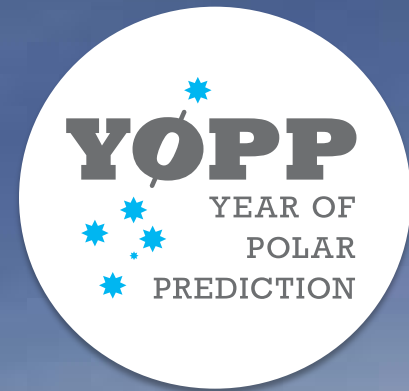


The Year of Polar Prediction

Overview and update from a Canadian perspective

Exposé et mise à jour du point de vue canadien

*PARCOF Ottawa
May 15th, 2018*



Paul Pestieau, ECCC YOPP Coordinator, MSC
Gilbert Brunet, Director MRD, ECCC S&T
Greg Smith, YOPP modelling lead, PPP-SG
Barbara Casati, YOPP verification lead, PPP-SG

What is the Year of Polar Prediction

A major international WMO project – Core phase of the 10-year WWRP - Polar Prediction Project (2013-2022)

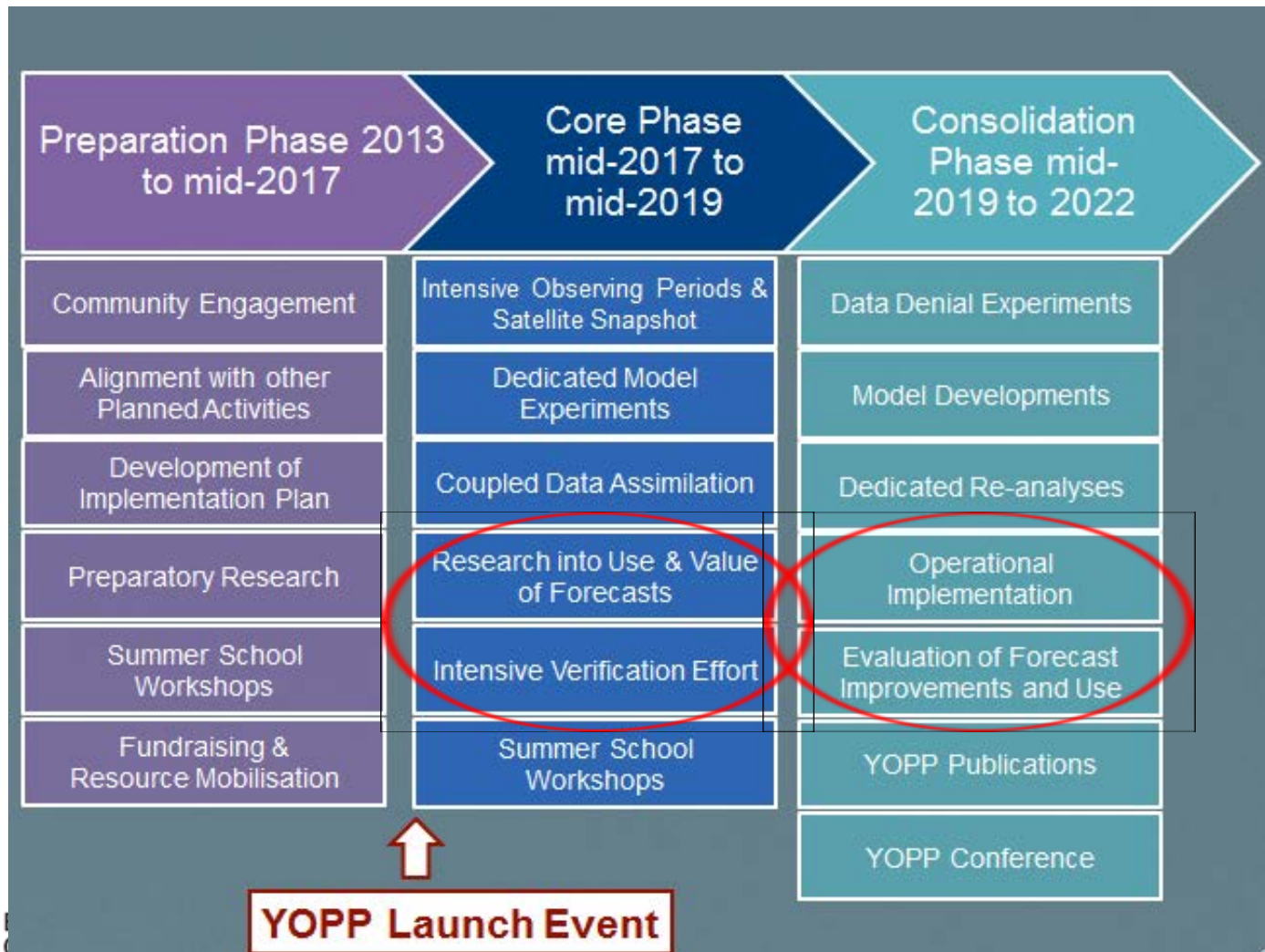
“to enable a significant improvement in the capacity to forecast weather, climate and the environment for polar regions and beyond”



