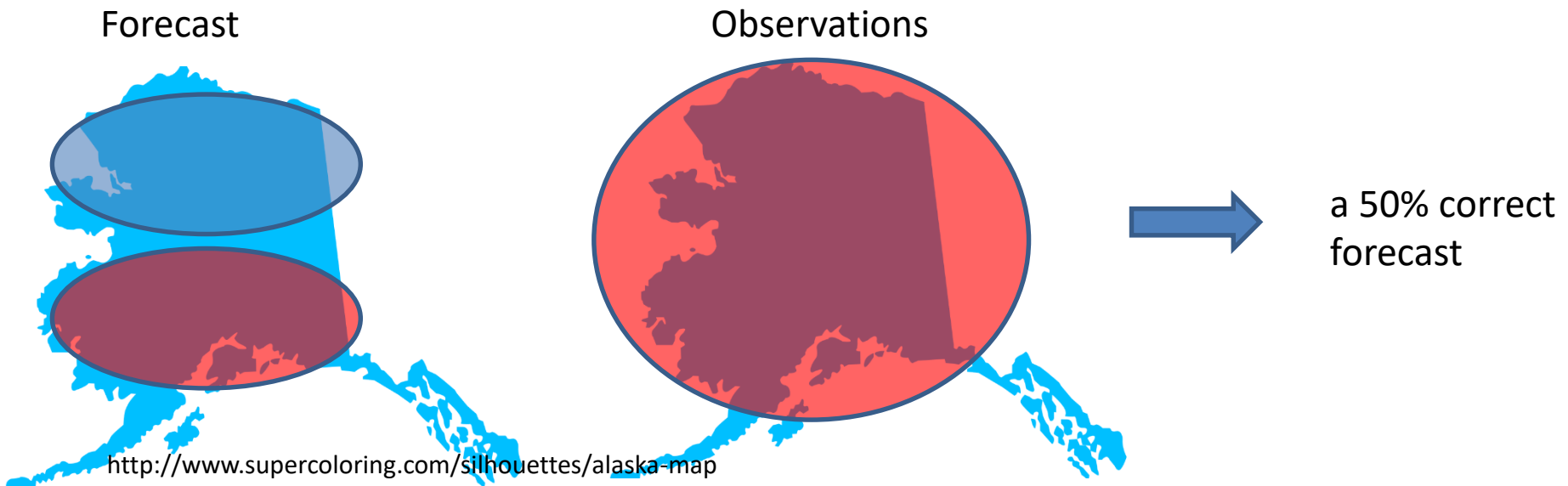


Precipitation Analysis

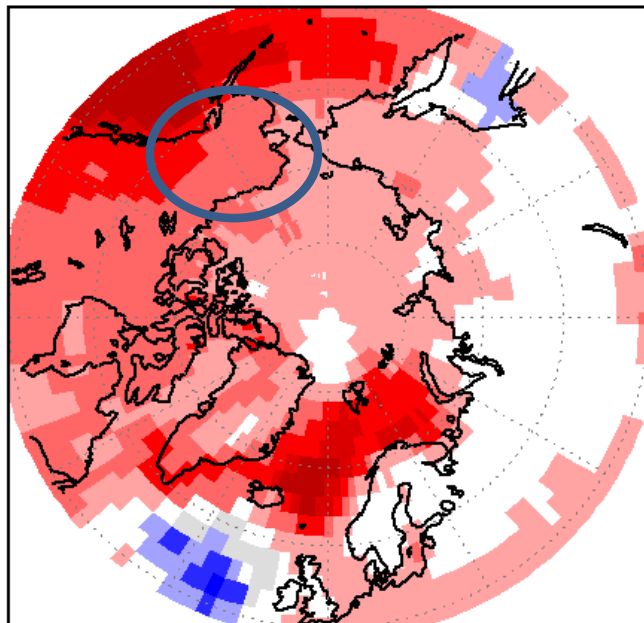


How do we verify seasonal forecasts?

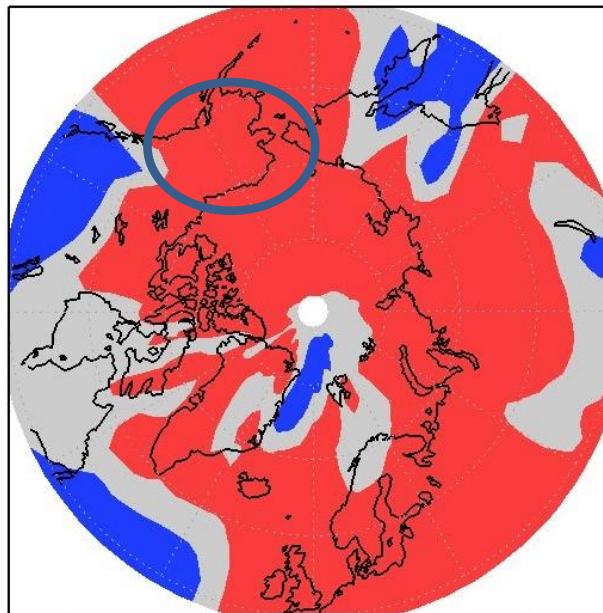
- ❑ We need some metric, some number to quantify the verification result
- ❑ We call this metric a score
- ❑ For the verification over the Arctic we will use a subjective score: a percentage of the correct forecast over a selected region in the Arctic.



