WP4: Unpredictable Arctic – extreme weather events
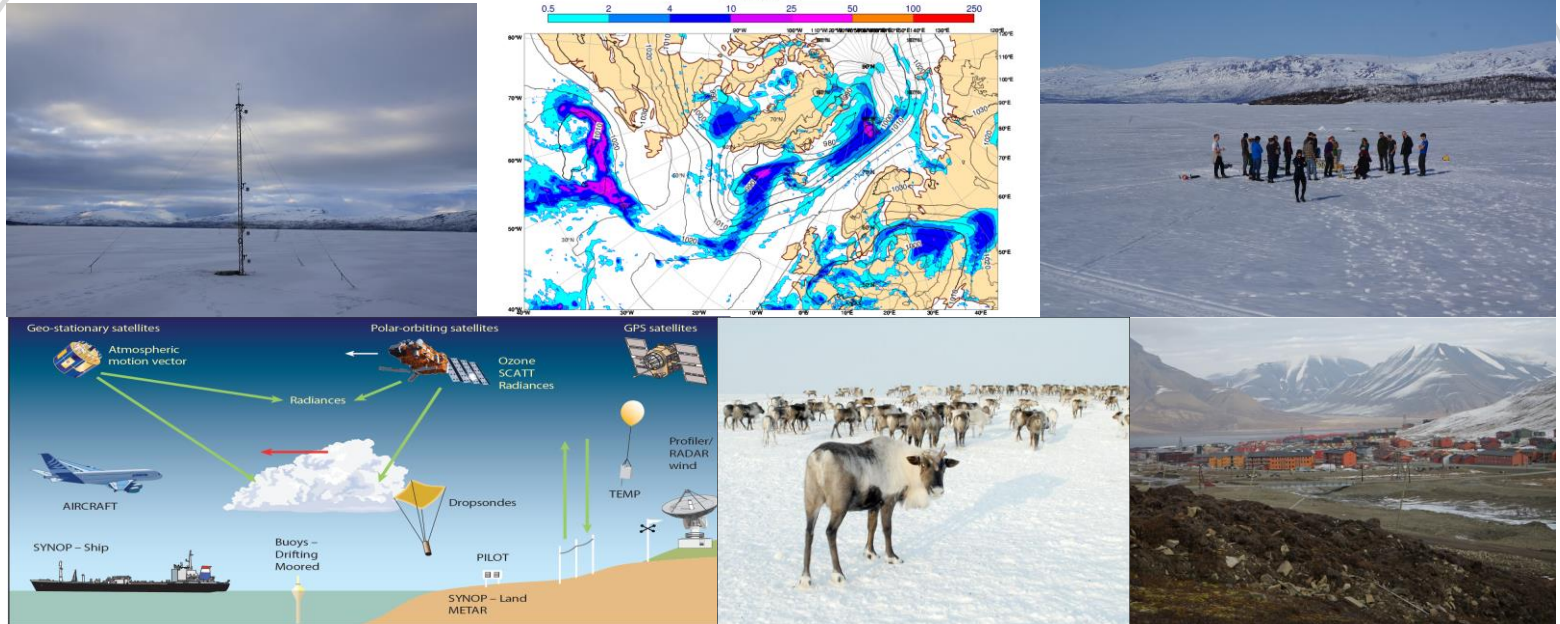

Jonny Day (ECMWF) with contributions from Tom Barry (CAFF) and Olga Morozova (TSU)

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Task 4.1: Documenting the effects of extreme weather events on ecosystems and biodiversity

- Underpins ongoing work that is informing research, monitoring and policy frameworks related to extreme events and Arctic biodiversity.
- Considered the effects of extreme weather events on the seasonal timing of species migration, range changes and biodiversity in the Arctics freshwater and terrestrial ecosystems;
- Inform how impacts of extreme events on biodiversity might be incorporated within the Circumpolar Biodiversity Monitoring Programme (CBMP).
- Identifies types of extreme events that potentially can have a big influence on Arctic Biodiversity; and potentially affect the seasonal timing of migrations, distribution patterns, ecological shifts, and invasive species pathways.