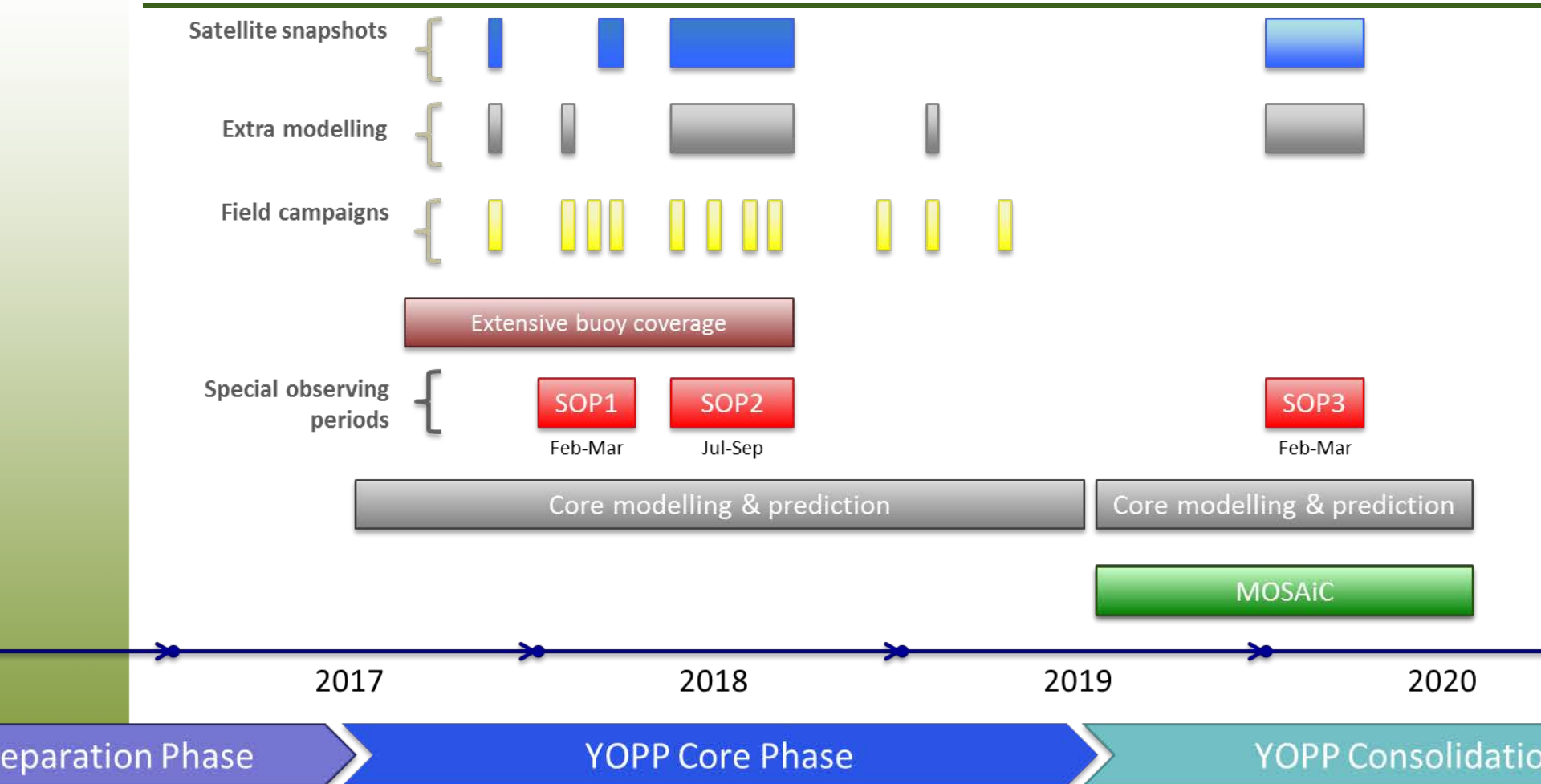
- Through coordination of intensive periods of observing, modelling, verification, user-engagement and educational activities at both poles from 2017 to 2019 – **Official Kick-Off May 15th 2017 at WMO in Geneva**
- Through mobilisation, via the World Meteorological Organisation (WMO), of all Arctic countries, and those close to Antarctica, and major weather centres (21 countries) **including significant ECCC in-kind contributions (~\$2M)**
- Endorsed by the White House Arctic Science Ministerial (2016) and the European Commission (€30M in Horizon 2020 funding).