Forecast, temp FMA 2019



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Verification Temperature

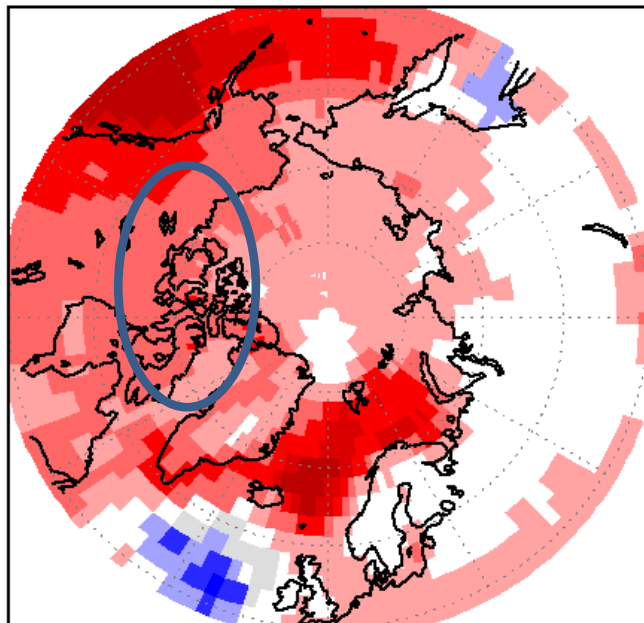


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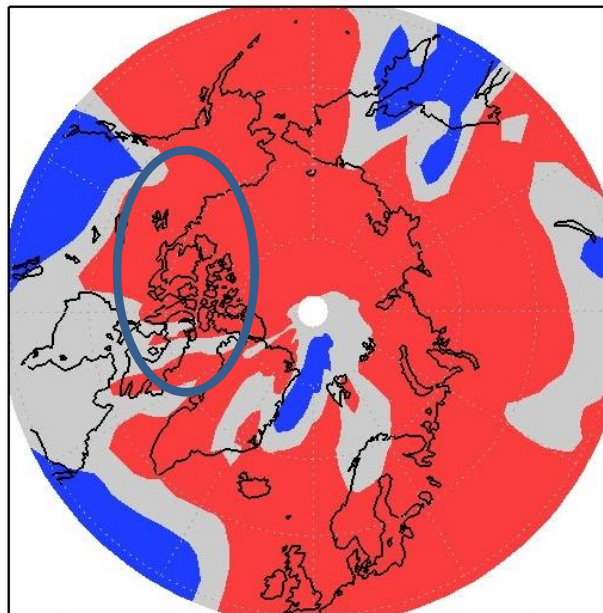
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Verif:	Forecast	CFS Reanalysis	Subj. Result
Alaska	Above normal	Above normal	hit
Canadian			
Atlantic			
European			
W. Siberian			
E. Siberian			
Chukchi			

Forecast, temp FMA 2019



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Verification Temperature

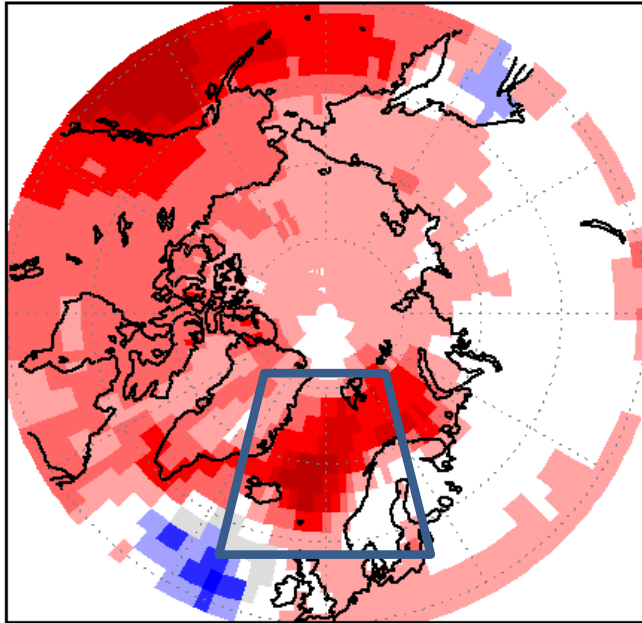
Above
normal

Near
normal

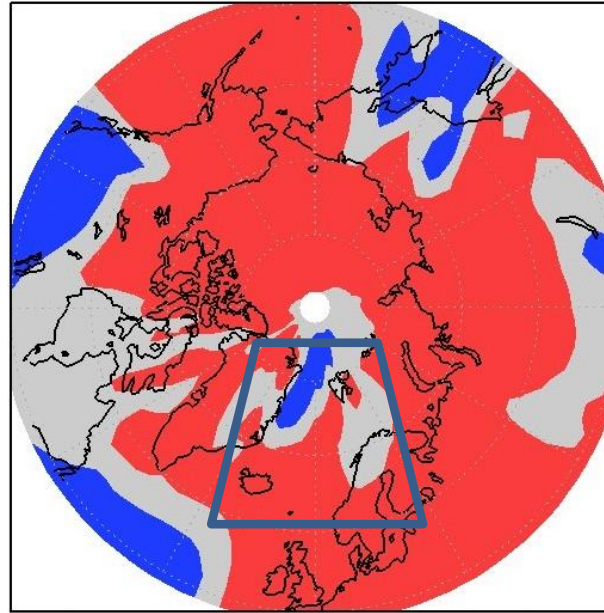
Below
normal

Verif:	Forecast	CFS Reanalysis	Subj. Result
Alaska	Above normal	Above normal	hit
Canadian	Above normal	Above normal, except in localised spots over Baffin island	80% hit, 20% miss
Atlantic			
European			
W. Siberian			
E. Siberian			
Chukchi			