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WP4: Task 1. CBMP extreme events and biodiversity Monitoring

Cambridge Bay

Zackenberg

RIF
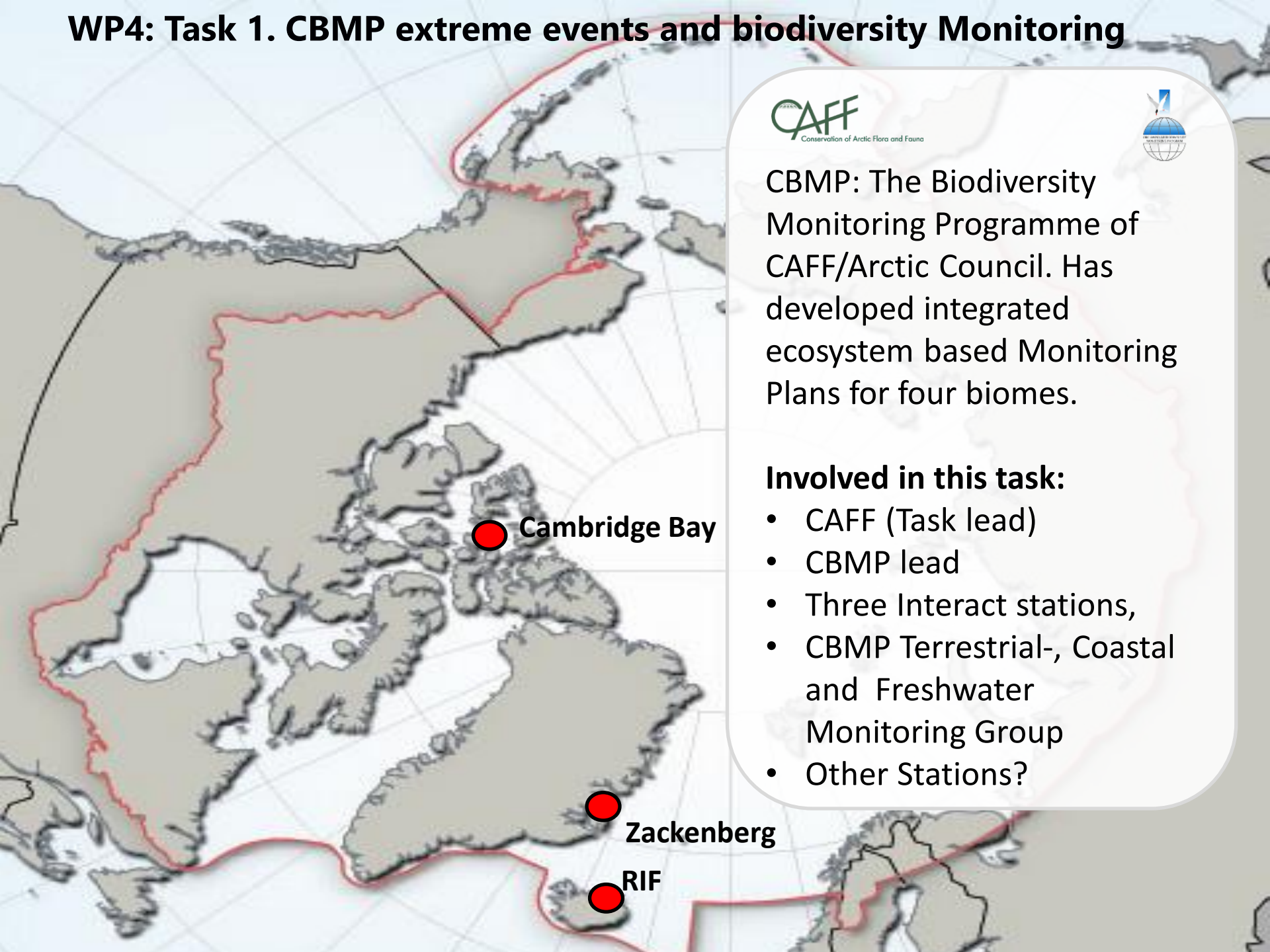
CBMP: The Biodiversity Monitoring Programme of CAFF/Arctic Council. Has developed integrated ecosystem based Monitoring Plans for four biomes.

Involved in this task:
- CAFF (Task lead)
- CBMP lead
- Three Interact stations,
- CBMP Terrestrial-, Coastal and Freshwater Monitoring Group
- Other Stations?

