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Canada

PARCOF-3: Seasonal forecast for summer June-July-August 2019 over the Arctic

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WMO

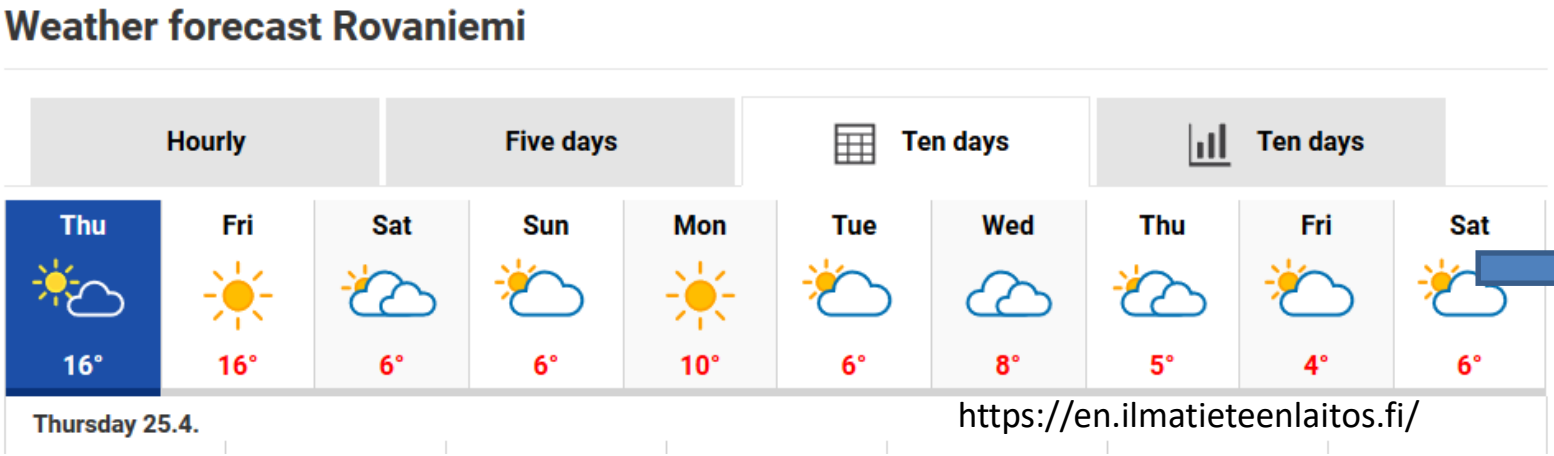
Plan

- Brief reminder on the seasonal forecasting (e.g. models, climatology, probabilities).
- Real time forecasts for the June July August 2019
- Historical skill and seasonal forecast confidence in June-July-August.
- Conclusions

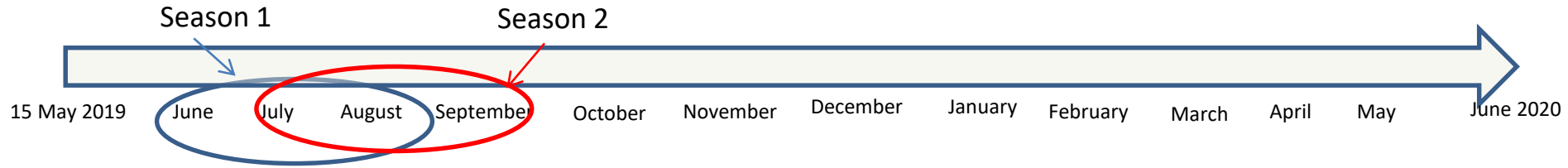
Introduction to Seasonal Forecasting
What is Seasonal Forecast?

- If we take a ***weather forecasting*** model and we add to it an ***ocean forecasting*** model we will obtain a ***climate forecasting*** model.

- **Seasonal Forecast** is a climate forecast ranging up to 1 year ahead.