Forecast, temp FMA 2019



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Verification Temperature

Above
normal

Near
normal

Below
normal

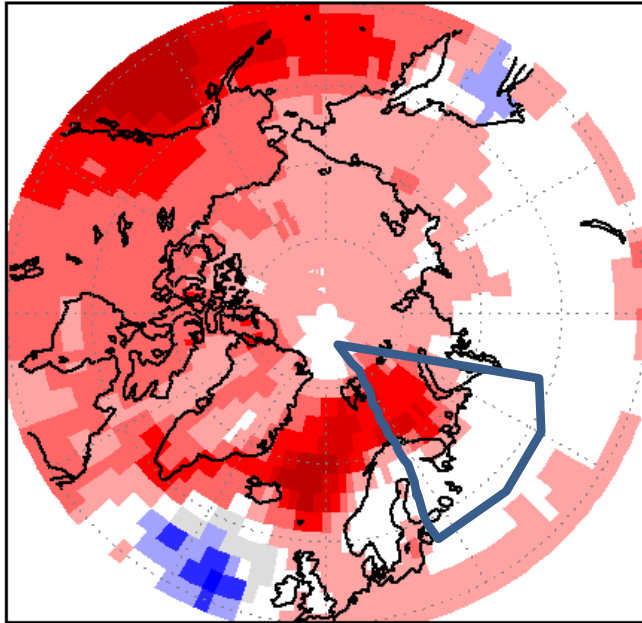


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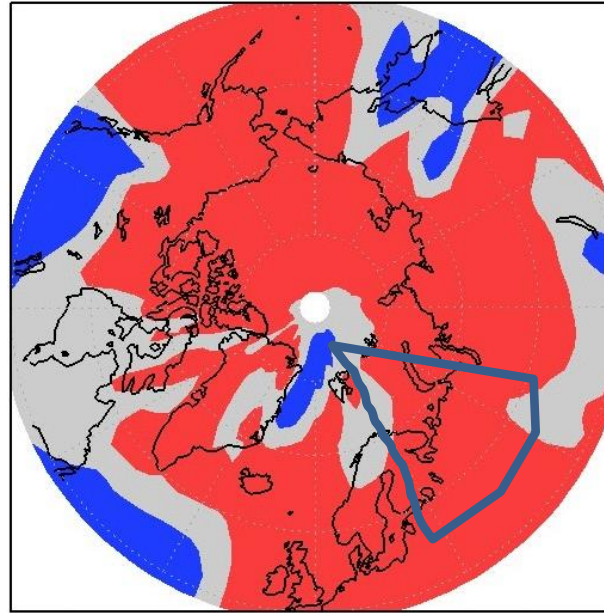
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W. Siberian			
E. Siberian			
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Forecast, temp FMA 2019



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Verification Temperature

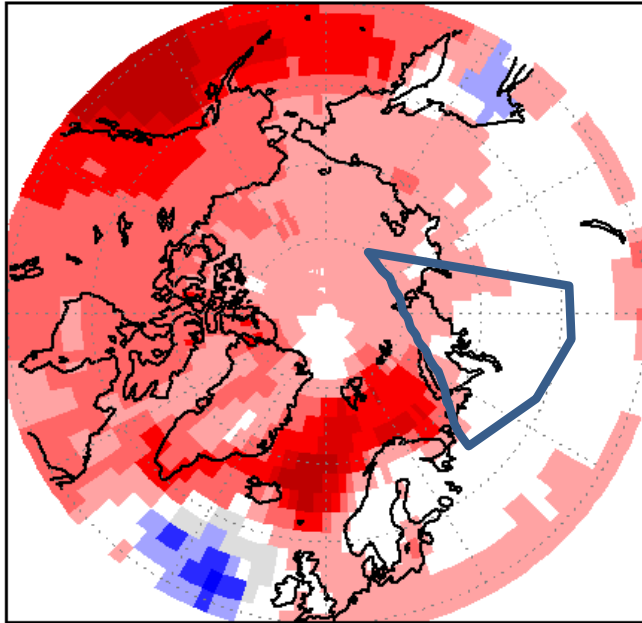
Above
normal

Near
normal

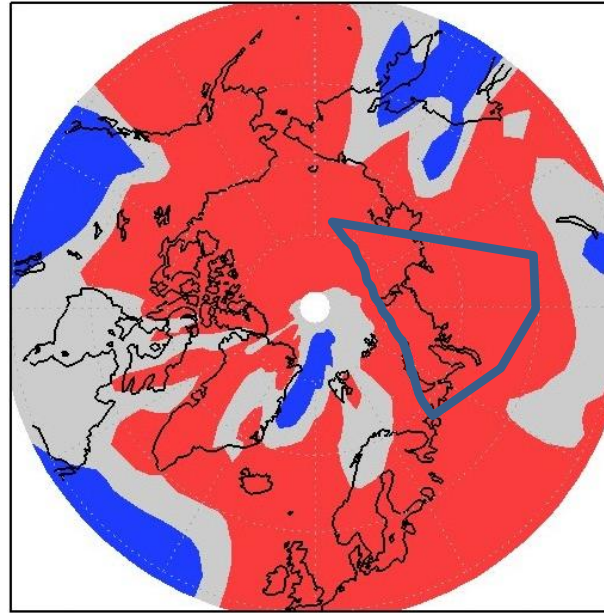
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European	Above in the north, but mostly indecisive	Above	Hit, where the forecast was decisive
W. Siberian			
E. Siberian			
Chukchi			