Outcomes

- Reviewed of the scientific evidence of extreme event impacts on the terrestrial Arctic biota (**paper submitted, D4.1 due this month**).
- Highlighted a research bias towards single-events studies and a lack of focus on impact recovery.
- Found that extreme events are a key facet of climate change research with impacts on biodiversity expected to be particularly severe in the Arctic.
- Building upon this Key Findings and recommendations were made on bridging current knowledge gaps by taking advantage of the established pan-Arctic long-term monitoring network, the CBMP in order to better define what is considered extreme in terms of events and ecological impacts
- Move beyond single-impact studies and spatial scales of observation; and consider predictive modelling to address ecosystem-level impacts.

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Task 4.2: Aim: To get information from indigenous and local people and meteo-data about extreme events in Yamal Peninsula and to analyse it.

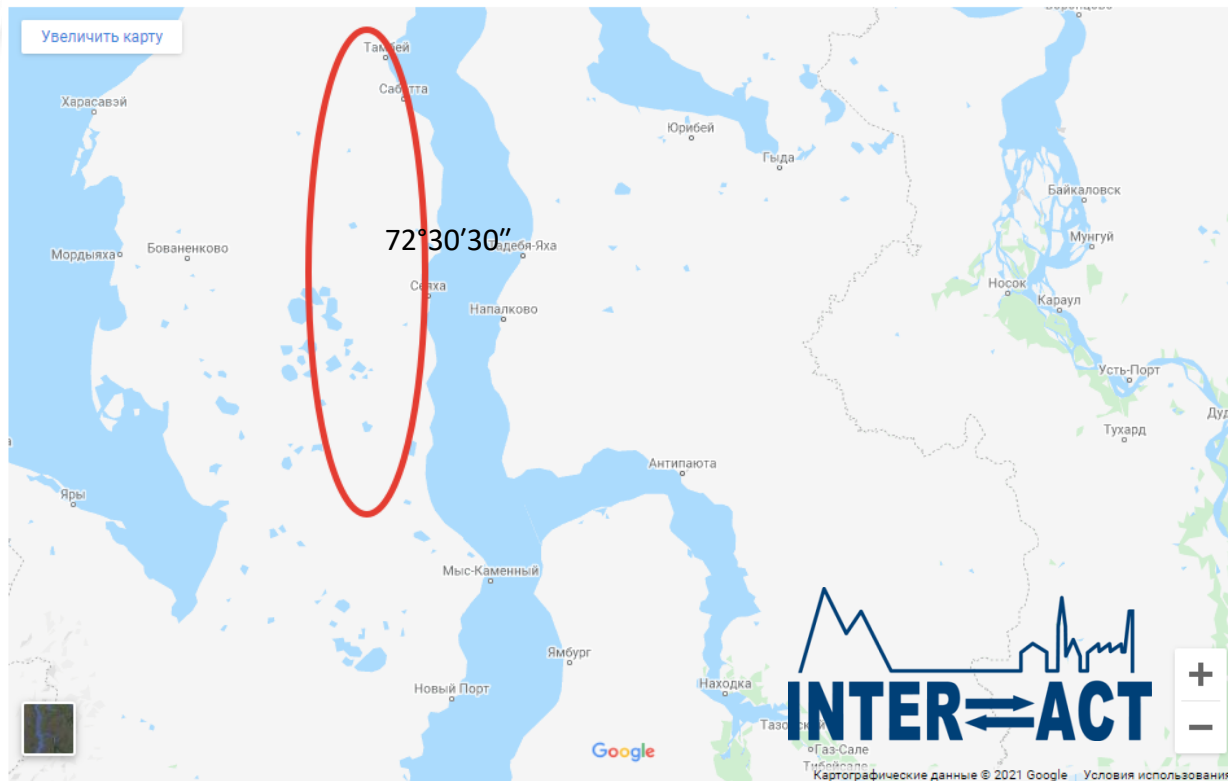## "Informational resources":
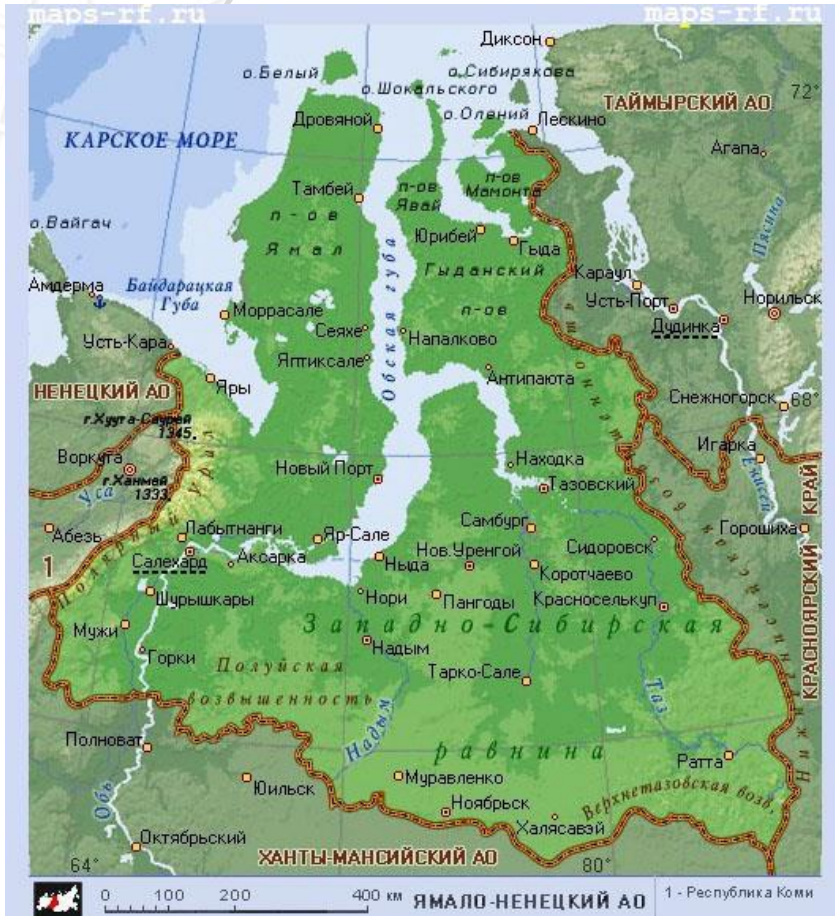
Herders

