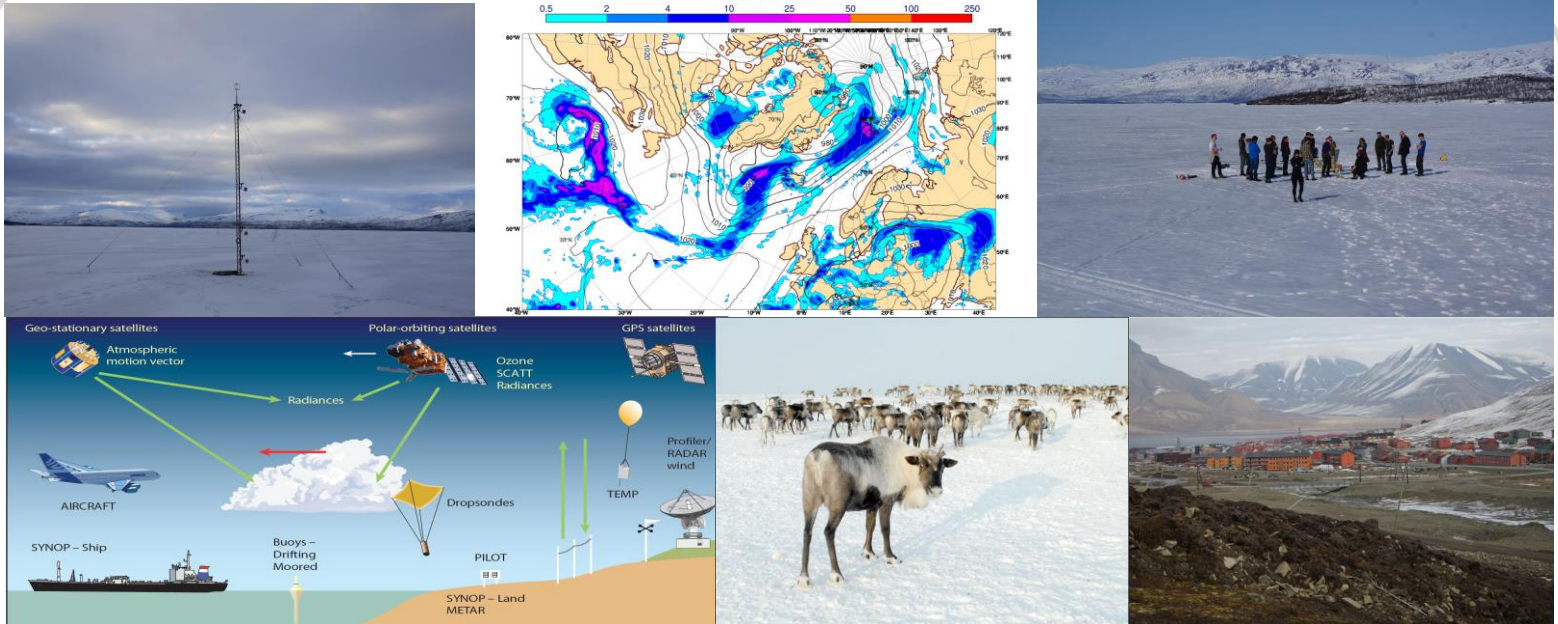# WP4: Unpredictable Arctic – extreme weather events

Jonny Day

European Centre for Medium-Range Weather Forecasts (ECMWF)

INTER=ACT

Aim of the WP

The objective of this work package is to document and improve awareness of the many consequences of extreme weather events in the Arctic that are of importance to ecosystem services, local and global communities, so that appropriate timely responses can be made.

The specific aims are to:
1. Document the effects of extreme weather events on rapid changes in biodiversity.
2. Identify the societal impacts of extreme weather on local communities through community engagement.
3. Evaluate the ability of current state-of-the-art weather predictions to forecast such events.

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Partners involved in the WP

AU - Aarhus University

TSU - Tomsk State University

CAFF - Conservation of Arctic Flora and Fauna Secretariat

SLU - Swedish University of Agricultural Sciences

RFS - RIF Field Station

POLAR - Canadian High Arctic Research Station

ECMWF - European Centre for Medium-range weather Forecasts

Task 4.1– Extreme weather impacts on biodiversity

Objective: to document and improve awareness of the consequences of extreme weather events of importance to ecosystem services, local and global communities

- A study of ongoing work that is informing research, monitoring and policy frameworks related to extreme events and Arctic biodiversity.
- Identify type of extreme events that potentially can have a big influence on Arctic Biodiversity
- The above will be used as input to target a design for a monitoring system.

