





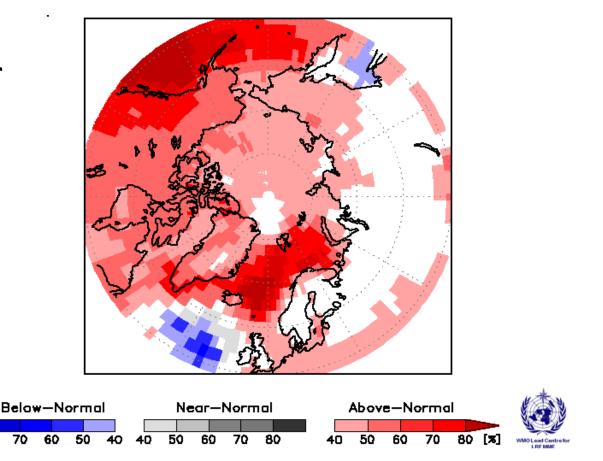
PARCOF-3: Verification of the February-March-April 2019 season

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Meteorological Service of Canada



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

A reminder

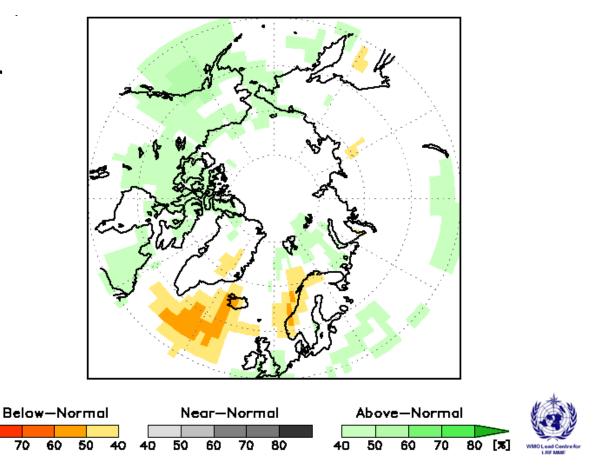


Considering multi-model ensemble forecast and a limited model skill over the Arctic:

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?

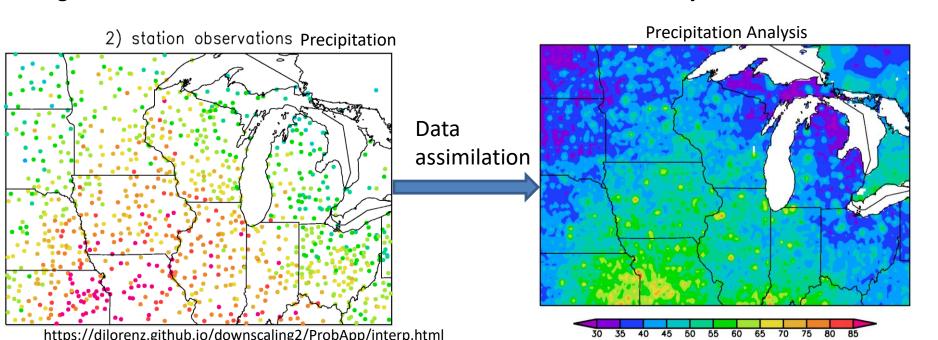
We need observations!





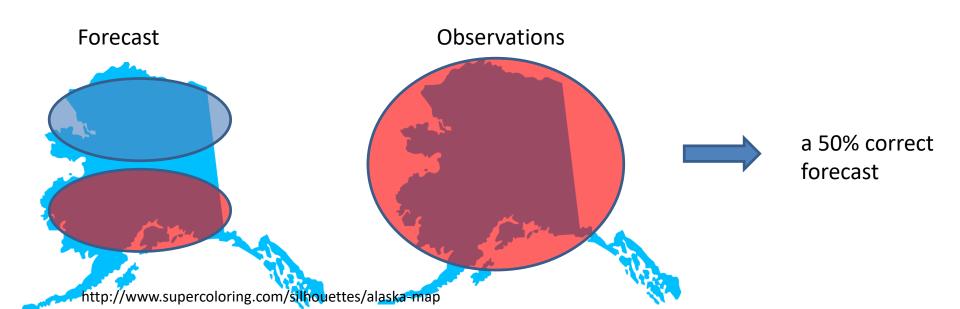


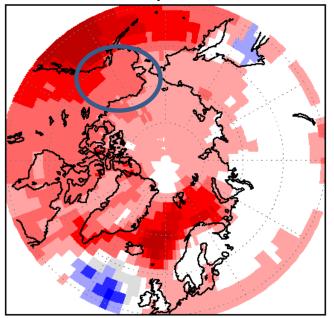
- Unfortunately we can not measure temperature or precipitation on every single point over the globe.
- This is why we use statistical techniques to interpolate measured variables over the regions where we can measure. The results is called the re-analysis.