Teachers

Achievements: Winter temperatures 2020-2021

November, 2020 - thaw with extremely high *t* (for season) , **up to + 5** with **rainfalls** and then , from the middle of December frosts of -40° has been established. This period with very low *t* lasted about 1 month.

" This time the ice appeared after the November holidays, he said. – That time in the tundra there was an unprecedentedly warm, above zero temperature. And in early December it even rained. As a result, the snow crust was compressed, and then the frosts turned it into a hard crust. Now the deer cannot break through this crust to get food. Their owners are trying to find plots more suitable for pastures."

In January in the Tambey tundra and Seyakha tundra, reindeer lichen was covered with a 3cm. layer of ice, and about 10 cm. of snow lays on top. In most places the food for deers was simply not available.

72°30'30"

Увеличить карту

Харасавэй
Тамбей
Сабетта
Юрибей
Гыда
Воронцово
Бованенково
Мордыяха
Надебя-Яха
Байкаловск
Сеяха
Напалково
Мунгуй
Носок
Караул
Ярры
Усть-Порт
Антипаюта
Тухард
Дуди
Мыс-Каменный
Новый Порт
Ямбург
Находка
Тазов
Газ-Сале
Тибейсале

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Google
Картографические данные © 2021 Google | Условия использования

Achievements: Winter storms 2020-2021

Salekhard, February, 07-08, 2021 - **storm wind, squally wind, speed up to 27 m/s**

Achievements: Impacts in spring 2020-2021

Real time reporting

About 1000 dead and thousands left for other places

Achievements: Responses in spring 2020-2021

counting reindeers deaths, reindeer food supply, food and fuel for herders and their families, searching and gathering reindeers, main road closed and under re-construction

Future consequences

1. Migration time (more early, warmer season, cross rivers by ice, calving), video available
2. Economical loses for reindeer-herders (will continue to count till the end of summer)
3. Road closed (for not-nomad people), more problematic and more expensive to get to the "big city" Salekhard, video available

Ethics and sensitivity

Added value to the project
Pictures and videos will be used in INTERACTive e-book and BBC

Kids learn how to catch the reindeer with a lasso.

Where to go from here

1. What will happen with the scavengers' population and diversity
2. What will happen with the vegetation greening
.... And most of all, what will happen to......
People – the possible new subject for a new project.

