AROME-MF SURFEX/GELATO 1D
over the Barents sea domain

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CNRM/GMAP

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Outline

- The APPLICATE project

- AROME-MF and the APPLICATE project

- SURFEX/GELATO

- Barents sea observation sites

- First results

- Further work ….

The APPLICATE project

- APPLICATE (Advanced Prediction in Polar regions and beyond: modelling, observing system design and LInkages associated with a Changing Arctic

- The multinational and multidisciplinary consortium will work to enhance weather and climate prediction capabilities : focus on the Arctic

- Our contribution for the NWP part:
  - Evaluate the Sea-ice model (Gelato) available in the SURFEX platform in AROME-MF-Arctic and compare to SICE used in AROME-Artcic (MetNorway)
  - Study more specifically the subgrid-scale variability due to the presence of sea ice at the marine surface and its impact on the turbulence near the surface
  - Impact of the high resolution analysis of the AROME -Arctic (MetNorway) in AROME-MF-Arctic à 2.5Km
  - Added value of the High resolution configuration of AROME-MF-Arctic

AROME experiments within the APPLICATE project over the Barents Sea:

Global ARPEGE @7.5km over France
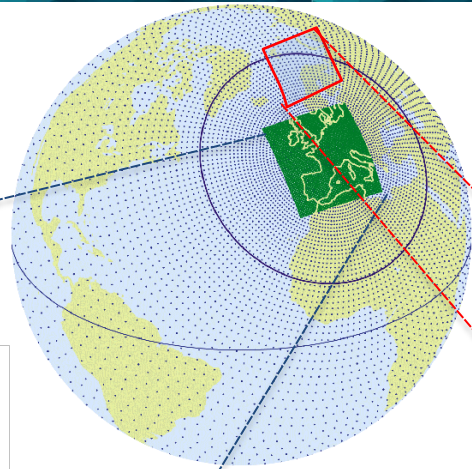
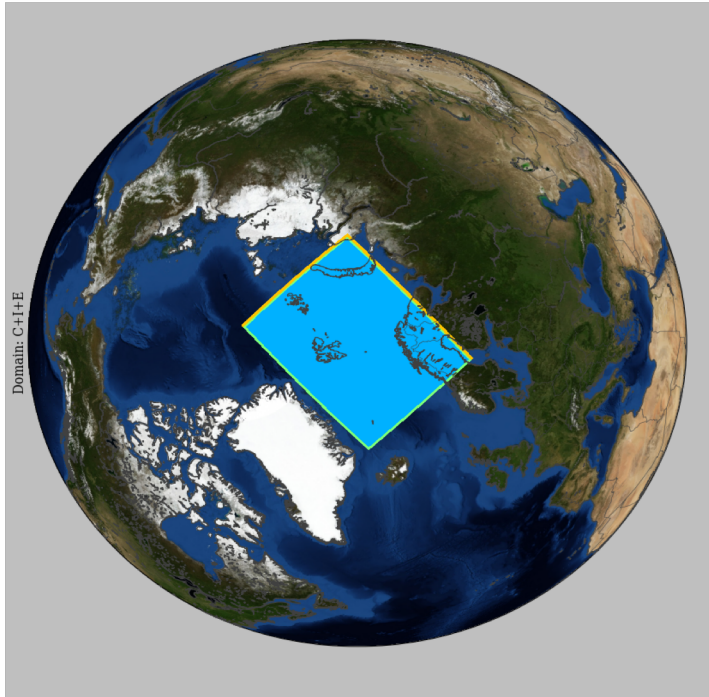
CRM AROME over France at 1.3km