Partners: CAFF/CBMP, POLAR Canada, Rif Field Station, Swedish Agricultural University, Aarhus University, Zackenberg Station

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Task 4.2– Societal impacts of extreme weather

Objective: Identify societal impacts of extreme weather and other events and explore ways in which local communities can contribute to identify these events and their impacts

- Work to develop an innovative citizen-science network led in conjunction with a health organization in the Nadym area of the Yamal-Nenets Autonomous District, Russia.
- This will assemble community members including the Nenets reindeer herders, workers in the gas and oil fields and other Arctic residents to provide a citizen observing network that will increase data flow on extreme weather events, unexpected changes in ecosystems and perceptions of changes in health and wellbeing from the phenomena reported.

Partners: TSU

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Task 4.3– Evaluation of extreme event forecasts in the Arctic

Objective: to evaluate how well current forecasting systems can forewarn of the types of extreme events that can severely impact livelihoods and biodiversity within and around the Arctic region, and assess the availability of INTERACT data to achieve this.

- Specific case studies will be selected, with input from (CAFF, local and Indigenous community via TSU and the station managers), based on the assessment of user needs conducted in Tasks 4.1 and 4.2 and the availability of relevant data from the INTERACT network.
- Potential to have cold regions theme for ECMWF user workshop (annually held in July).

Partners: ECMWF

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Task 4.4– Using station data to assess weather predictions

Objective: to demonstrate the utility of data collected at the INTERACT stations for improving weather forecasts by using it to diagnose the sources of forecast errors
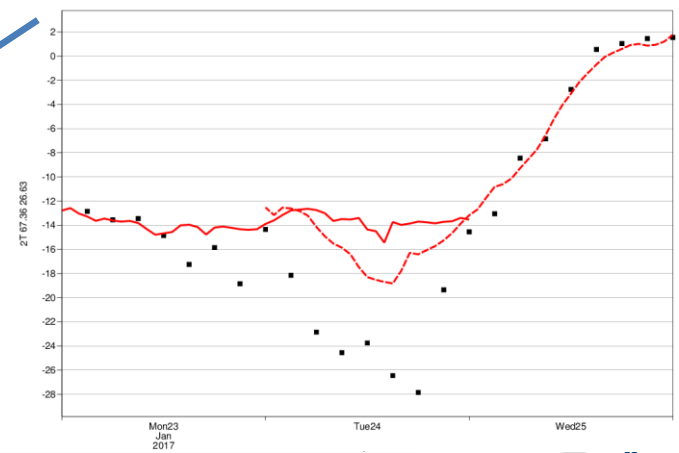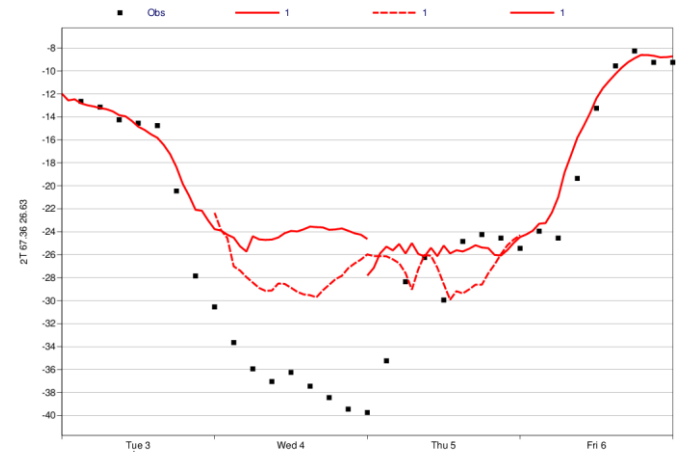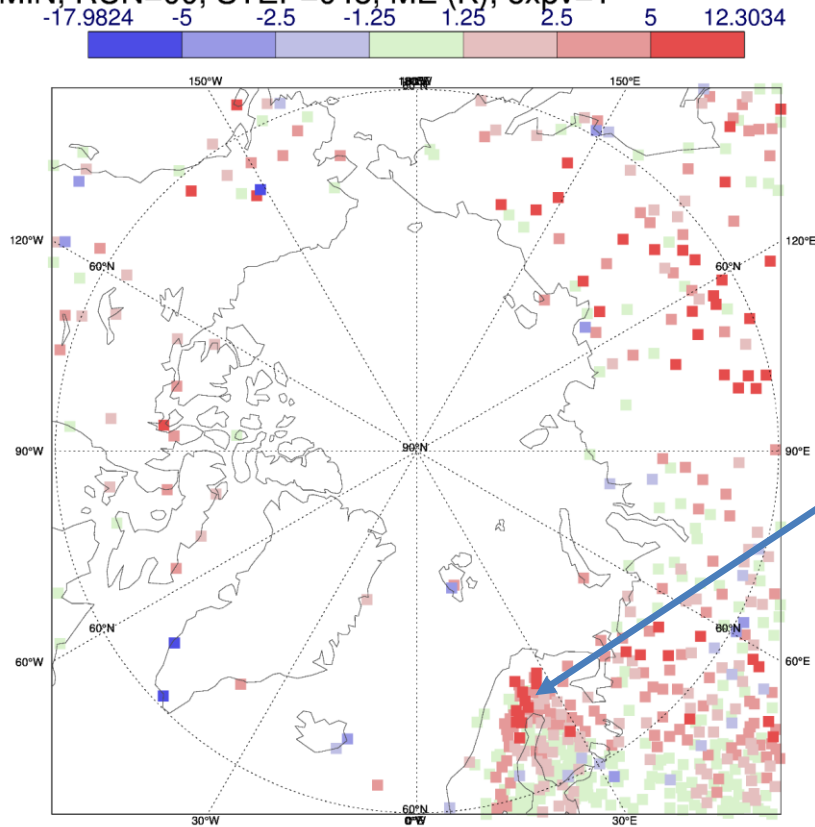
- Arctic regions pose specific challenges related to processes which are historically difficult to model (stable boundary layers, mixed-phase clouds, and atmosphere-snow coupling).
- Focus on a number pilot sites, including Sodankylä (Finland), Barrow (USA), Summit (Greenland) and Tiksii (Russia).
- Focus on the Year of Polar Prediction (YOPP) – Special Observing Periods (during 2017-2019), when additional meteorological data was collected from a number of INTERACT stations and a multi-centre archive of forecasts (YOPPsiteMIP) can be used.