PPP timeline of activities

(Unlike IPY) PPP-YOPP is heavily committed to Operational outcomes

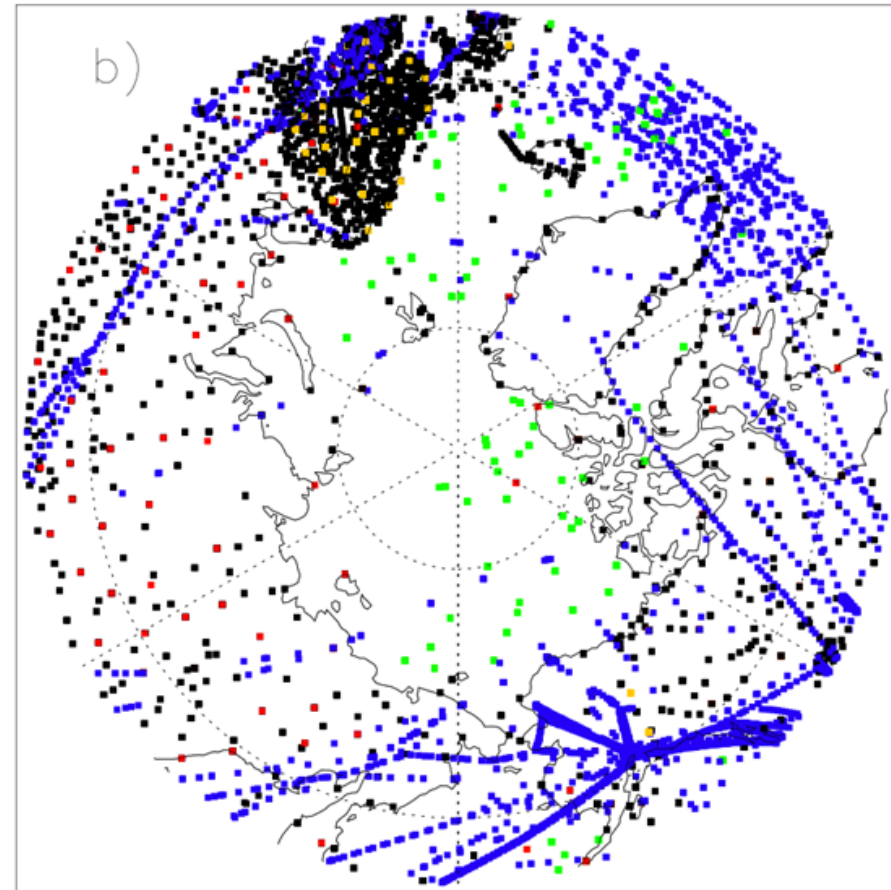
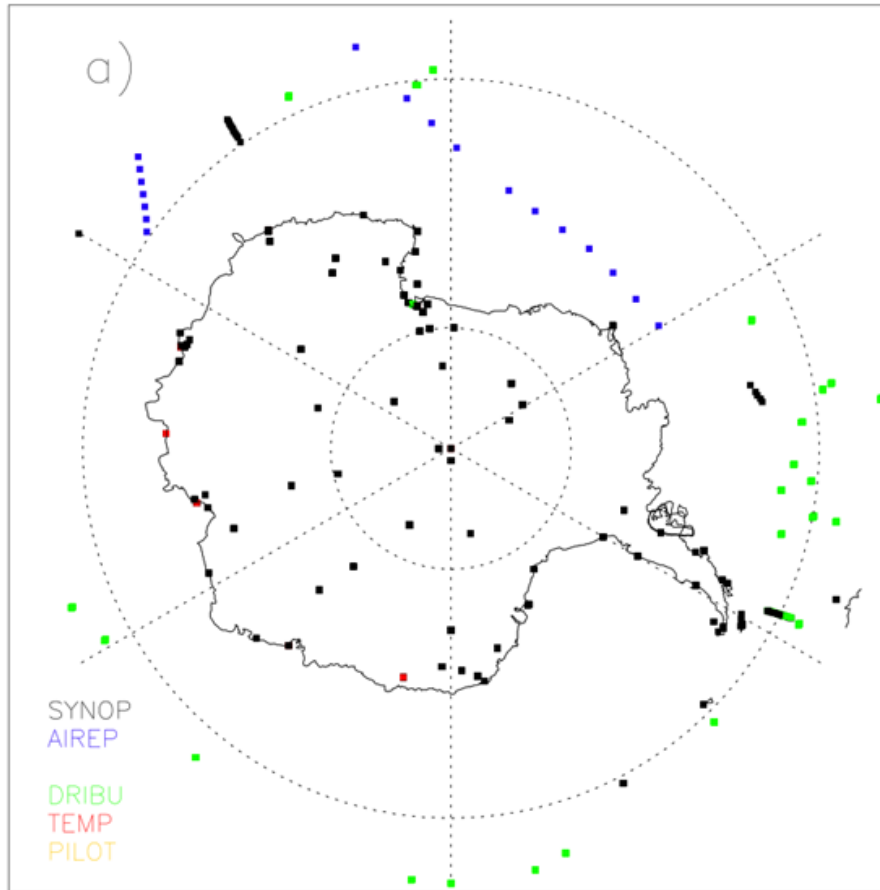


YOPP Observations – Arctic



*Mosaic is the first year-round experiment in central Arctic for climate research
Led by International consortium of leading polar research institutions €60M*

Polar vs Continental Observations



Why Numerical Weather Prediction skill scores typically decrease with latitude

Canadian and International contributions

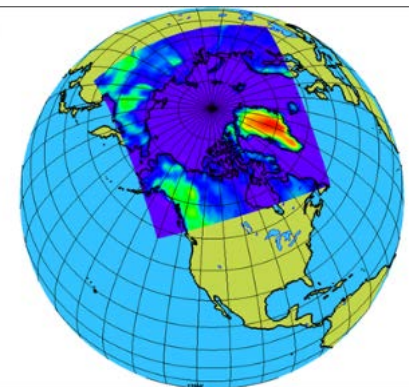
• Observations:

- Buoys – incremental deployments: **All Arctic countries, including Canada, Russia, and Germany + good coverage of Antarctica**
- Radiosondes – increased frequency : **Denmark; Sweden; Germany; US (?); Canada (4/day at 6 sites)**
- Ships: **China, South Korea, Japan, Norway, Sweden, Germany + MOSAIC (2019-20)**
- Aircrafts: **UK MetOffice, US Office of Naval Research**



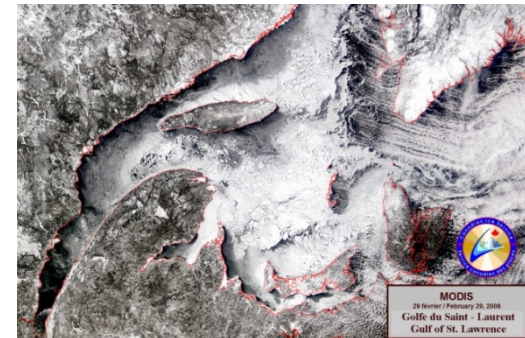
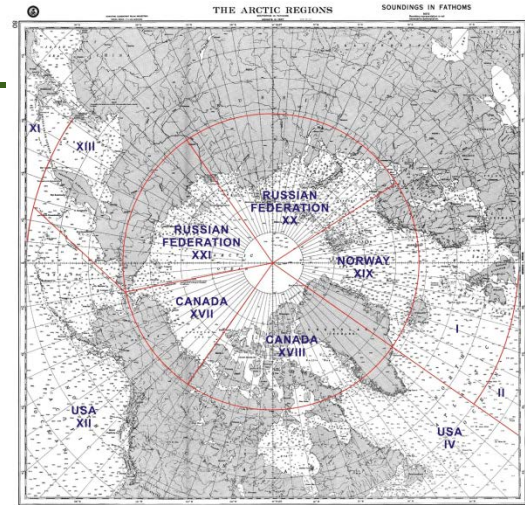
• Forecasting & Modelling

- **ECMWF & ECCC** to provide core datasets for SOPs
- Frontier experiments (e.g. high resolution models – 2.5km higher): **ECCC; Met-Norway; Meteo-France**
- **Norway** to host forecast data exchange and archive portal



Canada's interest in YOPP

- Over 40% of Canada's landmass is in the Arctic
 - Home and livelihood to 113,000 people
- PPP - YOPP objectives align with Canada's Arctic Policy Framework (science & information exchange, sovereignty, safety & security)
- Builds on Canada's leadership and investments to respond to MetAreas XVII and XVIII responsibilities (IMO 2008)
- MSC was the first centre (2008) with an atmosphere-ice-ocean coupled system GSL
- MSC is first and yet only Met Centre with a global coupled medium-range atmosphere-ice-ocean forecasting system (GDPS) in operations
- Co-benefits further plans Government of Canada has recently funded such as OPP and C-IOOS



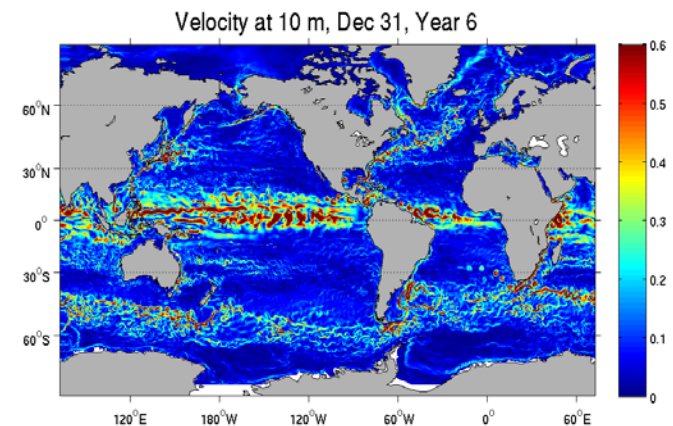
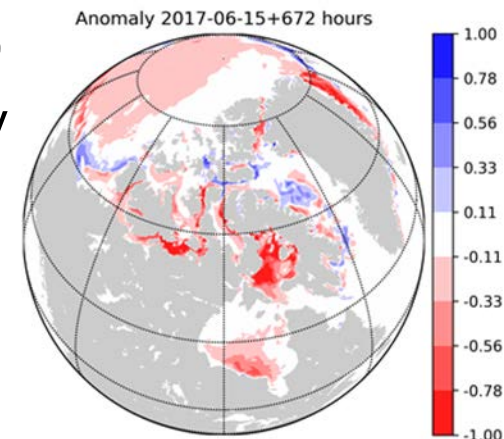
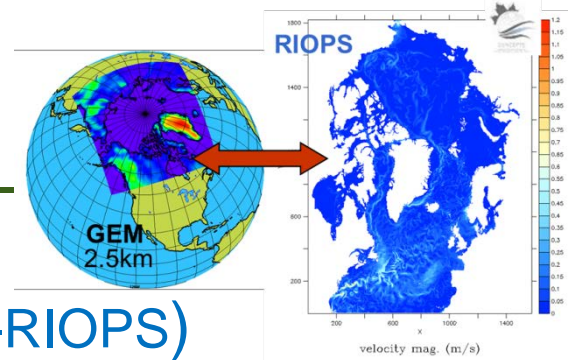
ECCC MSC – Modelling