Forecast, temp FMA 2019



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Verification Temperature

Above
normal

Near
normal

Below
normal

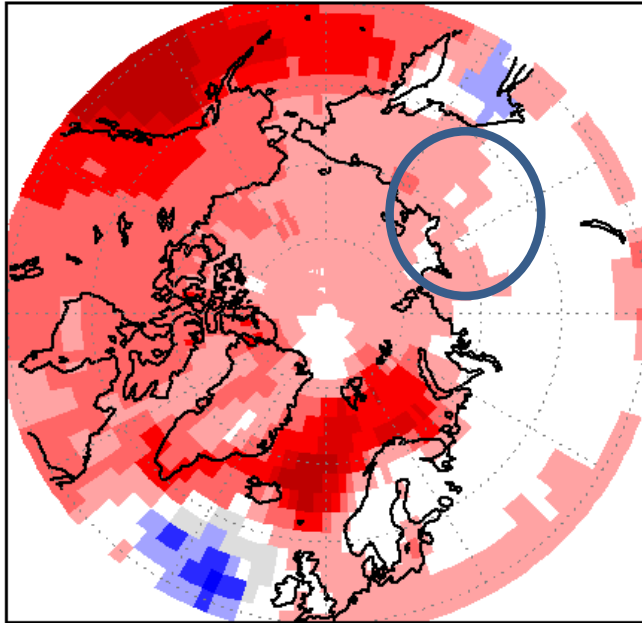


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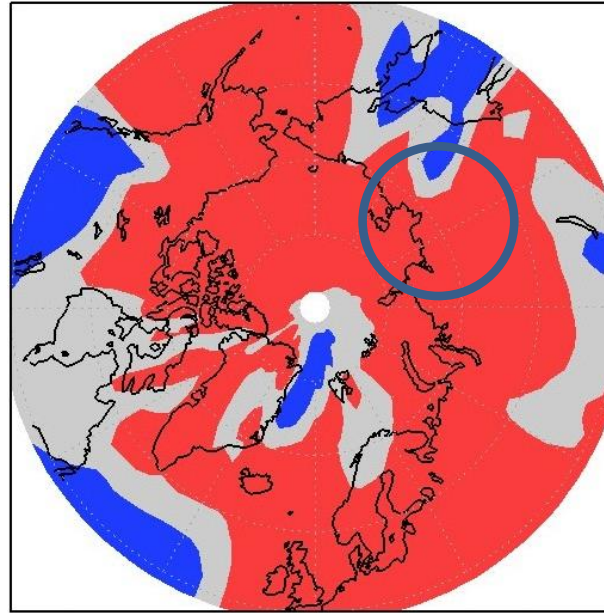
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E. Siberian			
Chukchi			

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Verification Temperature

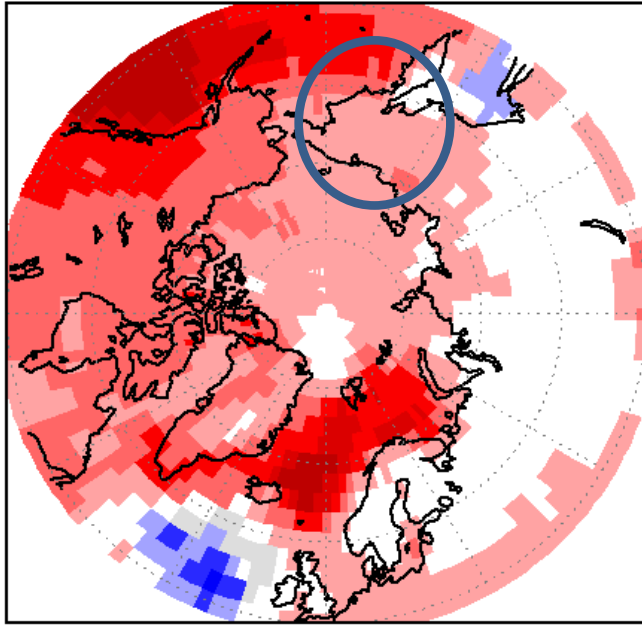
Above
normal

Near
normal

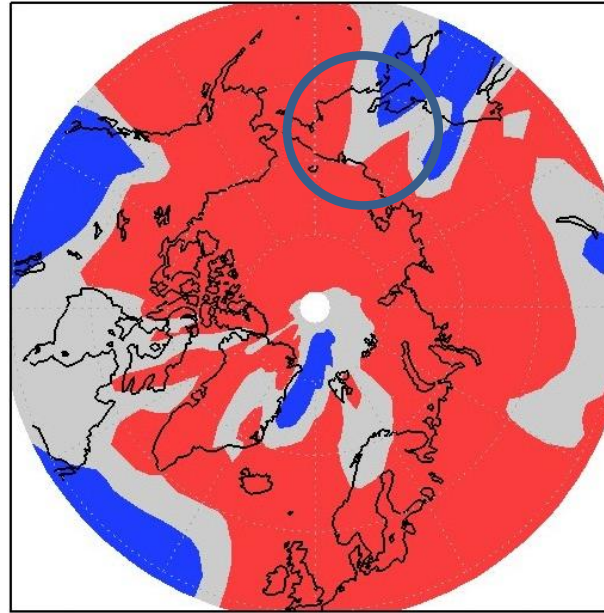
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European	Above in the north, but mostly indecisive	Above	Hit, where the forecast was decisive
W. Siberian	Above over sea, indecisive over land	Above	Hit, where the forecast was decisive
E. Siberian	Above in the north, indecisive over the south	Above	Hit, where decisive, except over the localised eastern region
Chukchi			