Partners: ECMWF

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ECMWF forecasts have a warm bias in Arctic winter

Meteogram for Sodankylä (data from FMI)
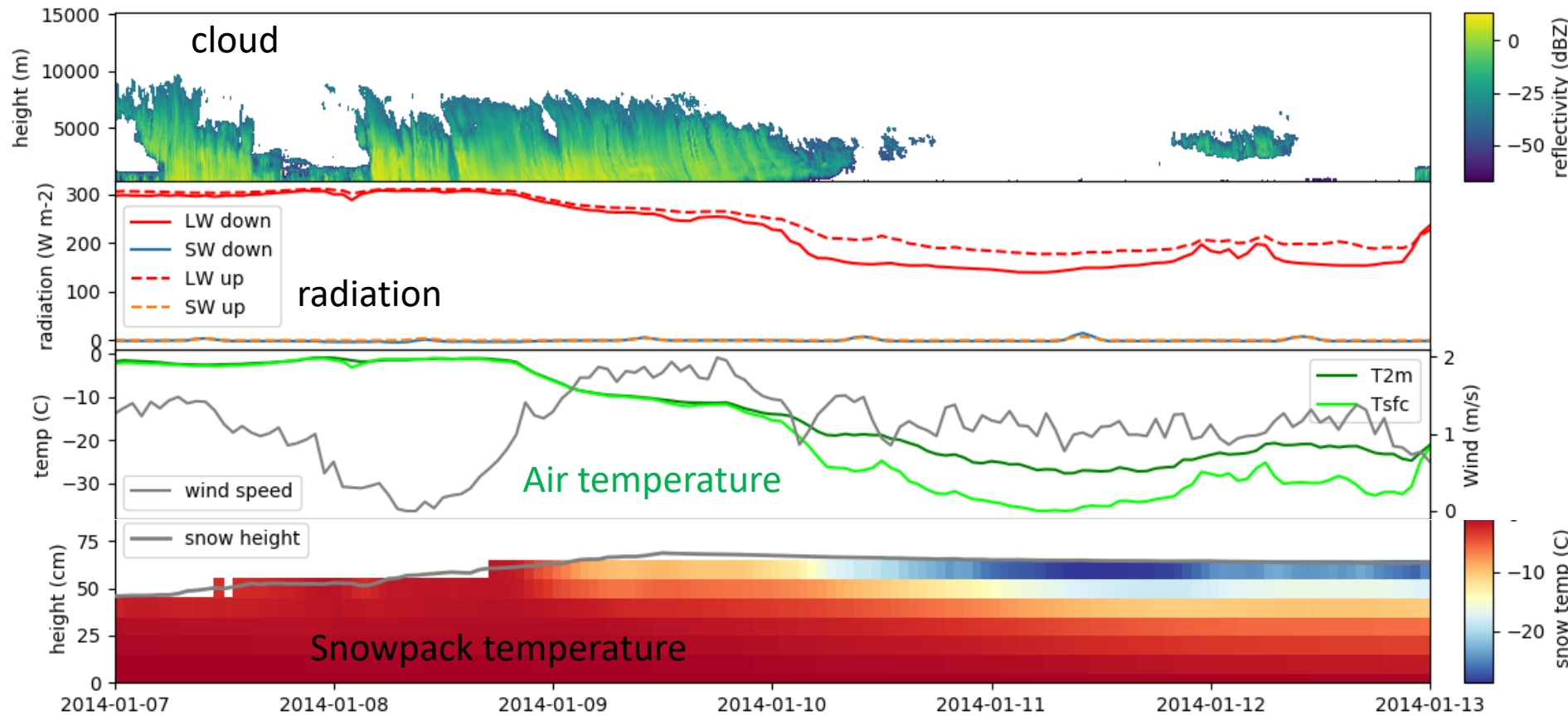
Future deliverables

- D4.1 A design of a monitoring system for how to detect impacts of extreme events on biodiversity (Month 15, Lead: CAFF)

- D4.2 Report on monitoring by Indigenous and local residents of extreme weather events and other unpredictable environmental challenges and their consequences (Month 24, Lead: TSU)

Future deliverables

- D4.3 Report on severe weather event case studies evaluation and implications for monitoring within INTERACT (Month 16, Lead: ECMWF)

- D4.4 Report on the use of INTERACT station data to understand systematic forecast errors and suggest which processes should be improved (Month 29, Lead: ECMWF)