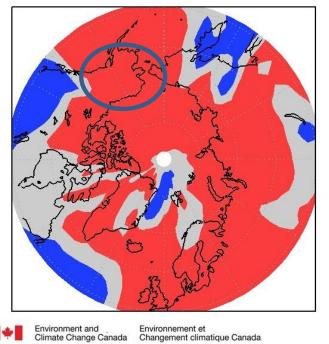
How do we verify seasonal forecasts?

- 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.





CFSR Reanalysis FMA 2019



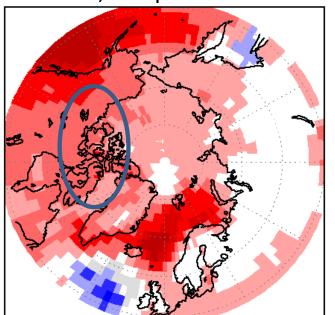
Verification Temperature

Above погтаl

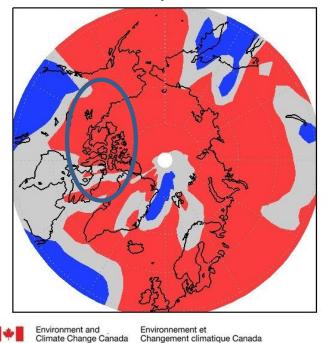
Near normal

Below normal

	Change Change Canada Changement Chinatique Canada	THE REAL PROPERTY OF THE PARTY
Forecast	CFS Reanalysis	Subj. Result
Above normal	Above normal	hit
	Forecast	Forecast CFS Reanalysis



CFSR Reanalysis FMA 2019



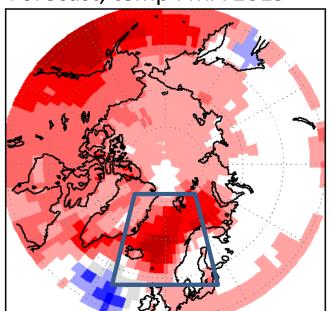
Verification Temperature

Above погтаl

Near normal

Below normal

		- Similar Shangs Sanada Shangshort Similarique Sanada	SAMPLE OF CO.
Verif:	Forecast	CFS Reanalysis	Subj. Result
Alaska	Above normal	Above normal	hit
Canadian	Above normal	Above normal, except in localised sports over Baffin island	80% hit, 20% miss
Atlantic			
European			
W. Siberian			
E. Siberian			
Chukchi			

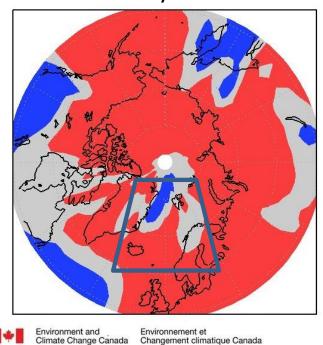


Forecast

Verif:

Chukchi

CFSR Reanalysis FMA 2019



Verification **Temperature**

Subj. Result

Below normal

Above normal

Near normal

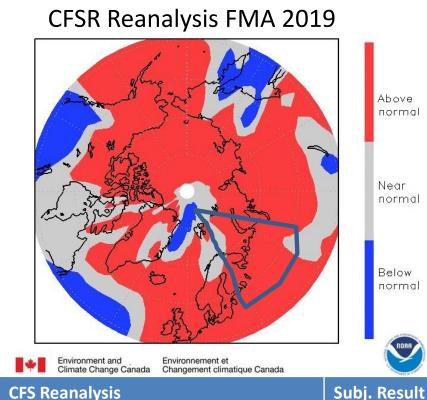
Alaska Above normal Above normal hit Above normal Above normal, except in localised 80% hit 20% Canadian

Aulant's	Ab	sports over Baffin island	miss
Atlantic	Above normal	Above for Island, normal over eastern	50 hit, 50% miss