Forecast, temp FMA 2019



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Verification Temperature

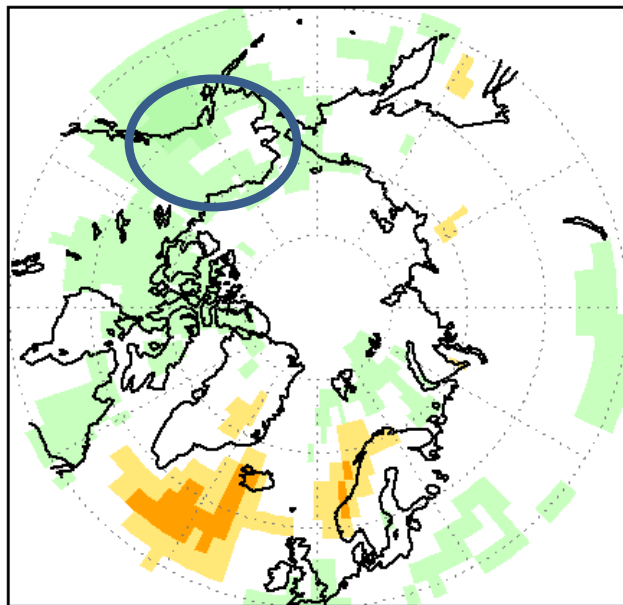
Above
normal

Near
normal

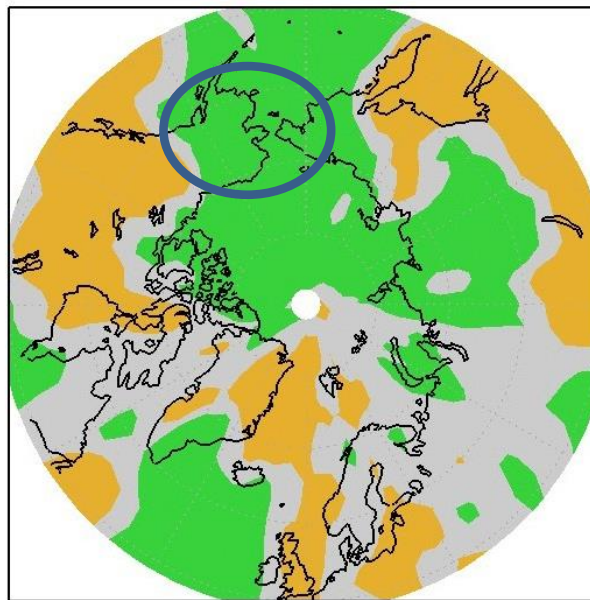
Below
normal

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Atlantic	Above normal	Above for Island, normal over eastern Greenland, normal over N. Scandinavia	50 hit, 50% miss
European	Above in the north, but mostly indecisive	Above	Hit, where the forecast was decisive
W. Siberian	Above over sea, indecisive over land	Above	Hit, where the forecast was decisive
E. Siberian	Above in the north, indecisive over the south	Above	Hit, where decisive, except over the localised eastern region
Chukchi	Above	Above in the east normal in the west	50%hit, 50% miss

Forecast, prec FMA 2019



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Verification Precipitation



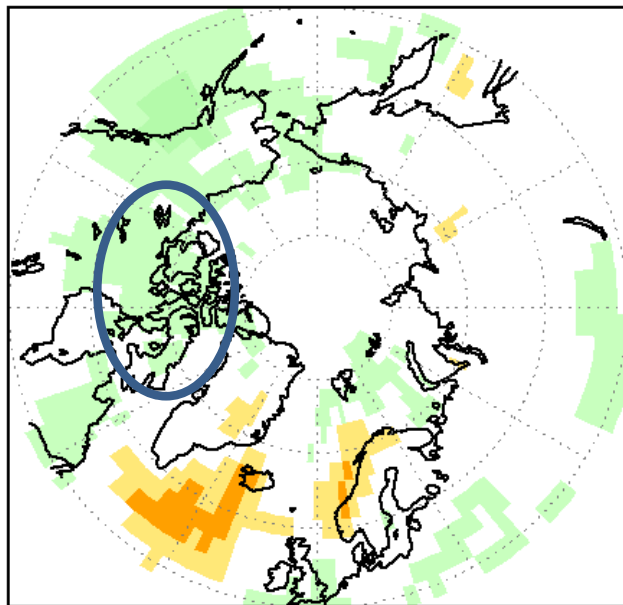
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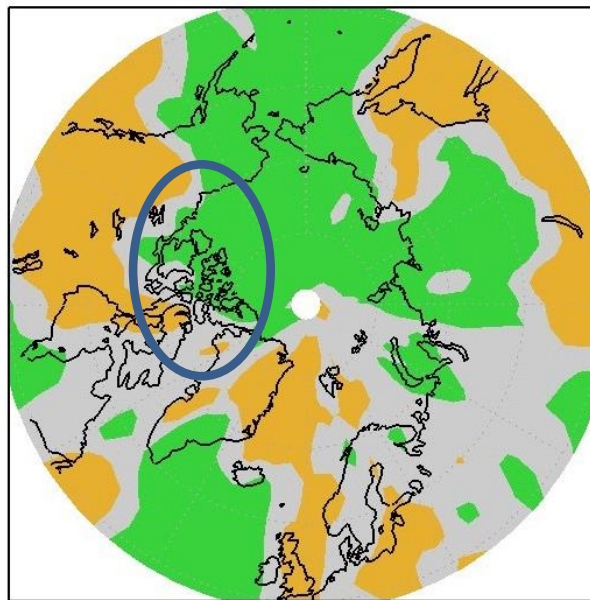