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Internal collaboration

Links to WP2:

Task 2.1 The unpredictable Arctic

- developing ways for research stations to help society to better cope with extreme events.

Task 2.3 Making station data and publications widely available

- to ensure that all forms of data (both historic and near-real-time) from research stations are captured and made widely

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External collaboration

YOPPsiteMIP – YOPP site Model Intercomparison Project

Arctic sites
★ initial focus

Models: DWD, ECCC, ECMWF, FMI, MetNorway, MetOffice, NOAA/NCEP, MeteoFrance, Russian Met, CORDEX, CESM, …

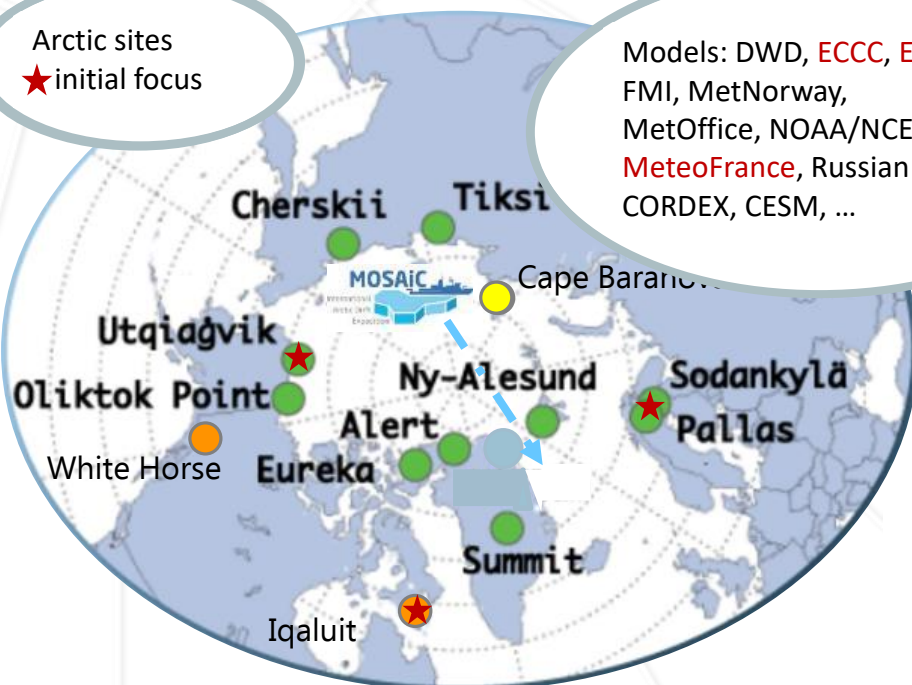Cherskii · Tiksi · Cape Baranova · Utqiaġvik · Oliktok Point · White Horse · Ny-Alesund · Alert · Eureka · Sodankylä · Pallas · Summit · Iqaluit · MOSAiC