Domain: C+I+E
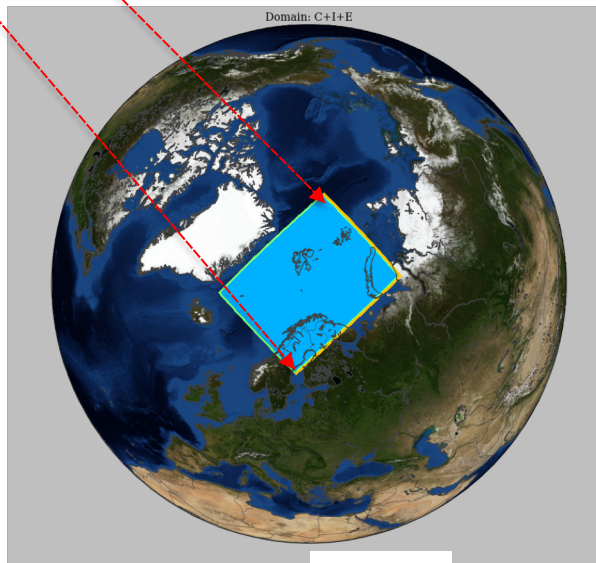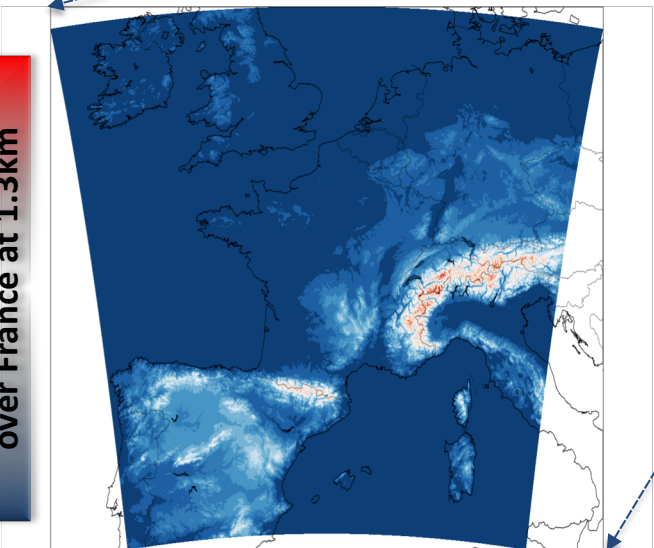
AROME-MF-Arctic version over the Barentz sea

AROME experiments within the APPLICATE project over the Barents Sea:

AROME-MF-Arctic version over the Barentz sea

Domain: C+I+E

AROME-MF-Arctic

◆ **Low Resolution:** 2.5km grid size and 65 vertical level (same as Arome-Arctic from MetNorway)

➡ **Actual configuration**

◆ **High Resolution:** 1.25km grid size and 90 vertical level (similar to Arome-France)

No assimilation cycle. LBC and initial conditions from ARPEGE
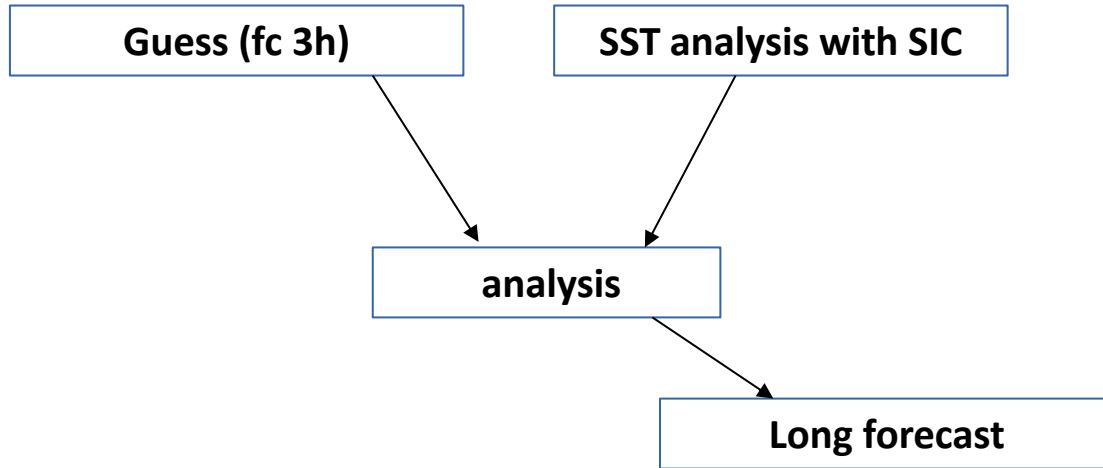
GELATO