Task 4.3 and 4.4 Progress

Task 4.3 evaluation of forecasts of Arctic extremes:
- Ongoing evaluation of case studies (Extreme event catalogue).
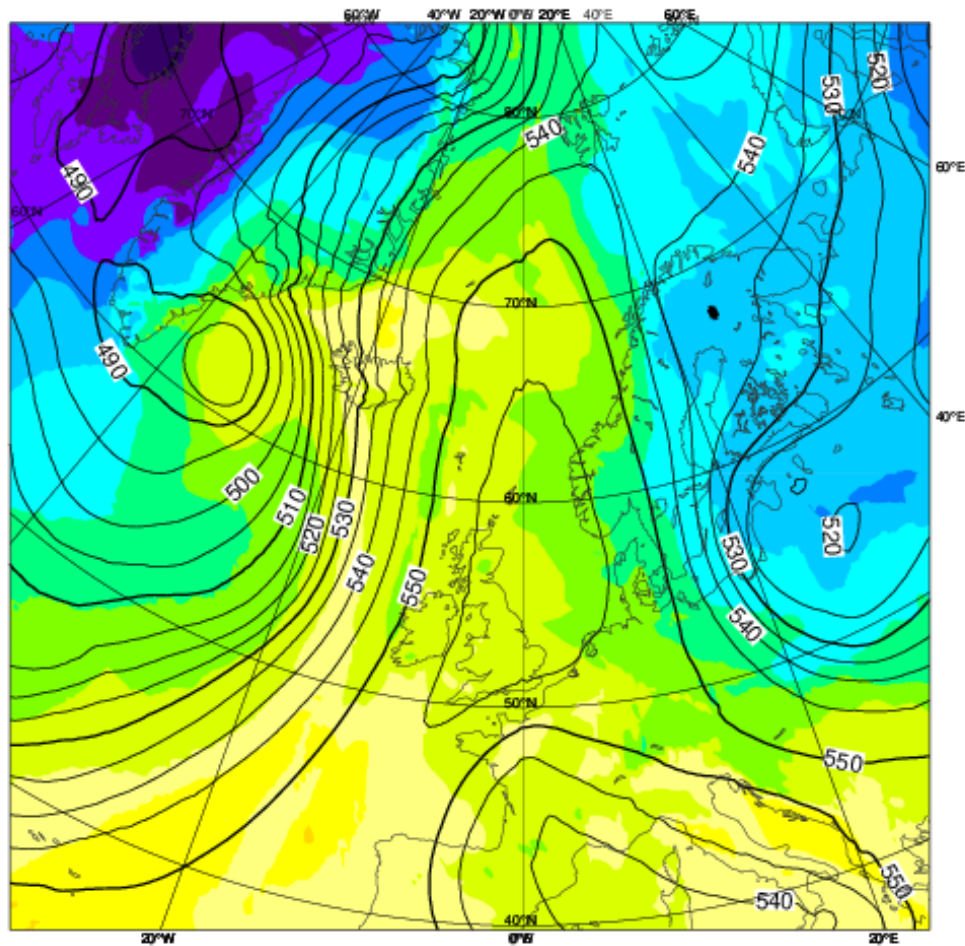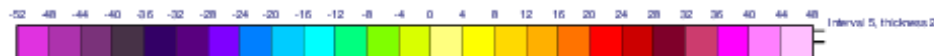- Decided to focus on hot and cold extremes.
- Downloading 20yrs of reforecasts to examine systematic issues.