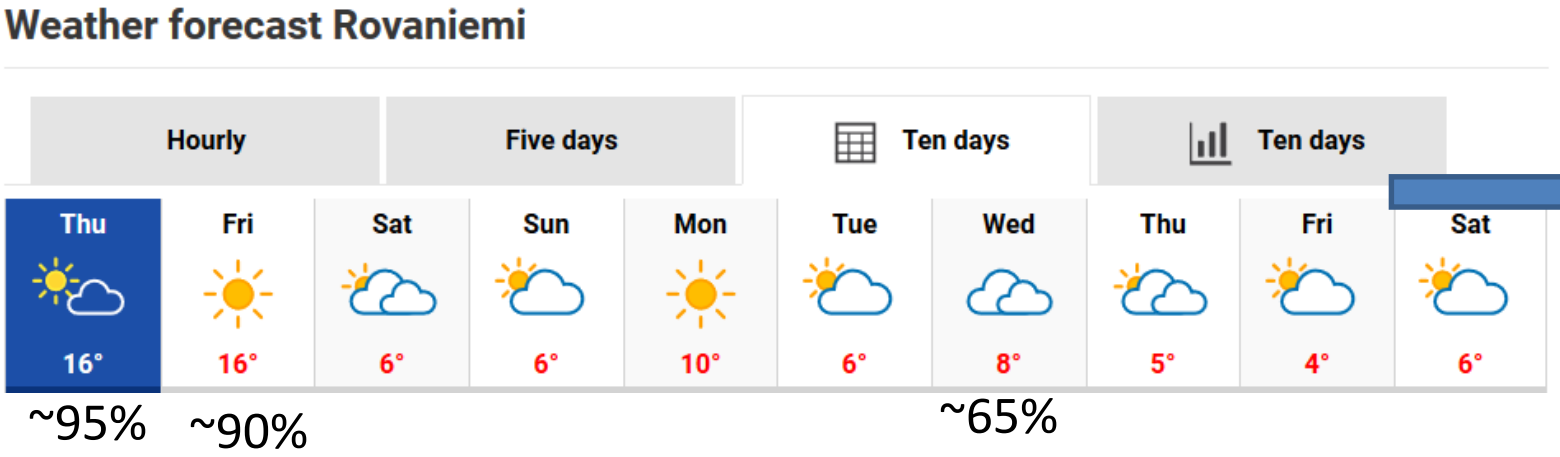
1 year



- **Seasonal Outlook** represents a 90-day average of the seasonal forecast's daily realisations.

Introduction to Seasonal Forecasting
Seasonal Forecast Skill?

- Skill is a measure of the forecast's accuracy.



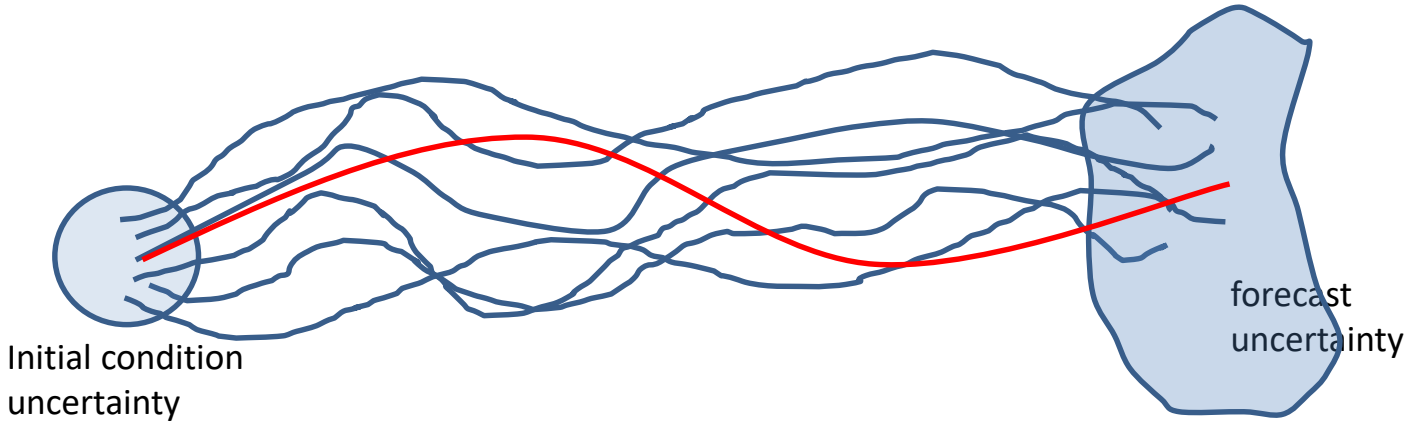
- How can the seasonal forecast be skillful if there is a very low weather forecast skill beyond two weeks?