Verif:	Forecast FMA	CFS Reanalysis	Subj. Result
Alaska	Above normal	Above	Hit, where decisive
Canadian			
Atlantic			
European			
W. Siberian			
E. Siberian			
Chukchi			

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Verification Precipitation

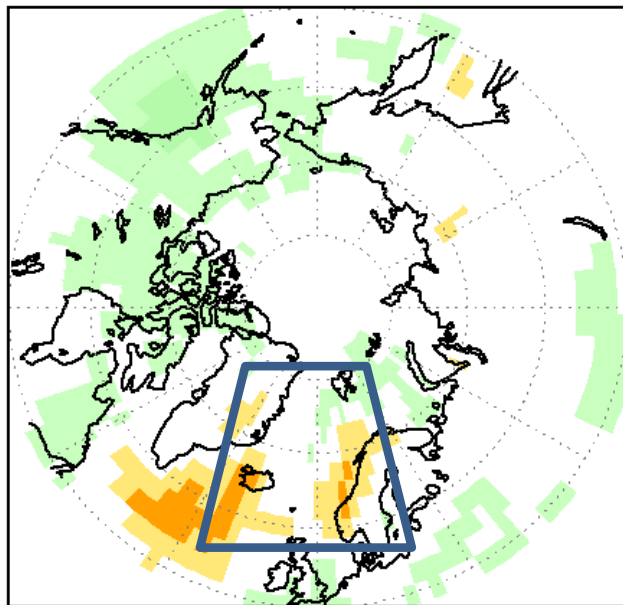
Above
normal

Near
normal

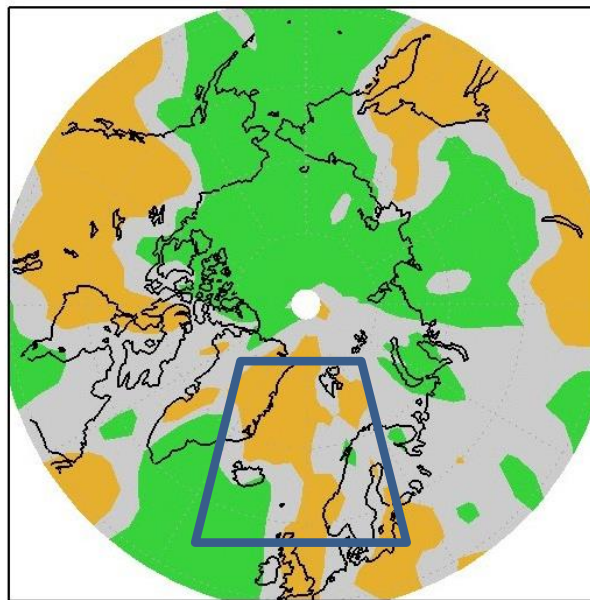
Below
normal

Verif:	Forecast FMA	CFS Reanalysis	Subj. Result
Alaska	Above normal	Above	Hit, where decisive
Canadian	Above normal	Above over NW, otherwise near normal or below normal	Miss, where decisive
Atlantic			
European			
W. Siberian			
E. Siberian			
Chukchi			