Task 4.4 Advancing the exploitation of INTERACT station data:
- Started multi-model analysis at Sodankylä using the YOPPsiteMIP dataset
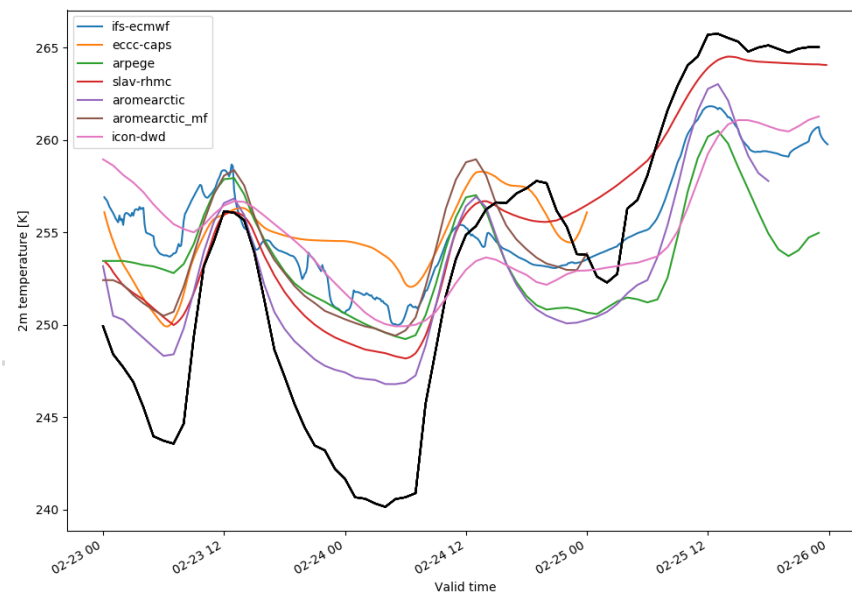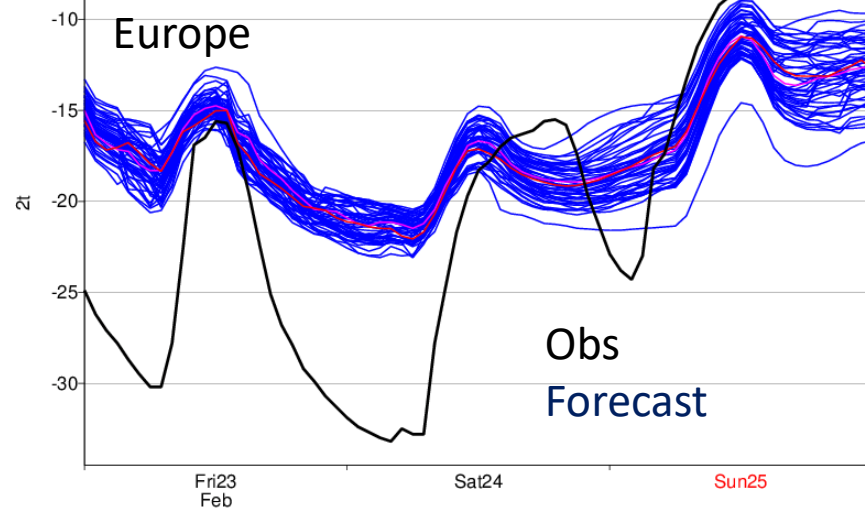- Identified issues in the YOPPsiteMIP dataset.

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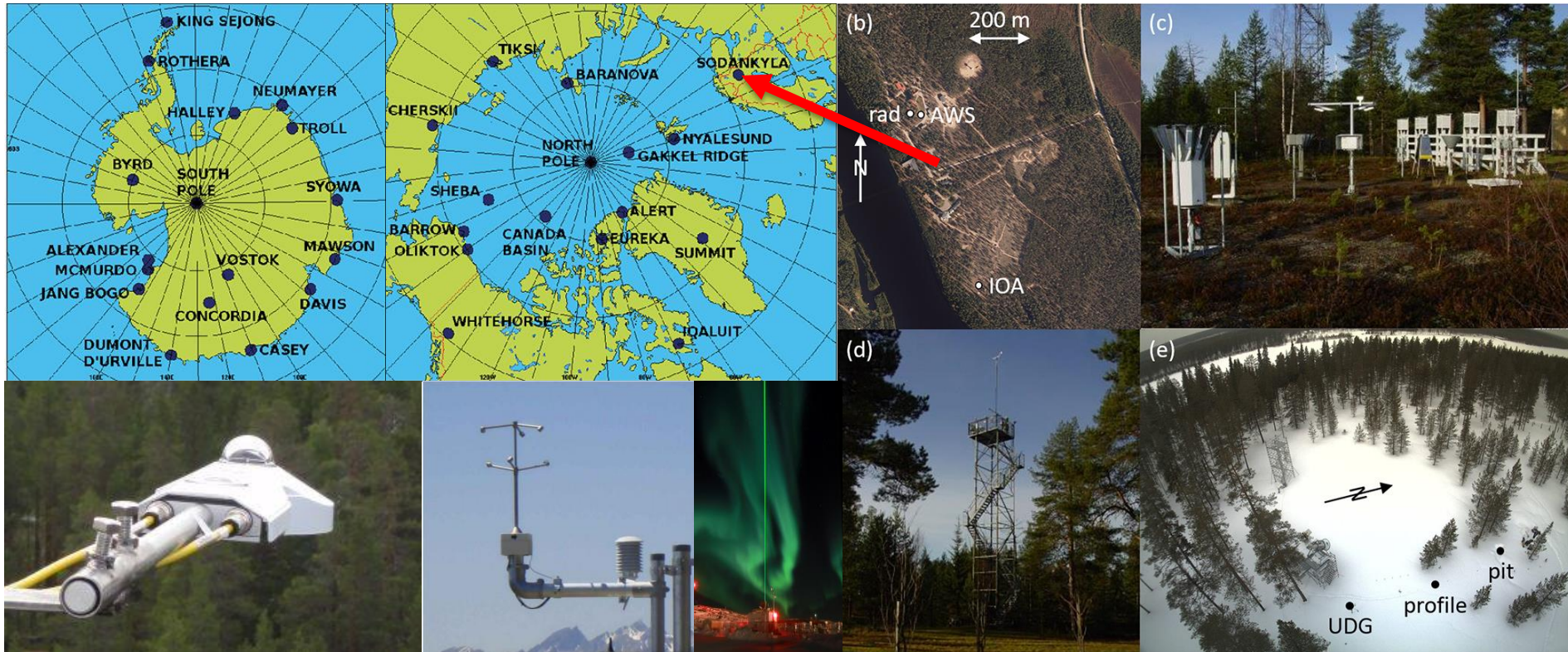# Task 4.3 evaluation of Arctic extremes