- Seasonal climate, and especially over Arctic, depend on the features that are not so important for day-day weather (i.e. they evolve very slowly). Those are: presence of sea-ice, snow on the ground, soil moisture and sea-surface temperature.

- This is why we are able to have skillful seasonal forecast.

Introduction to Seasonal Forecasting
Why do we need ensembles?

- Ensembles are climate forecasts with slightly changed initial conditions.

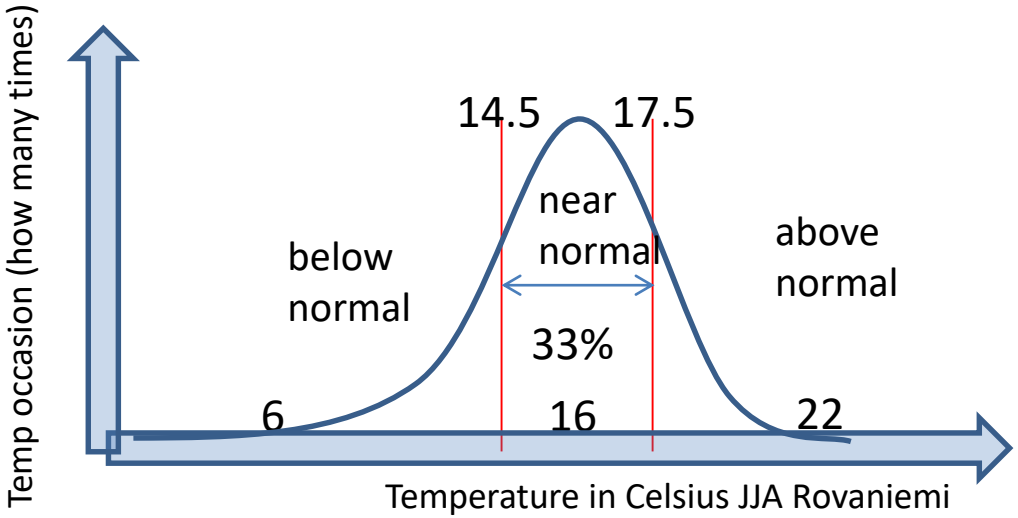


- Ensembles are very helpful in seasonal forecasting:
  - Error cancellation when averaging ensemble members
  - Enabling us to assess a chance (probability) for a certain result (e.g. how many members say that it will be colder than normal).

Seasonal forecast over the Arctic, JJA 2019
A reminder:

- To calculate seasonal forecasts we use:
  - Climate models with ensemble prediction
  - International Multi model ensemble (US, Russia, Canada, Europe, …)

- We need ensembles to assess the probability for the certain outcome (e.g. how many ensemble members are above normal).
- We communicate seasonal forecast results in terms of probabilities (e.g. There is a 50% probability that the summer will be above normal).