- Canadian Arctic Prediction System (CAPS-RIOPS)
 - For YOPP, fully-coupled A-I-O+waves, 3km(A)-3-8km(I-O), 2day
- Coupled Global Medium-range Deterministic System
 - GDPS-GIOPS (producing operational forecasts)
 - fully-coupled A-I-O, 15km(A)-1/4deg(I-O), 10day
- Monthly Ice-Ocean Ensemble Forecasts
 - EnsGIOPS, Global, 1/4deg, 20 member, 32day
- Seasonal Predictions (CanSIPS)
 - CanESM & GEM-NEMO-CICE
 - Global, 1deg, 2x20 member

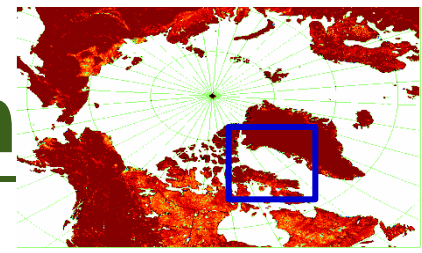
Outputs are placed on a Datamart

For sharing nationally and internationally

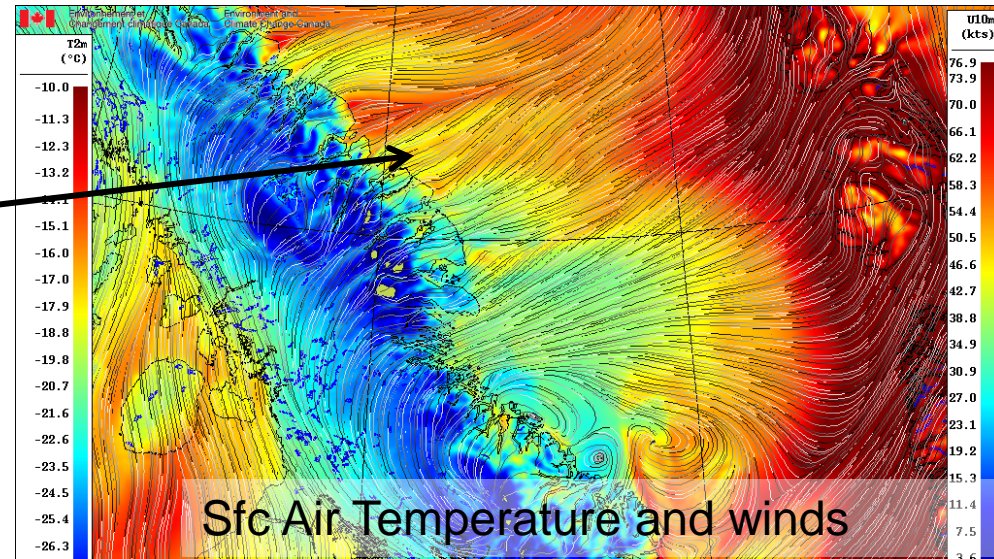
– <http://dd.alpha.weather.gc.ca/yopp>



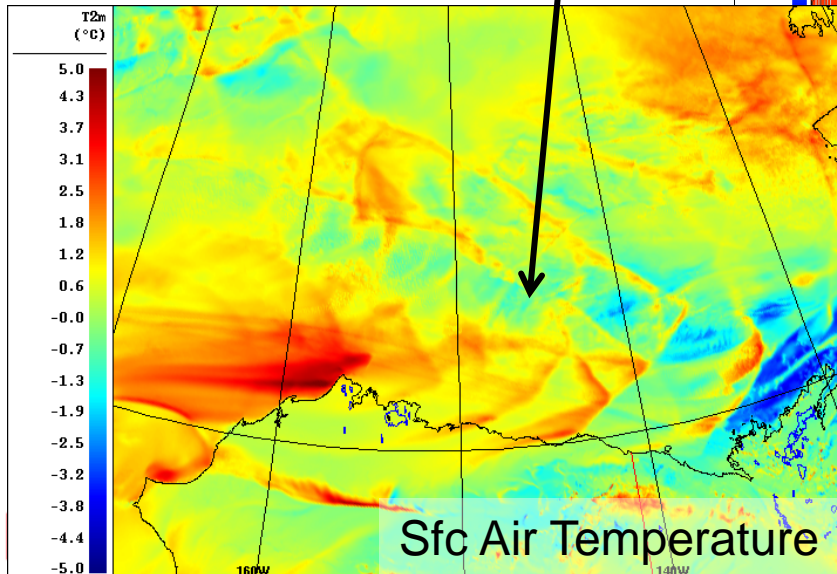
CAPS coupled atmos-ice-ocean



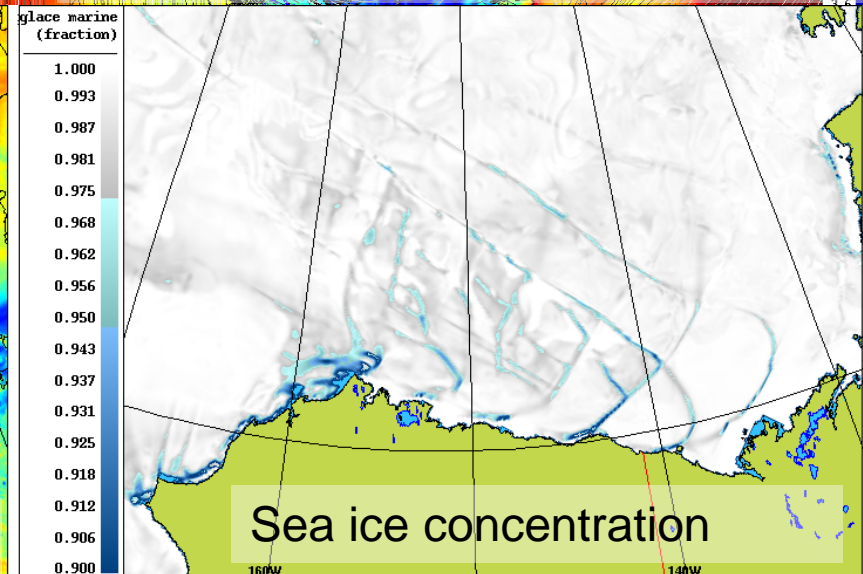
- Evidence of the two-way exchange between ocean, ice and atmosphere
- Captures small-scale features
 - Wind through fjords
 - Impact of leads in sea ice
- Expecting significant improvements in weather forecasts



Sfc Air Temperature and winds



Sfc Air Temperature

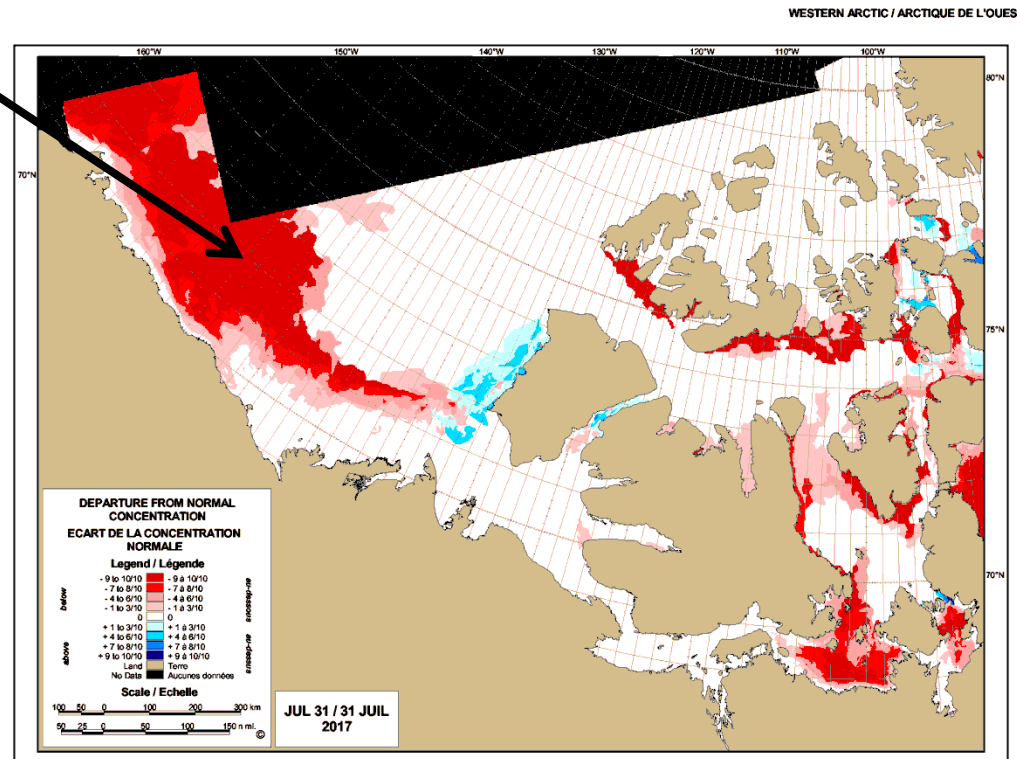
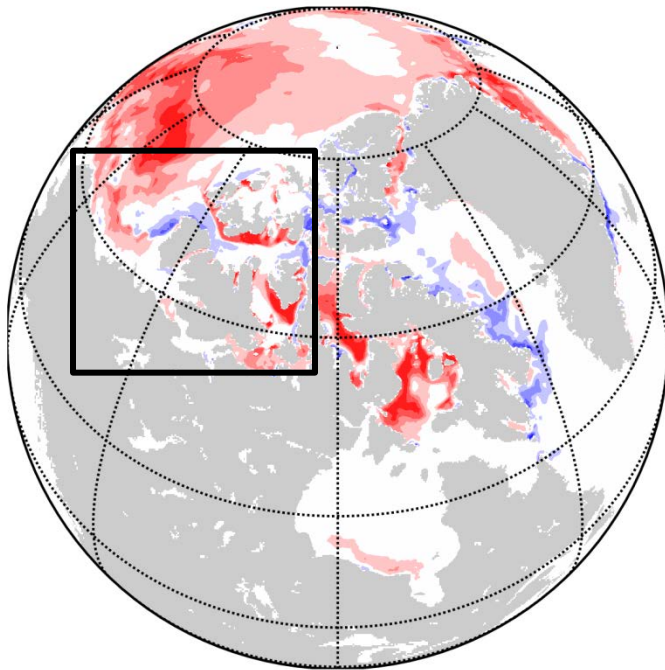