The numerical model GELATO (Global Experimental Leads and Ice for Atmosphere and Ocean) describes the dynamic and thermodynamic evolution of sea ice in the Arctic and Antarctic. (Phd Matthieu Chevalier, 2012)

GELATO make possible the study of the sea ice variability in the Arctic, or to better understand extreme events like sea ice rapid regression
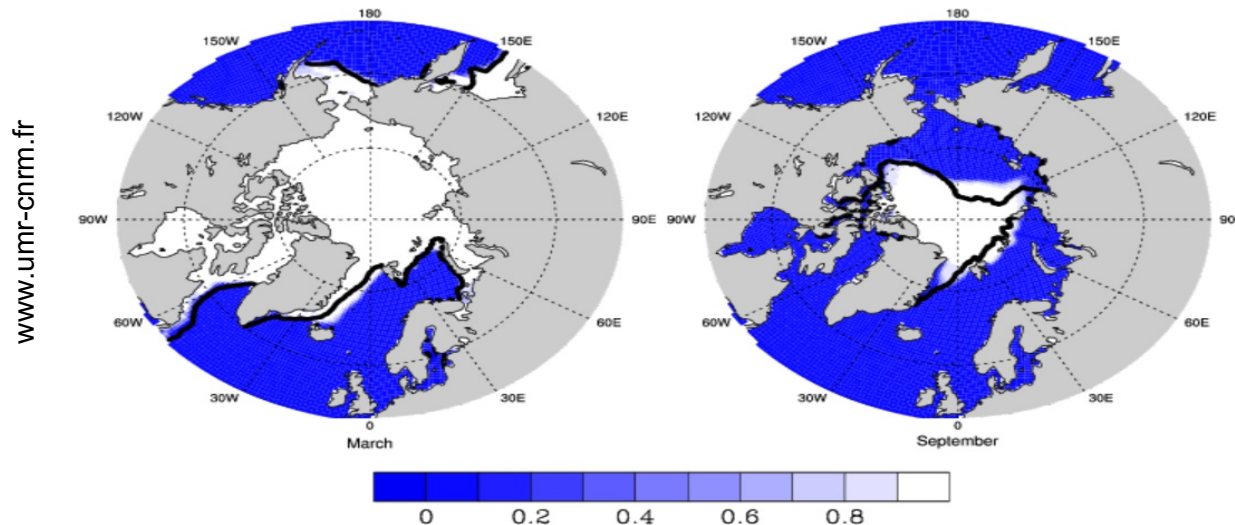
Sea ice Concentration simulated by the Gelato model forced by atmospheric observations: March 2007 (left figure) and September 2007 (right). A value of 0 corresponds to an absence of ice, and a value of 1 indicates that locally the marine surface is totally glaciated
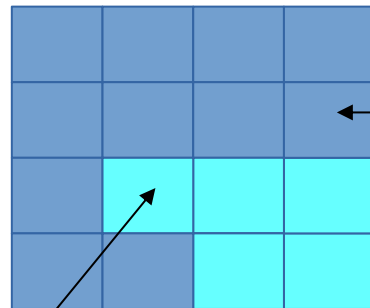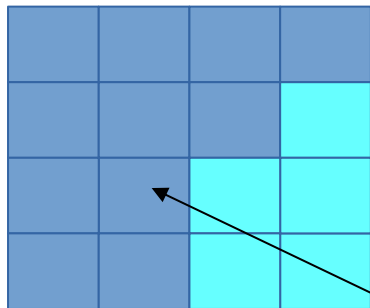
How to initialize the GELATO variables

Guess (fc 3h)

SST analysis with SIC

analysis

Long forecast

GELATO variable	Signification
SFX.ICEFSI	Sea ice fraction
SFX.ICEHSI	Sea ice height
SFX.ICETSF	Sea ice temperature
SFX.ICEH (1 to 10)	Sea ice enthalpy

AROME-MF/GELATO

Guess (fc 3h)

SST analysis

SIC =0 in the guess and SST < -1.8 → initial value for GELATO variables ?