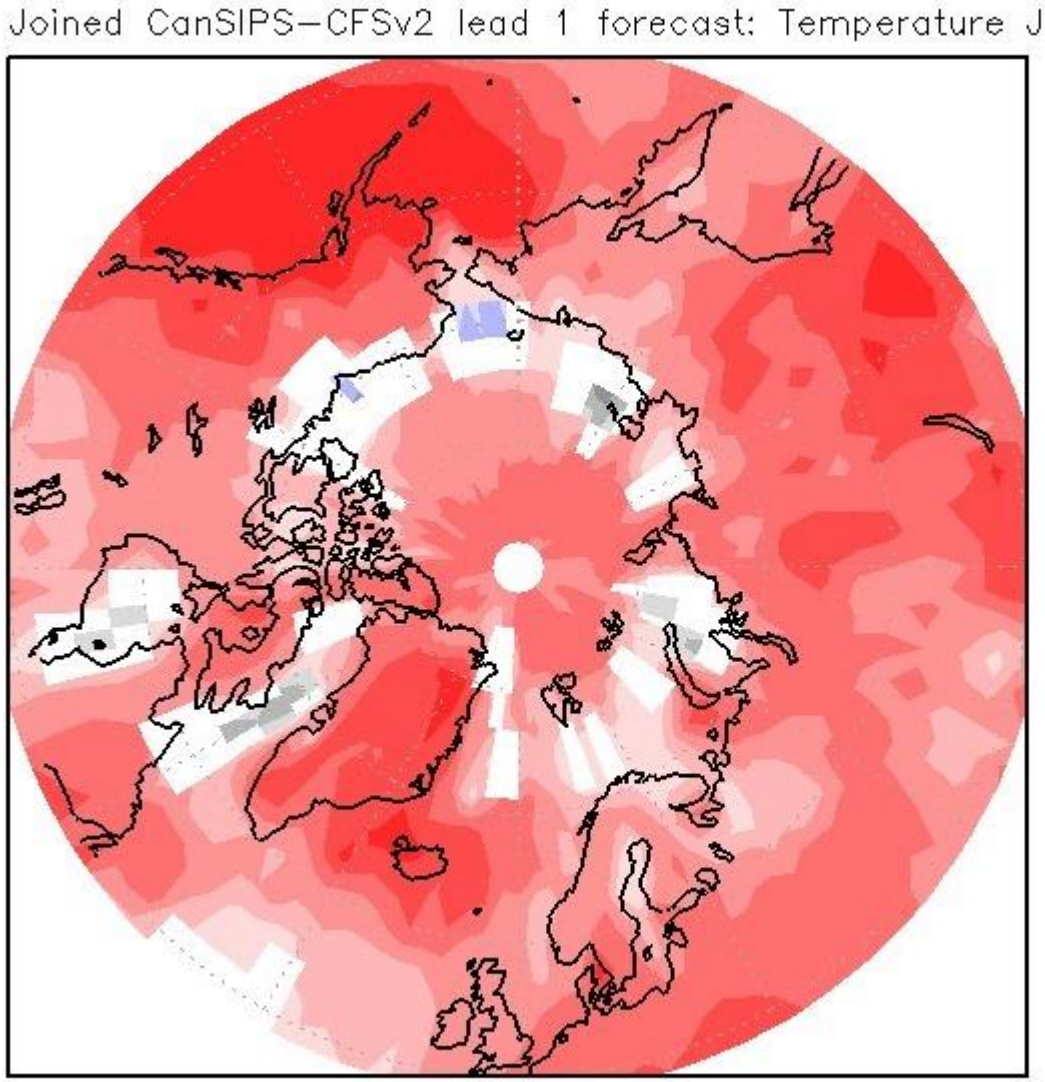


- If the forecast for temp is higher than 17.5 we declare it **above normal.**
- Lower 14.5 degrees is **below normal.**
- In between is **near normal.**

Actual (real time)seasonal forecasts over the Arctic JJA-2019

- temperature
- precipitation

Temperature outlook over the Arctic: June-July-August 2019



1. Alaska
2. Canadian Arctic
3. Atlantic Arctic
4. European Arctic
5. West. Siberian
6. Eastern Siberian
7. Chukchi

- The redder the color does not mean it is warmer.
- It means we have more confidence in the above normal forecast over that region.