Sea ice concentration

Monthly Outlook case study at CIS

- 32 day probabilistic global sea ice forecasts
- Predicting an anomaly never seen in last 30 years of climatology

Anomaly 2017-07-06+504 hours



STN
LES

Actual ice concentration anomaly (CIS)



Environment
Canada

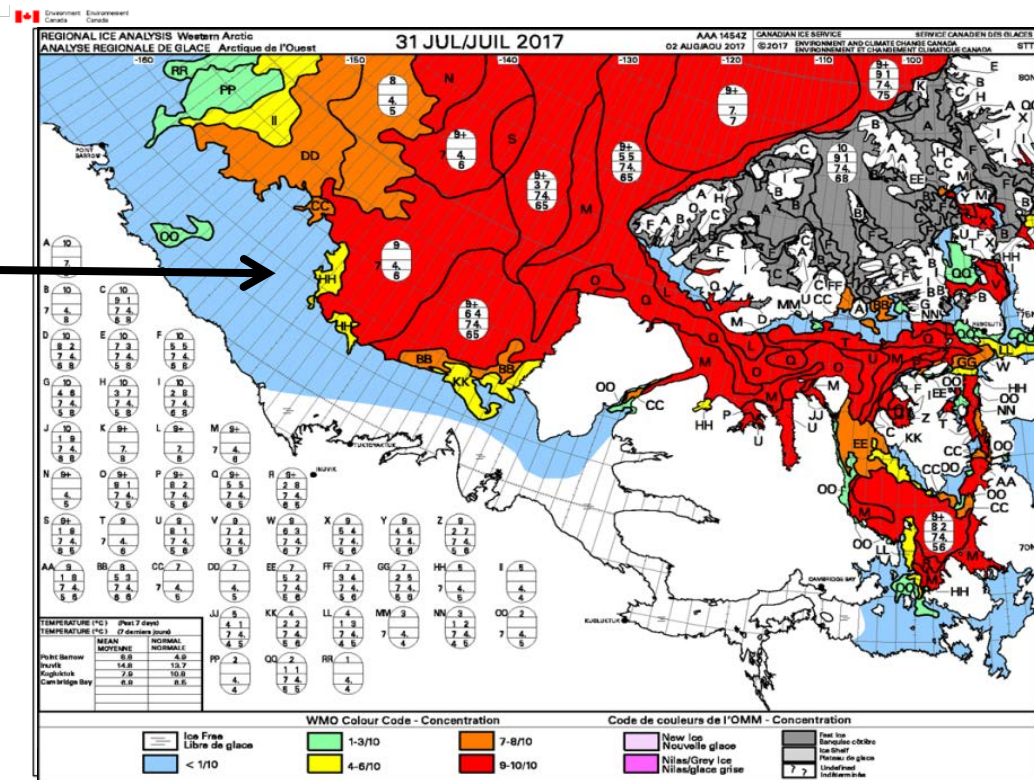
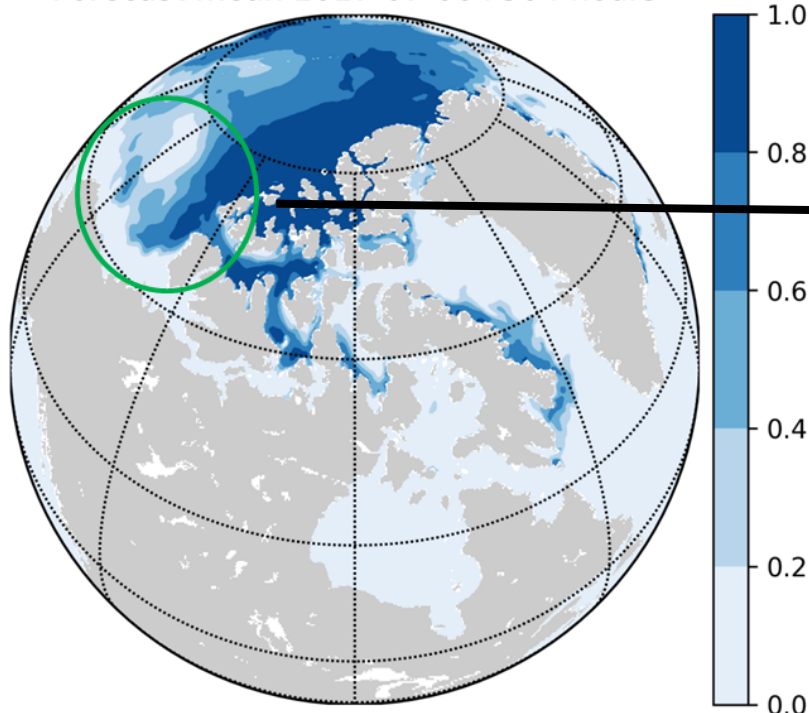
Environnement
Canada