SIC > 0 in the guess and SST > -1.8 → SIC_ana =0
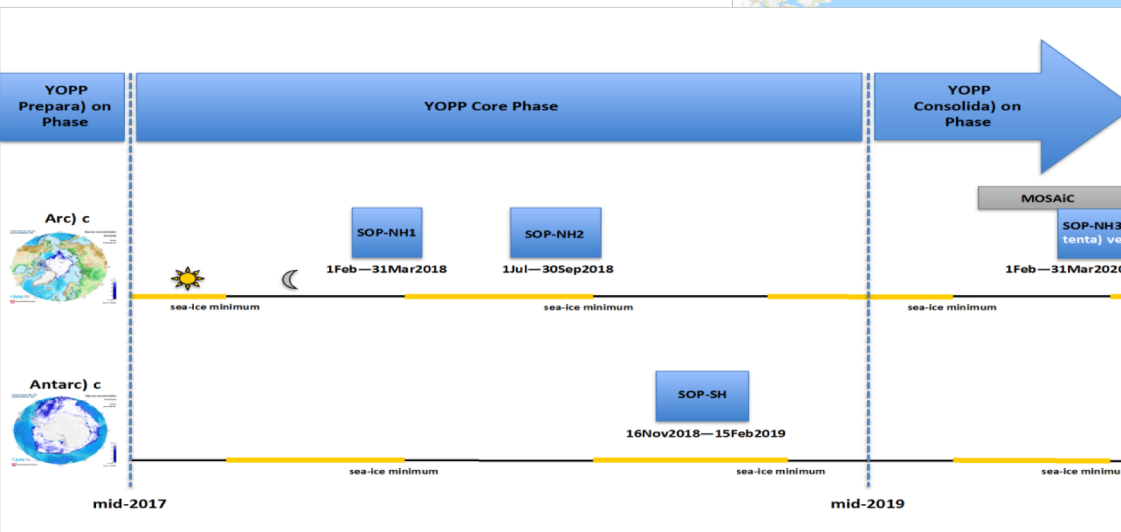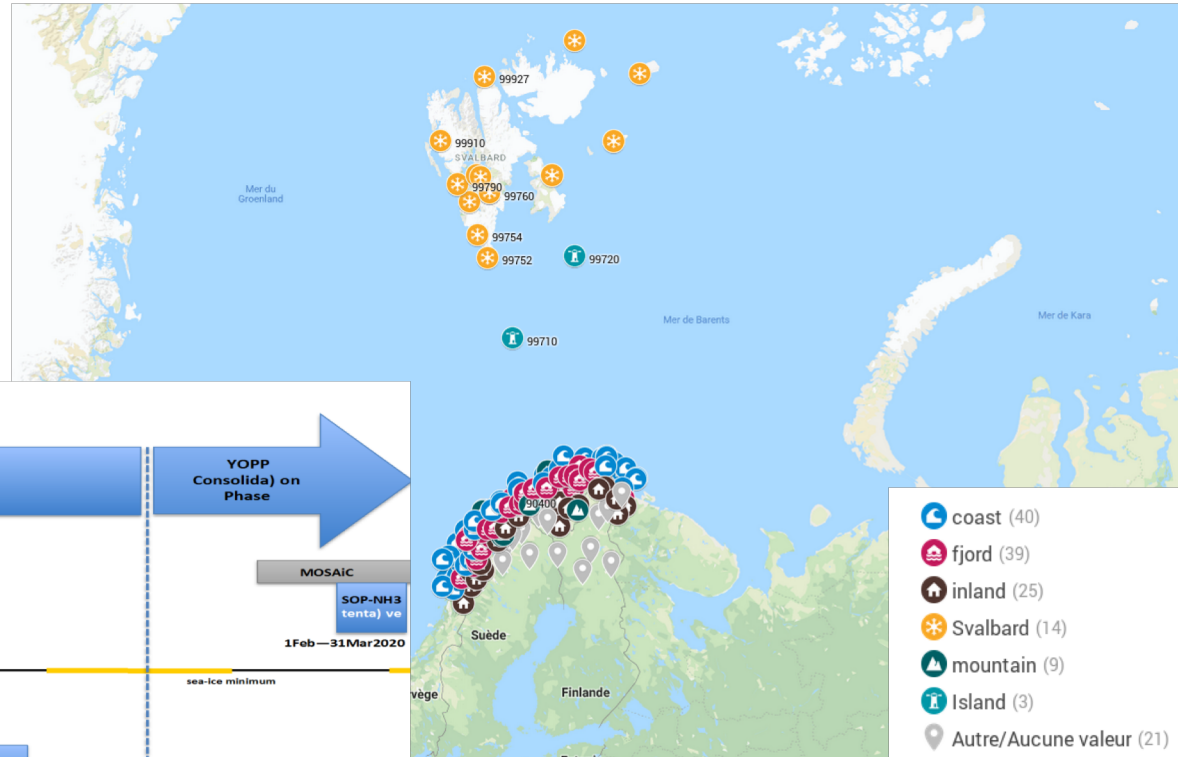