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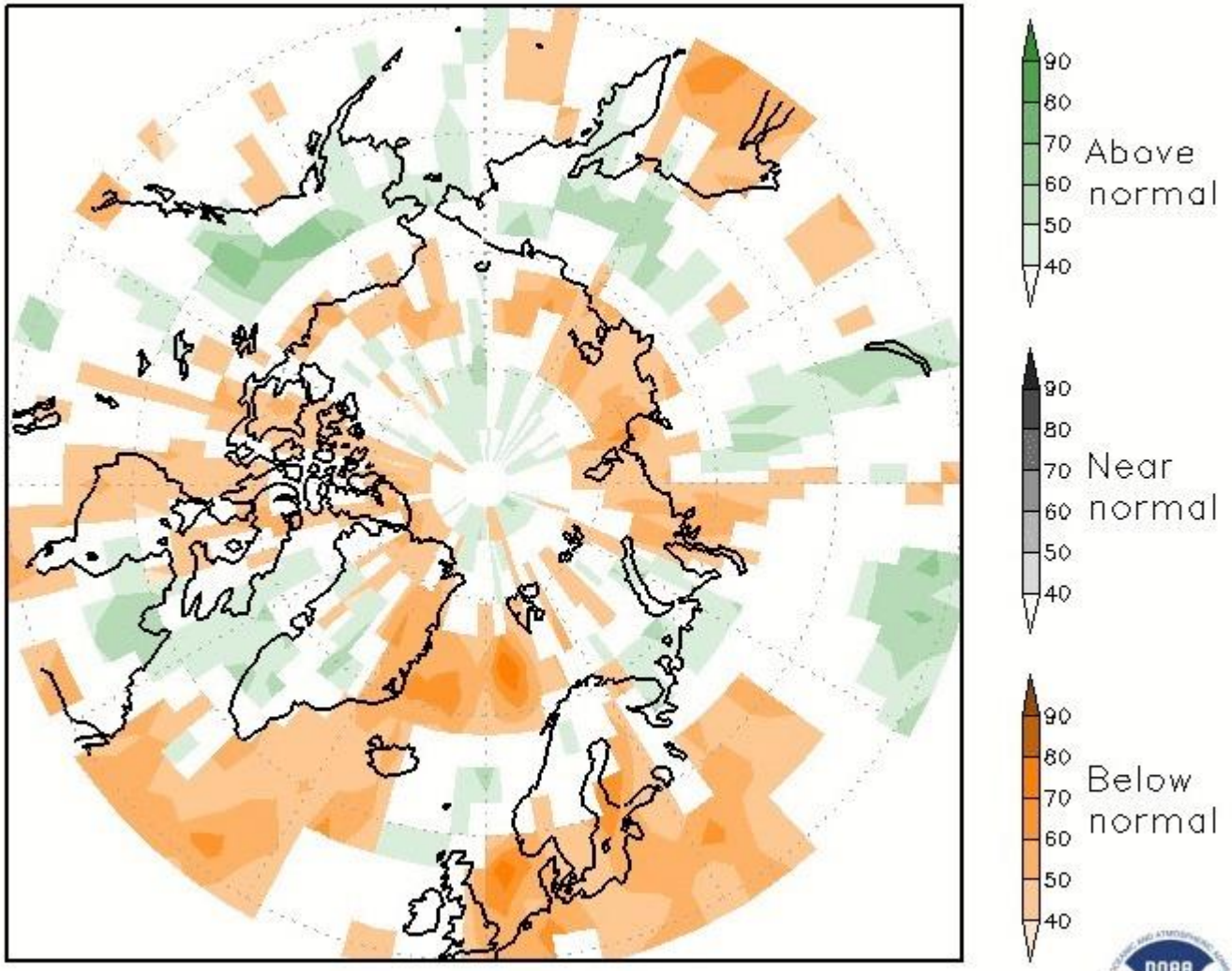
Precipitation outlook over the Arctic: June-July-August 2019



1. Alaska
2. Canadian Arctic
3. Atlantic Arctic
4. European Arctic
5. West. Siberian
6. Eastern Siberian
7. Chukchi

- The greener the color does not mean it will precipitate more.
- It means we have more confidence in the above normal precipitation forecast over that region.