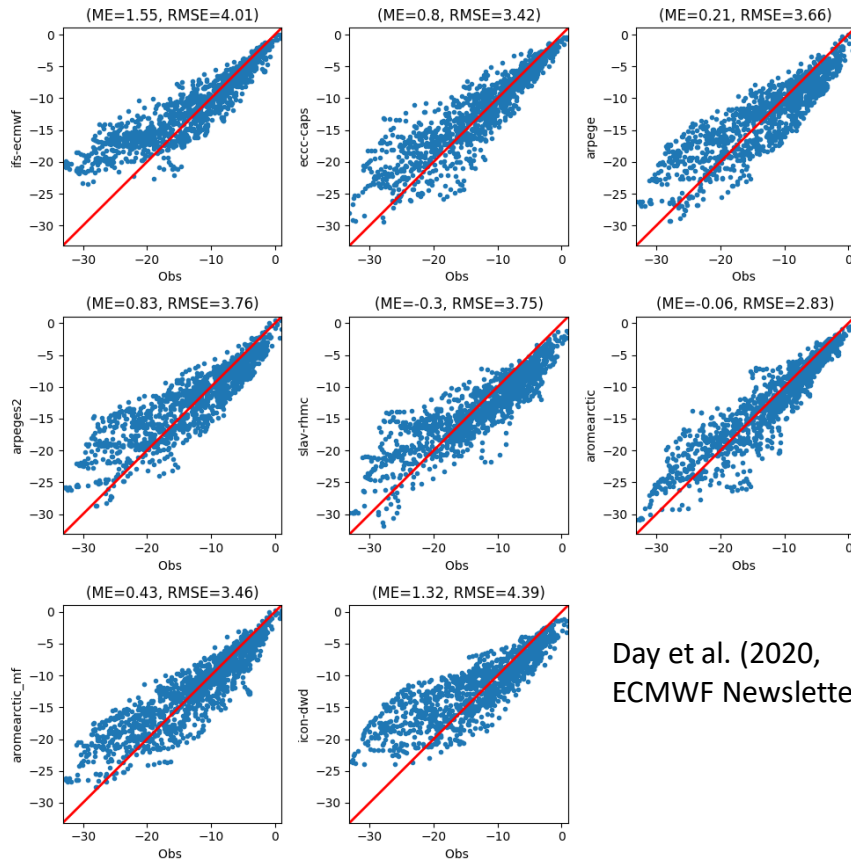t 850, z 500, 2018022400 0

To warm in Northern Europe

Obs

Forecast

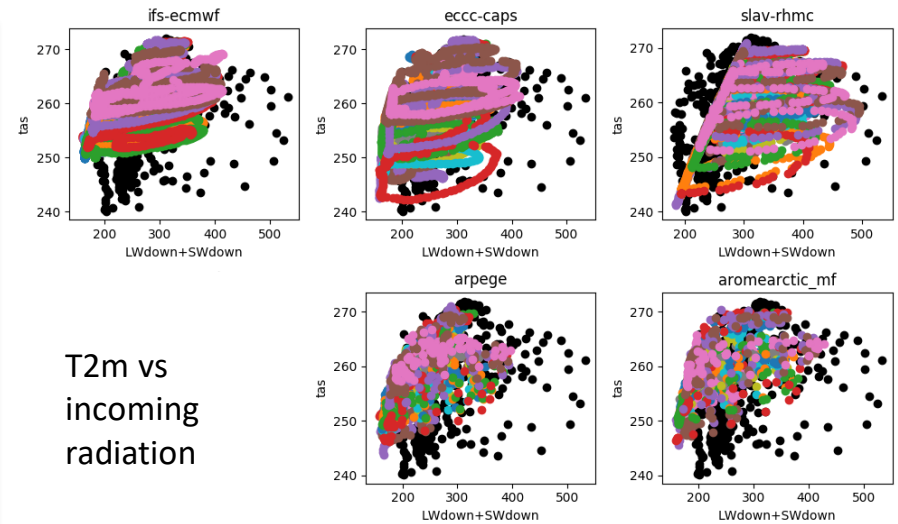# Task 4.4: Exploiting INTERACT station data to understand forecast errors

Focusing on budgets/process-oriented diagnostics

Developing process understanding of forecast errors using INTERACT station observations: Sodankylä

(ME=1.55, RMSE=4.01) (ME=0.8, RMSE=3.42) (ME=0.21, RMSE=3.66)
(ME=0.83, RMSE=3.76) (ME=-0.3, RMSE=3.75) (ME=-0.06, RMSE=2.83)
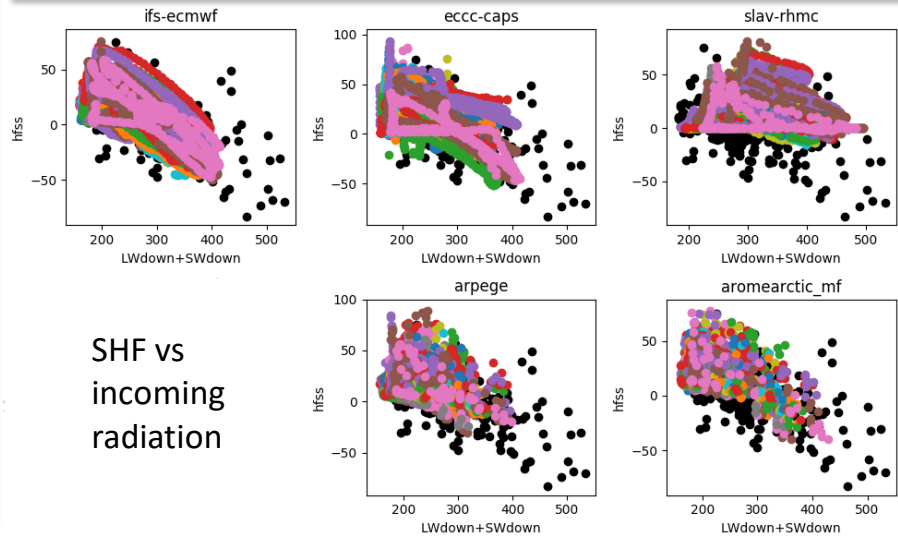(ME=0.43, RMSE=3.46) (ME=1.32, RMSE=4.39)

Day et al. (2020, ECMWF Newsletter)

$$LW \downarrow + SW_{net} = -(SHF + LHF + GHF - LW \uparrow)$$

T2m vs incoming radiation

SHF vs incoming radiation

T4.3 and 4.4 next steps

Task 4.3 evaluation of forecasts of Arctic extremes:
- Moving from case studies to systematic errors:
    - use hindcasts to evaluate reliability of forecasts of temperature extremes.
    - Linking errors in extreme temperature forecasts to errors in intra-day forecasts (diurnal cycles etc.).
    - Report due in (July M19).

Task 4.4 Advancing the exploitation of INTERACT station data:
- Presenting results at AMS-Polar next week.
- Develop multi-model analysis at Sodankylä and extend to to other sites (Utqiagvik (Barrow), Summit Greenland, …).
- Continue supporting YOPPsiteMIP collaboration (including Merged Observatory Data Files).
- Planning to submit a proposal to the Bulletin of the AMS for an overview paper.

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