Preliminary evalution with a "test" spin-up
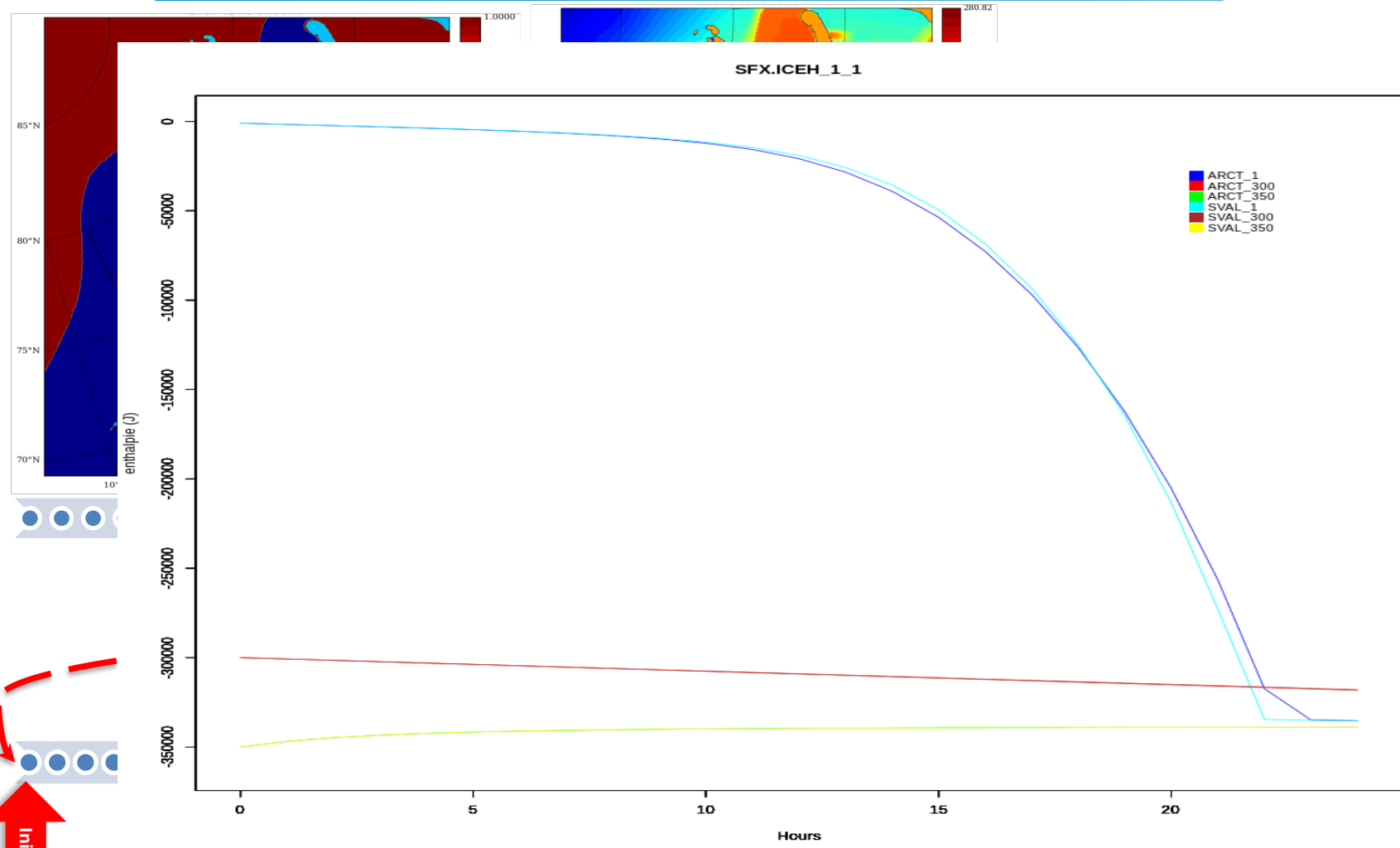
Site measurements