Forecast, prec FMA 2019



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Verification Precipitation

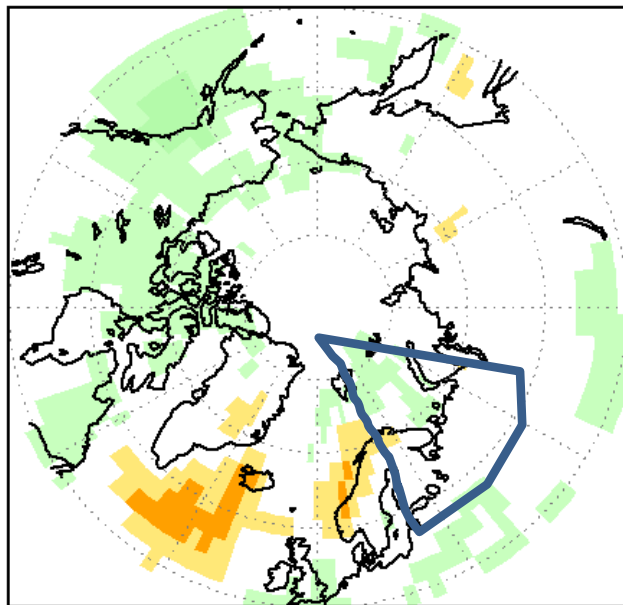
Above
normal

Near
normal

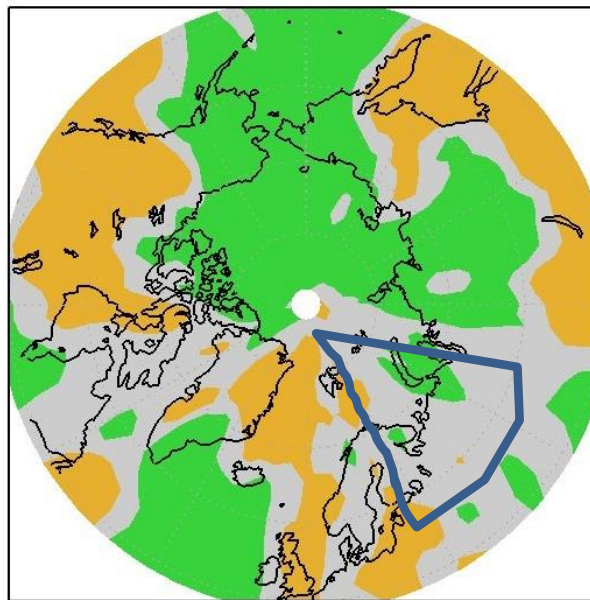
Below
normal

Verif:	Forecast FMA	CFS Reanalysis	Subj. Result
Alaska	Above normal	Above	Hit, where decisive
Canadian	Above normal	Above over NW, otherwise near normal or below normal	Miss, where decisive
Atlantic	Below normal over Island, Norway and eastern Greenland	Below over southern Norway and eastern Greenland	1/3 hit, 2/3 miss
European			
W. Siberian			
E. Siberian			
Chukchi			

Forecast, prec FMA 2019



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Verification Precipitation

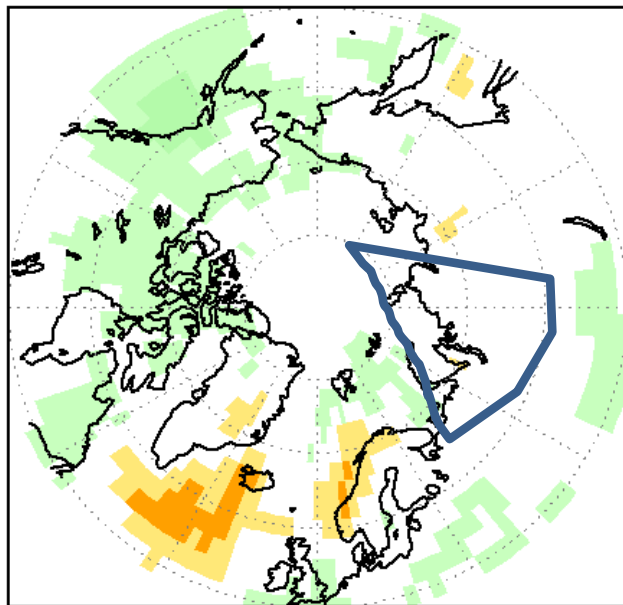
Above
normal

Near
normal

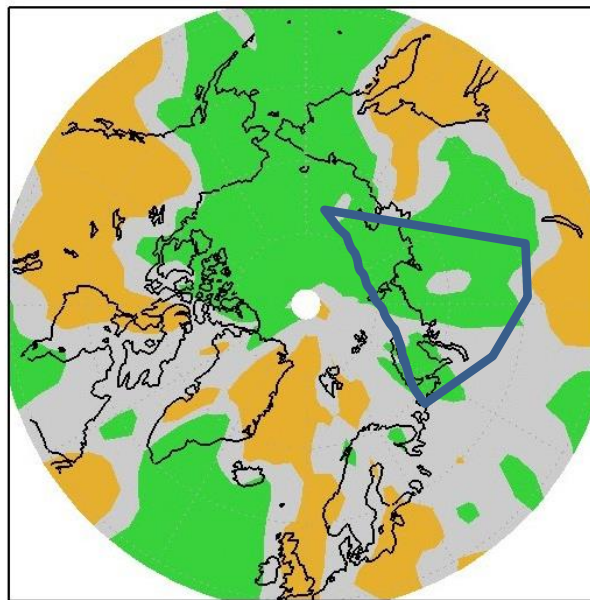
Below
normal

Verif:	Forecast FMA	CFS Reanalysis	Subj. Result
Alaska	Above normal	Above	Hit, where decisive
Canadian	Above normal	Above over NW, otherwise near normal or below normal	Miss, where decisive
Atlantic	Below normal over Island, Norway and eastern Greenland	Below over southern Norway and eastern Greenland	1/3 hit, 2/3 miss
European	Mostly indecisive	Mostly near normal	~
W. Siberian			
E. Siberian			
Chukchi			