CFS Reanalysis

Greenland, normal over N. Scandinavia European W. Siberian E. Siberian

Forecast, temp FMA 2019



Verification **Temperature**

• • • • • • • • • • • • • • • • • • • •
Alaska

Canadian

Atlantic

European

W. Siberian

E. Siberian

Chukchi

Verif:

Above normal

Forecast

Above normal

Above normal

Above in the north, but

mostly indecisive

Above

Above normal

Baffin island

Above normal, except in localised sports over

Above for Island, normal over eastern

Greenland, normal over N. Scandinavia

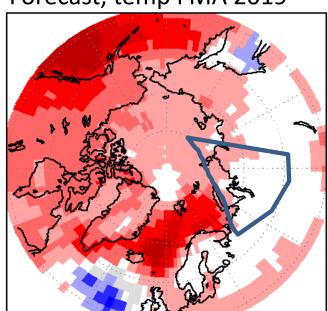
hit

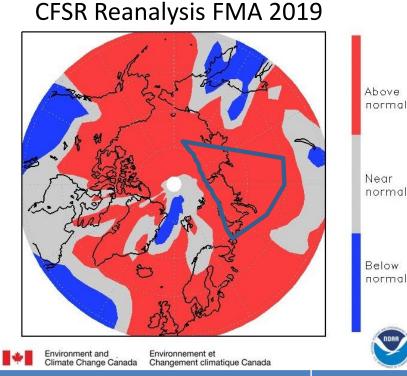
Hit, where the forecast was decisive

80% hit, 20% miss

50 hit, 50% miss

Forecast, temp FMA 2019





Verification Temperature

Verif:	Forecast	CFS Reanalysis	Subj. Result
Alaska	Above normal	Above normal	hit

Above normal

80% hit, 20% miss

Canadian Baffin island

Atlantic Above normal European

Above in the north, but mostly indecisive

over land

W. Siberian

E. Siberian

Chukchi

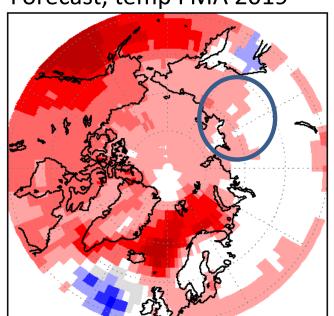
decisive

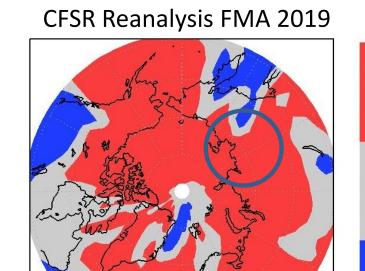
Above over sea, indecisive **Above**

Above normal, except in localised sports over Above for Island, normal over eastern Greenland, normal over N. Scandinavia Above

50 hit, 50% miss Hit, where the forecast was decisive Hit, where the forecast was

Forecast, temp FMA 2019





Verification Temperature

Environment and Climate Change Canada Environnement et Changement climatique Canada **CFS Reanalysis** Subj. Result

Verific	
Alaska	

Canadian

Atlantic

European

W. Siberian

E. Siberian

Chukchi

Verif:

Forecast

Above normal

Above normal

Above in the north,

Above normal

Above in the north, but mostly indecisive

Above over sea, indecisive over land

indecisive over the south

Baffin island Above for Island, normal over eastern Greenland, normal over N. Scandinavia Above

Above normal, except in localised sports over

hit

50 hit, 50% miss Hit, where the forecast was decisive

80% hit, 20% miss

Above normal

Near normal

Below normal

Hit, where the forecast was decisive

Hit, where decisive, except over the localised eastern region

Above

Above normal

Above

CFSR Reanalysis FMA 2019 Above normal Near normal Below normal Environment and Climate Change Canada Environnement et Changement climatique Canada **CFS Reanalysis**

Verification Temperature

Alaska	Abo

Verif:

Canadian

Atlantic

European

W. Siberian

E. Siberian

Chukchi

ove normal

Above normal

Forecast

the south

Above

Above normal

Above in the north, but mostly indecisive

Above over sea, indecisive over land

Above in the north, indecisive over

Above for Island, normal over eastern Above Above

Above normal

Baffin island

Above

Greenland, normal over N. Scandinavia

Above in the east normal in the west

Above normal, except in localised sports over

Hit, where the forecast was decisive

50 hit, 50% miss

80% hit, 20% miss

localised eastern region

50%hit, 50% miss

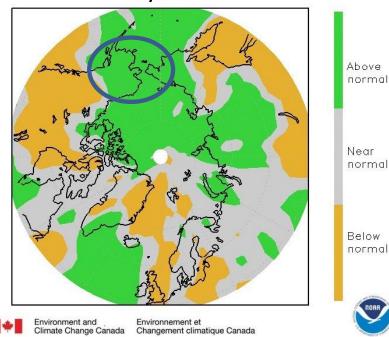
hit

Subj. Result

Hit, where the forecast was decisive

Hit, where decisive, except over the

Forecast, prec FMA 2019



Verification Precipitation

Verif:

Canadian

Atlantic

European

W. Siberian

E. Siberian

Chukchi

Alaska **Above normal**

Forecast FMA Above

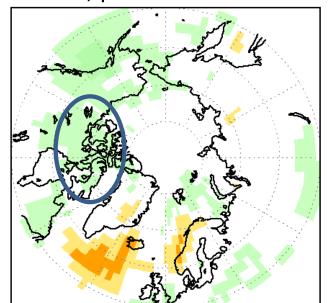
CFS Reanalysis

Subj. Result

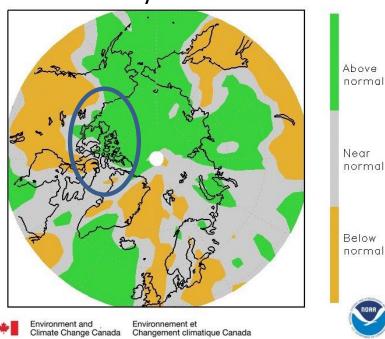
Hit, where decisive

Forecast, prec FMA 2019

Chukchi



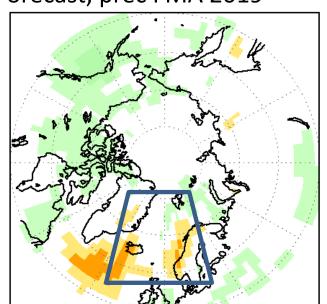
CFSR Reanalysis FMA 2019

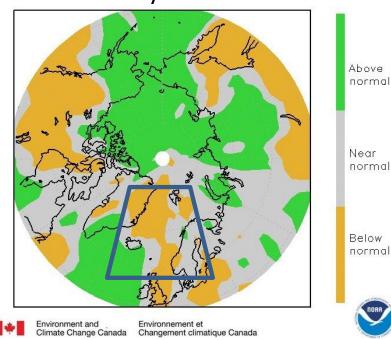


Verification Precipitation

	Hit, where decisive
Alaska Above normal Above Hit	int, where accisive
Canadian Above normal Above over NW, otherwise near normal or below normal	Miss, where decisive
Atlantic	
European	
W. Siberian	
E. Siberian	

Forecast, prec FMA 2019





Verification Precipitation

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

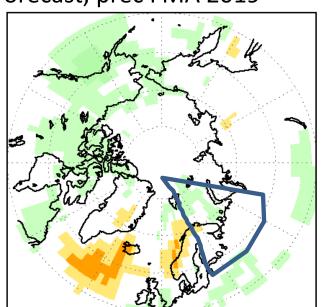
Atlantic Below over southern Norway and eastern Below normal over Island, 1/3 hit, 2/3 miss

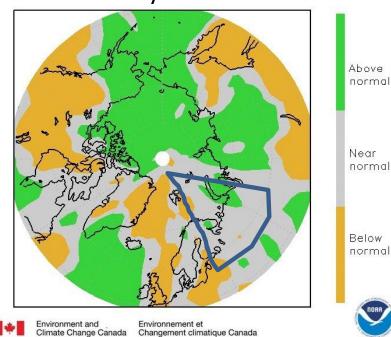
Norway and eastern Greenland Greenland

European W. Siberian

E. Siberian Chukchi

Forecast, prec FMA 2019





Verification Precipitation

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

Below normal over Island, Below over southern Norway and eastern

1/3 hit, 2/3 miss

Atlantic Norway and eastern Greenland Greenland

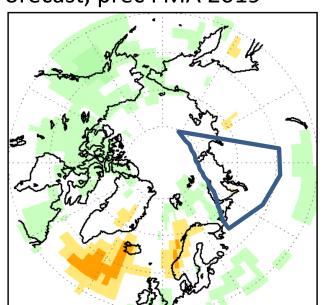
Mostly indecisive Mostly near normal European