- 151 measurement station
- 6 site classes
- 2 measurement periods

GELATO/SURFTEMPERATURE

Diff. ARM_GELATO/ARM 48h frc
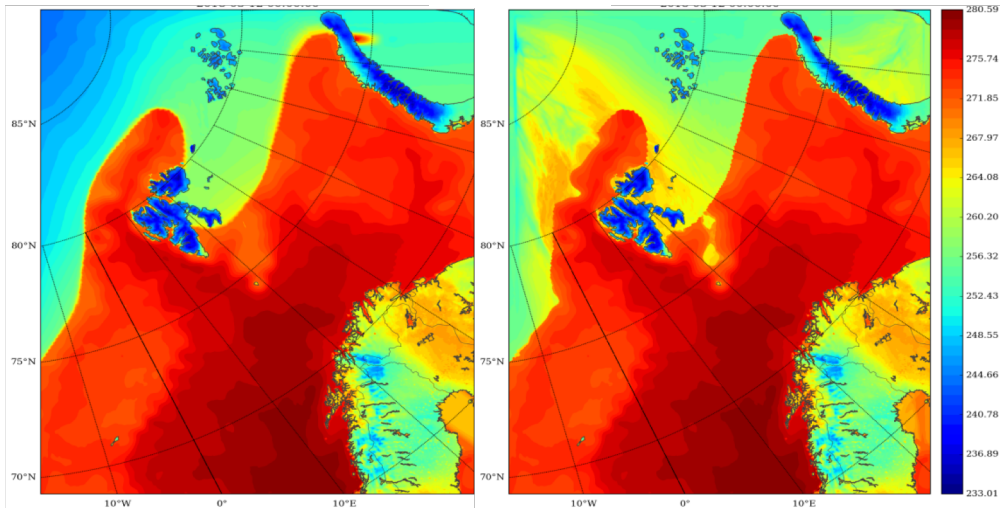