Canada

Monthly Outlook case study at CIS

- Forecast mean was validated by observations
 - contrary to climatology and forecaster experience
- Bringing changes in use and view of ice modelling at CIS

Forecast mean 2017-07-06+504 hours

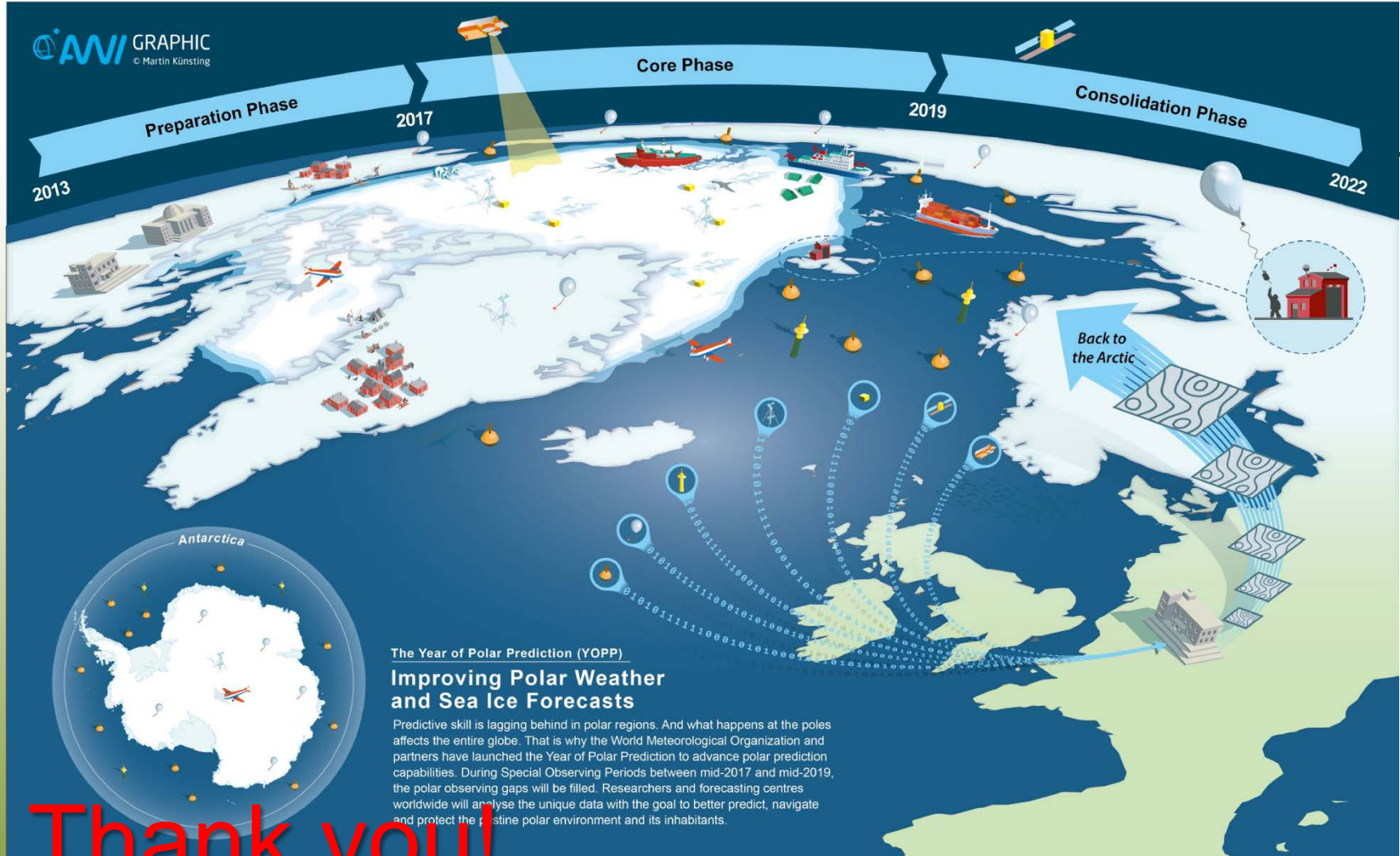


Environment
Canada

Environnement
Canada

P: Canadian Ice Service Regional Analysis





Thank you!



Weather and Sea Ice Modeling

To predict weather and sea ice, scientists use weather and climate models – computer programs that divide the Earth's atmosphere, ice, land and oceans into a network of grid boxes. After being fed with actual meteorological and oceanographic observations, the models calculate how the physical state changes step by step into the future.