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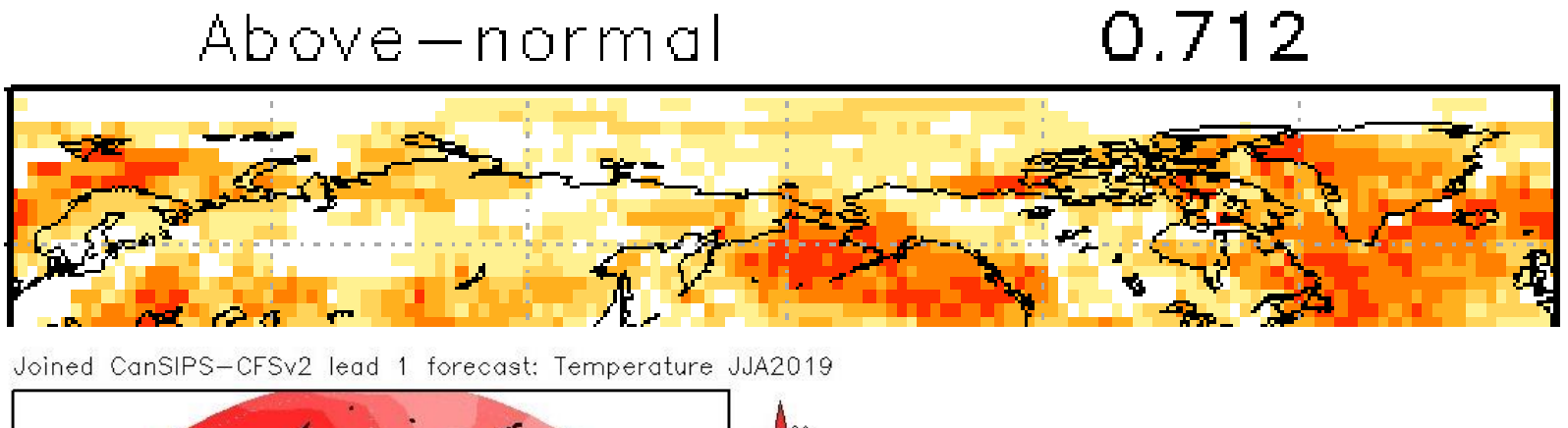
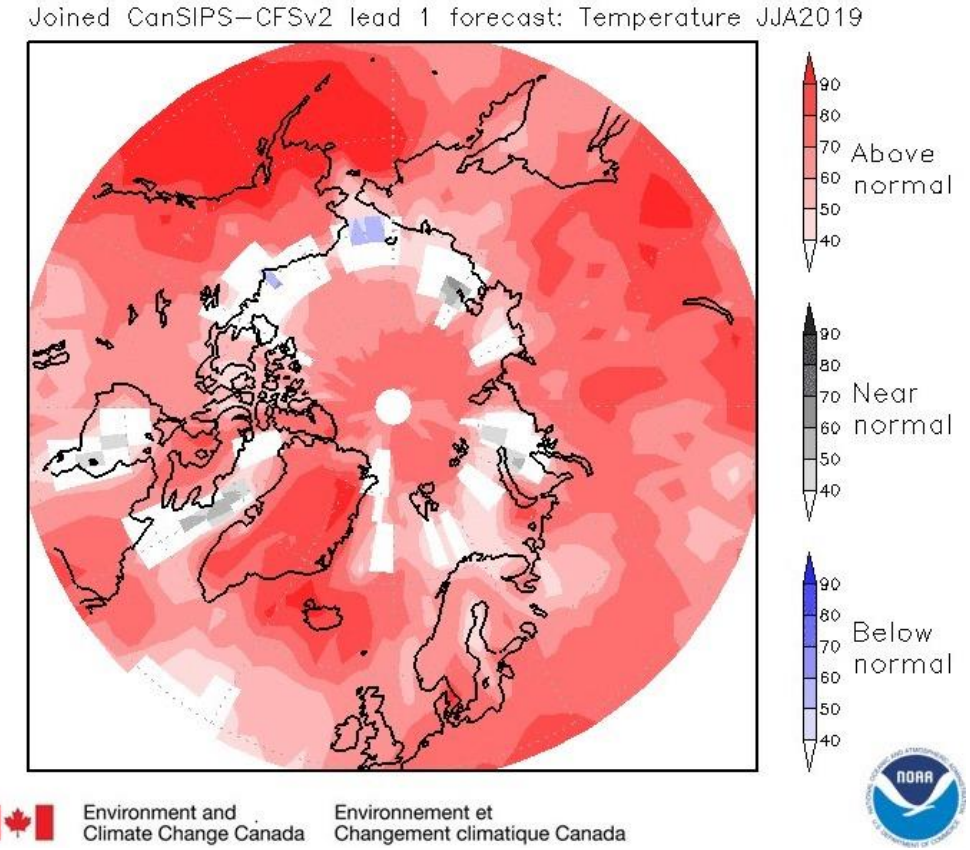
NOAA

Discussing historical skill over the Arctic, Temperature

(confidence with respect to the historical skill)