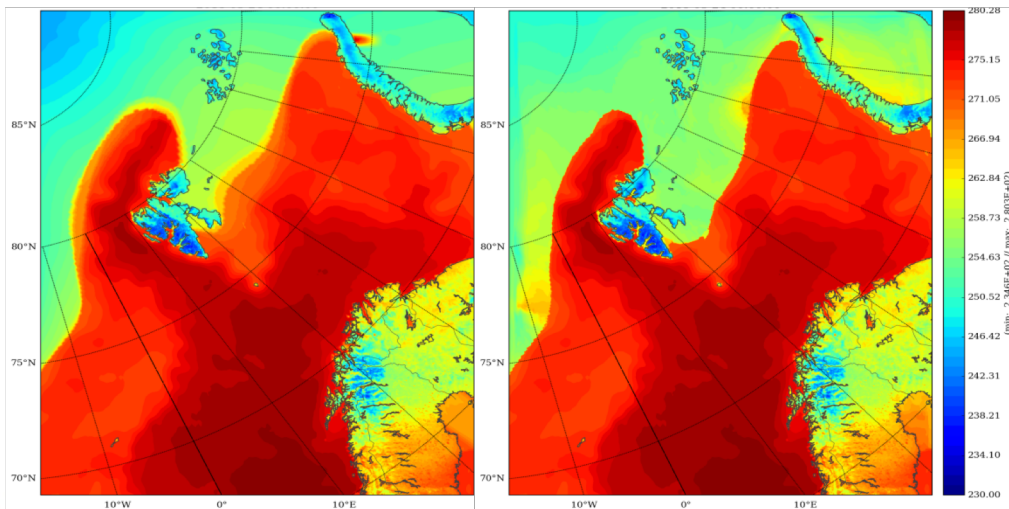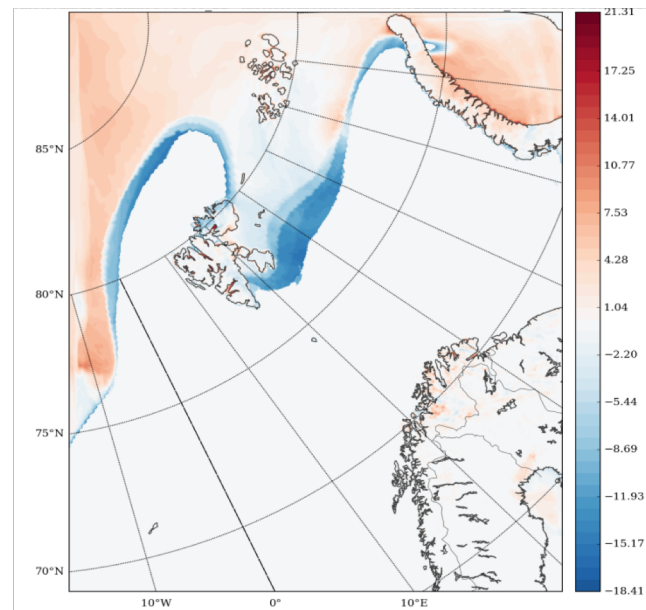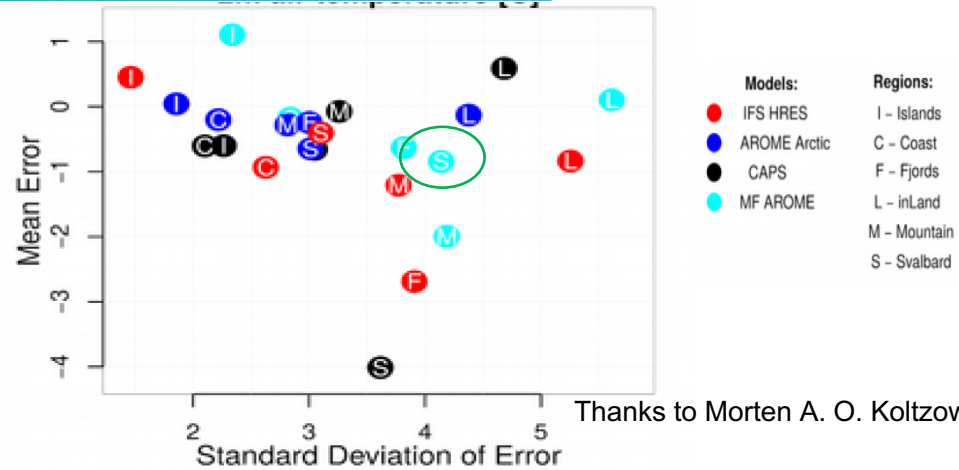
AROME-ARCTIC   AROME-ARCTIC/GELATO