Forecast, prec FMA 2019



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Above
normal

Near
normal

Below
normal



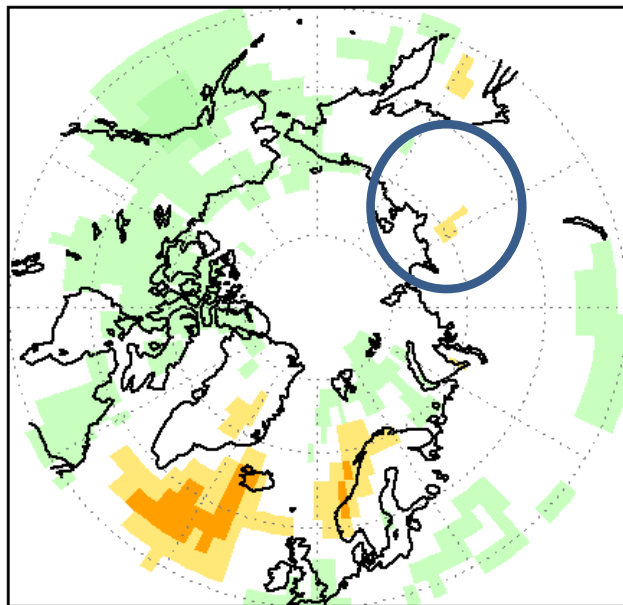
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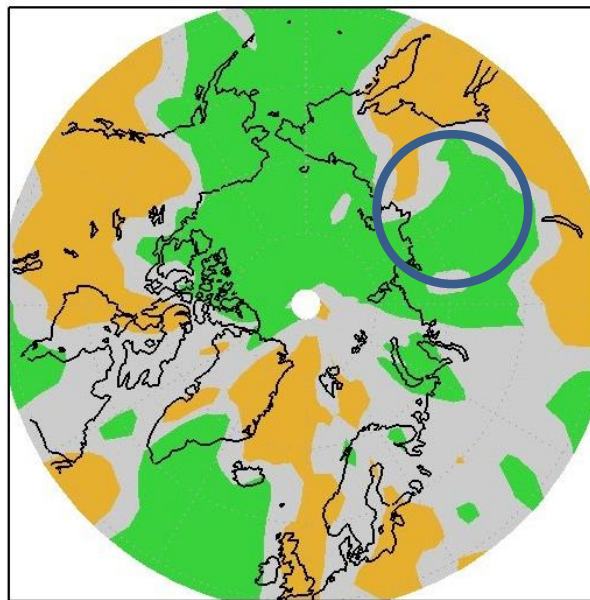
Verification Precipitation

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European	Mostly indecisive	Mostly near normal	~
W. Siberian	Indecisive	Mostly above normal	~
E. Siberian			
Chukchi			

Forecast, prec FMA 2019



CFSR Reanalysis FMA 2019



Above
normal

Near
normal

Below
normal



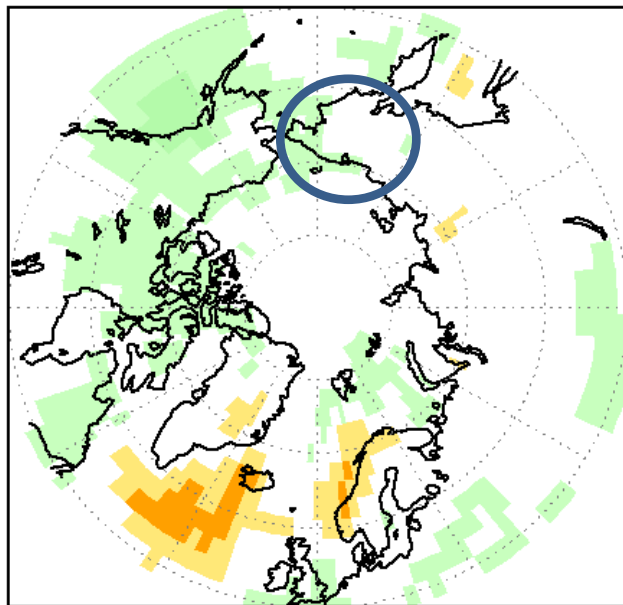
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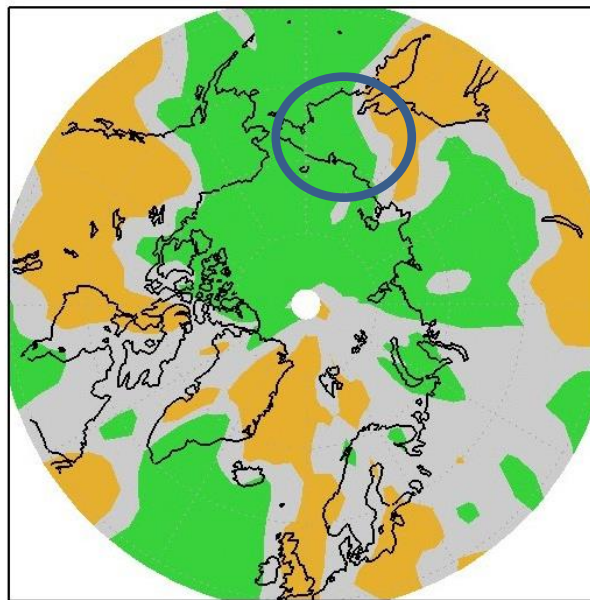
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E. Siberian	Indecisive	Mostly above normal	~
Chukchi			

Forecast, prec FMA 2019



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Above
normal

Near
normal

Below
normal



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Verification Precipitation

Verif:	Forecast FMA	CFS Reanalysis	Subj. Result
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Atlantic	Below normal over Island, Norway and eastern Greenland	Below over southern Norway and eastern Greenland	1/3 hit, 2/3 miss
European	Mostly indecisive	Mostly near normal	~
W. Siberian	Indecisive	Mostly above normal	~
E. Siberian	Indecisive	Mostly above normal	~
Chukchi	Mostly indecisive, above in the east	Mostly above normal	Hit where decisive

Overall result, subjective verification

- ❑ **Temperature:** very good spring forecast in almost all regions where the forecast was decisive. Subjective score ~75%.
- ❑ **Precipitation:** mostly equal chances. In the regions where the models did not predict equal chances ~40-50% of the territory had a good percent correct score.