🟢 IASOA (International Arctic Systems for Observing the Atmosphere)
🟠 ECCC supersites – soon members of IASOA
🟡 Cape Baranova – soon member of IASOA
--- MOSAiC drifting station

Supersites: Suites of instruments measuring variables that lead to *process understanding*

Models: *High frequency* column output on *model levels* at supersites

MIP: Developed *Format and Semantics* used for both models and observations promoting *multimodel* and *multisite* verification and *process evaluation*

Data: Available through the *YOPP Data Portal* (yopp.met.no)

Targeted processes: Low level clouds (including phase), Stable boundary layers, Atmosphere-snow interactions over land and sea-ice, Coupling procedures (variables and frequencies), Ocean mixing, …
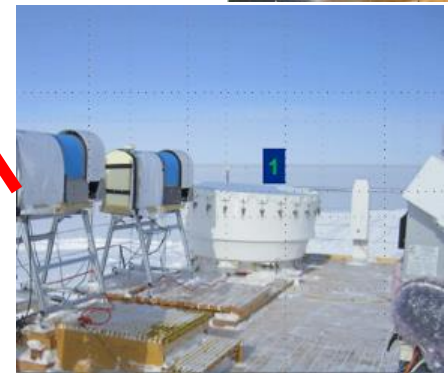
YOPP YEAR OF POLAR PREDICTION

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Collaborating with observationalists across the three poles to produce merged observatory data files (MODFs) to facilitate fair comparison with models.