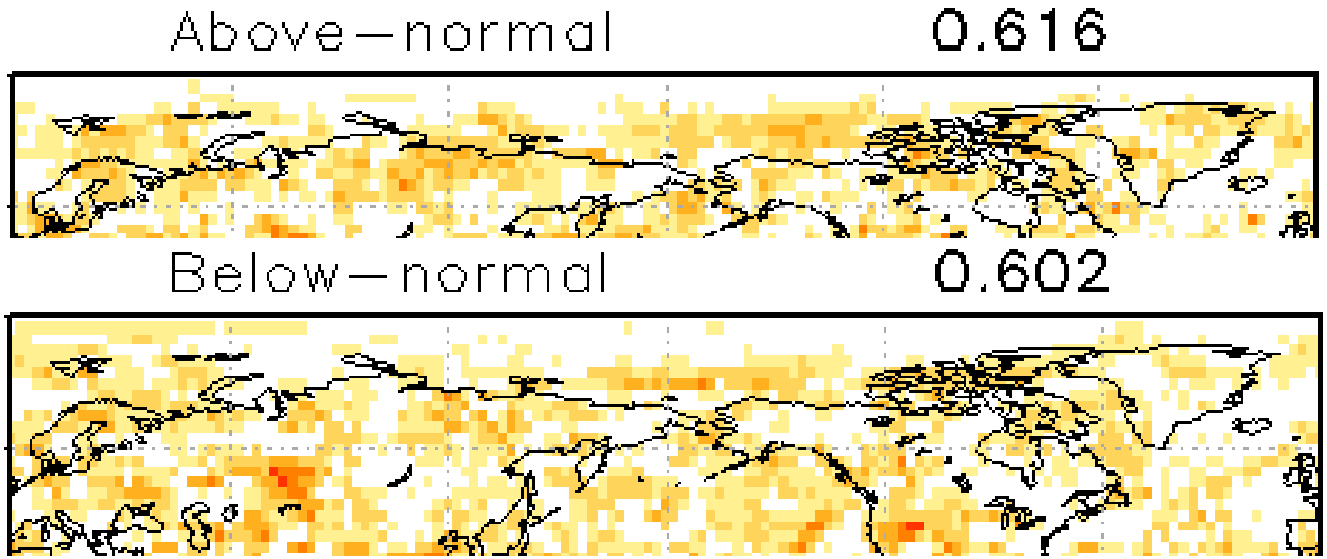


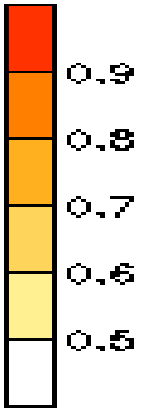


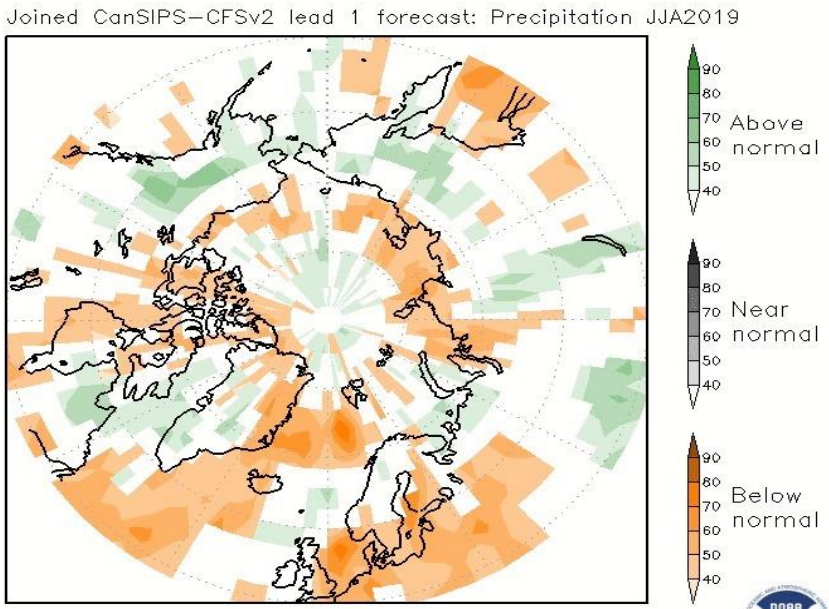
- If a historical skill was good over a certain region (e.g. colored region on the upper figure) we are more confident about the forecast results over the same region
- Overall confidence is weak in JJA over the Arctic with the exception of the Atlantic, Siberian and Chukchi regions.

Discussing historical skill over the Arctic, Precipitation

(confidence with respect to the historical skill)







- We don't have a very high confidence in precipitation skill over the Arctic in summer.

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Conclusions

- We use Multi Model Ensemble (MME) approach to calculate seasonal forecast.
- We use probabilistic approach to communicate seasonal forecast results.
- For evaluation over the Arctic we use a combination of observations and model results called re-analysis.
- FMA2019 MME forecast over the Arctic region was ~75% correct, which is generally good result and much higher than a pure chance (i.e. 33%).
- We expect above normal temperatures over the Arctic in JJA19
- We expect above normal precipitation over the Russian and Alaskan Arctic, over Canada, Atlantic regions and Scandinavia, mostly below normal precipitation is expected. **Historically, we do not have a high confidence in precipitation forecast over the Arctic in JJA**.