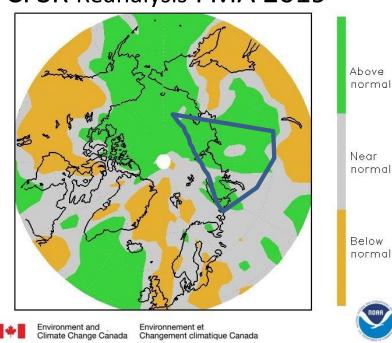
W. Siberian

E. Siberian

Chukchi

Forecast, prec FMA 2019





Verification Precipitation

Verif:	Forecast FMA	CFS Reanalysis	Subj. Result

Alaska Above normal

Atlantic

E. Siberian

Chukchi

Above

Hit, where decisive

Canadian Above normal Above over NW, otherwise near normal or below normal

Miss, where decisive

Below normal over Island, Below over southern Norway and eastern

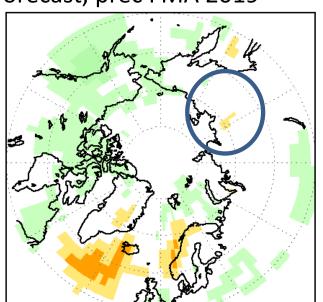
Norway and eastern Greenland Greenland 1/3 hit, 2/3 miss

Mostly indecisive Mostly near normal

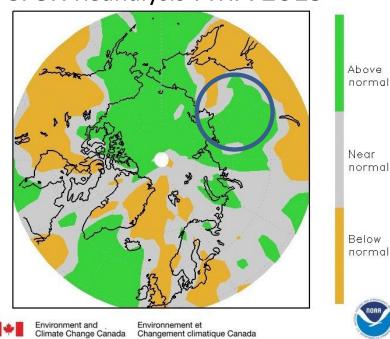
European W. Siberian **Indecisive**

Mostly above normal

Forecast, prec FMA 2019



CFSR Reanalysis FMA 2019



Verification Precipitation

Verif:	Forecast FMA	CFS Reanalysis	Subj. Result

Alaska Above normal

Above Above over NW, otherwise near normal or

Hit, where decisive Miss, where decisive

Canadian Above normal **Atlantic**

below normal

Below normal over Island,

Below over southern Norway and eastern

Norway and eastern Greenland

Greenland

1/3 hit, 2/3 miss

Mostly indecisive

Indecisive

European

Mostly near normal

W. Siberian

Mostly above normal

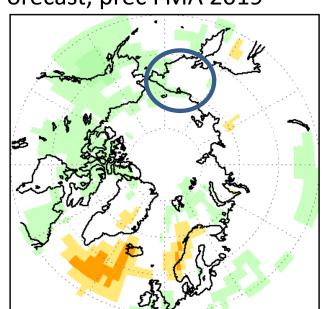
Indecisive

E. Siberian

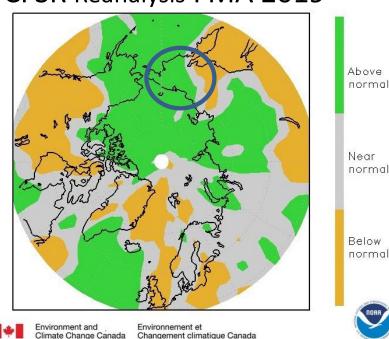
Chukchi

Mostly above normal

Forecast, prec FMA 2019



CFSR Reanalysis FMA 2019



Verification Precipitation

Verif:	Forecast FMA	CFS Reanalysis	Subj. Result

Mostly above normal

Mostly above normal

Alaska Above normal

W. Siberian

E. Siberian

Chukchi

Above normal

Above Above over NW, otherwise near normal or below

Hit, where decisive

Canadian

normal

Miss, where decisive

Atlantic Below normal over Island, Norway and eastern Greenland

Indecisive

east

Below over southern Norway and eastern

European

Greenland

1/3 hit, 2/3 miss

Mostly indecisive

Hit where decisive

Mostly near normal

Indecisive

Mostly indecisive, above in the

Mostly above normal

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.