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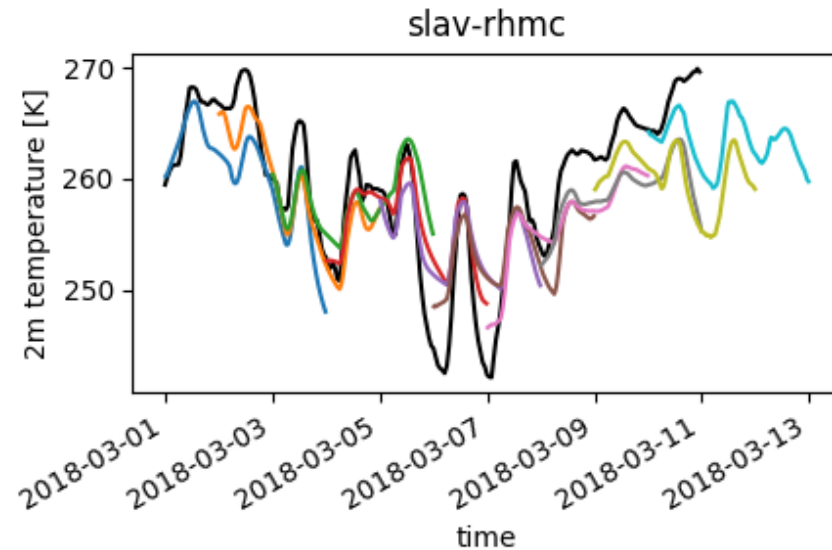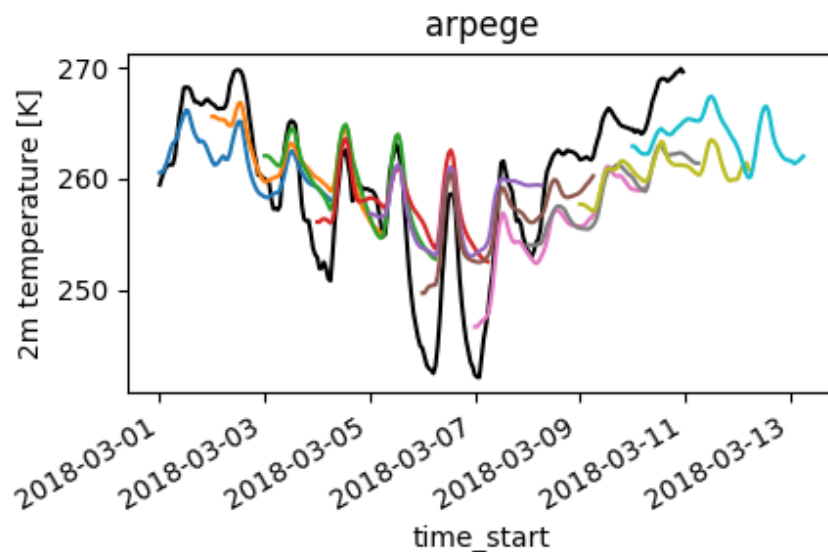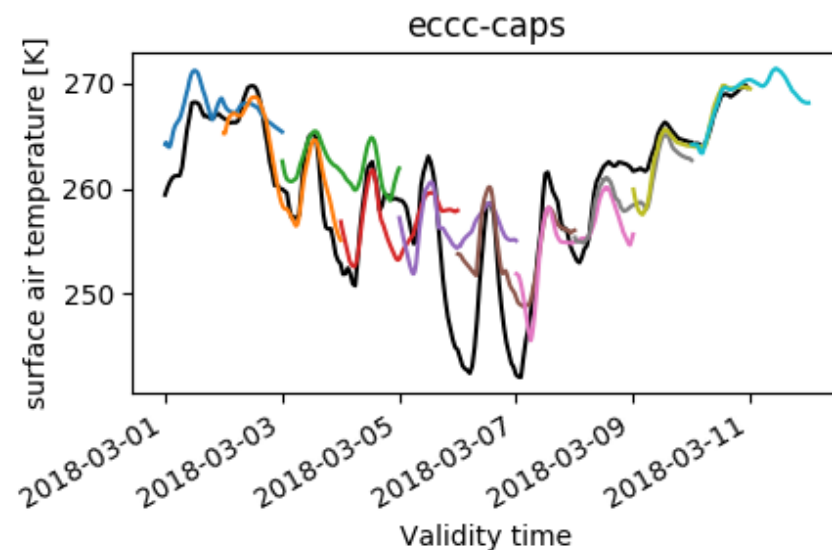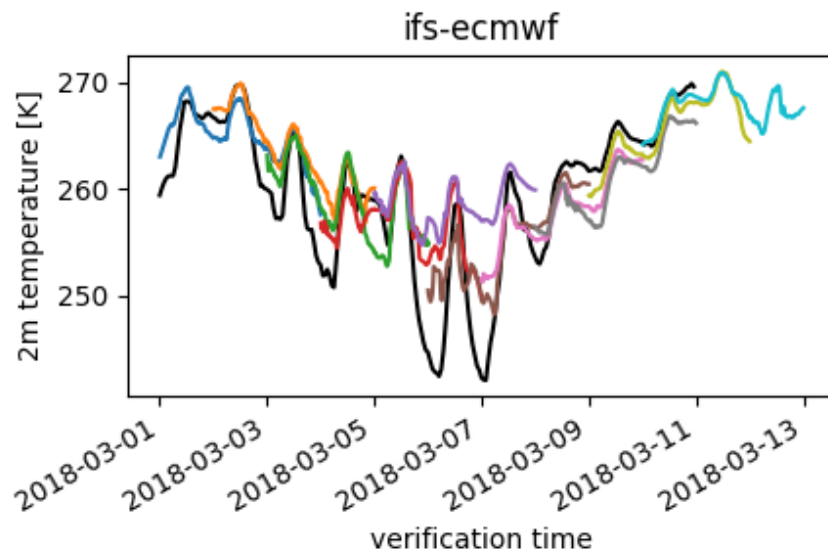
YOPPsiteMIP: initial results from Utqiagvik, Alaska