BIAS and Standard deviation T2m

- BIAS for SOP1 period

- BIAS for 3 days ARM-MF/GELATO

Thanks to Morten A. O. Koltzow

20180219   20180312   20180322

ARM-ARCTIC-MF

ARM-ARCTIC-MF/GELATO

ARM-ARCTIC (Nor. intial cond.)
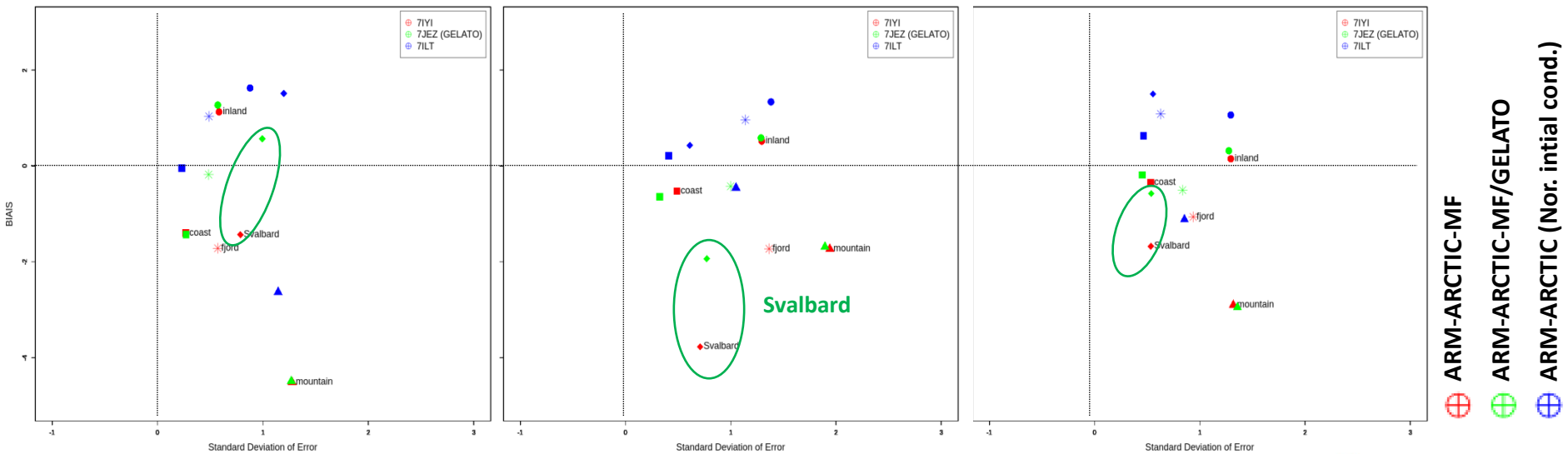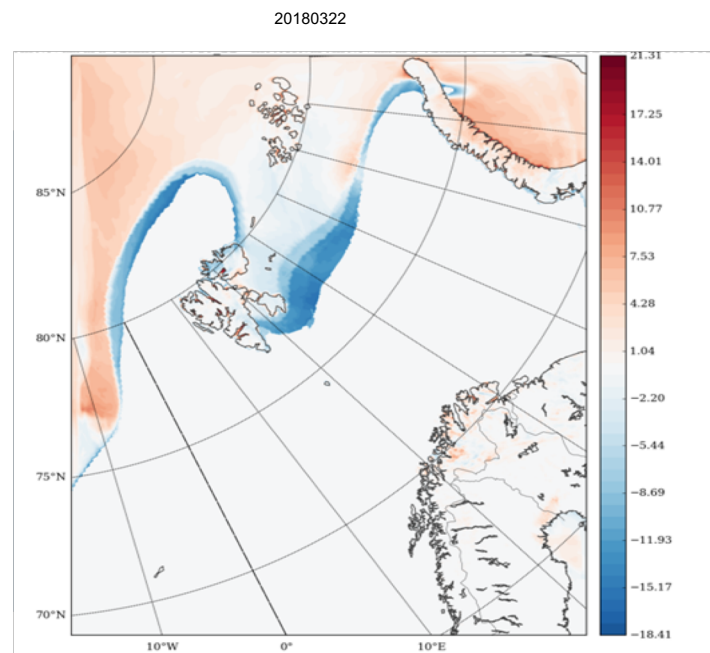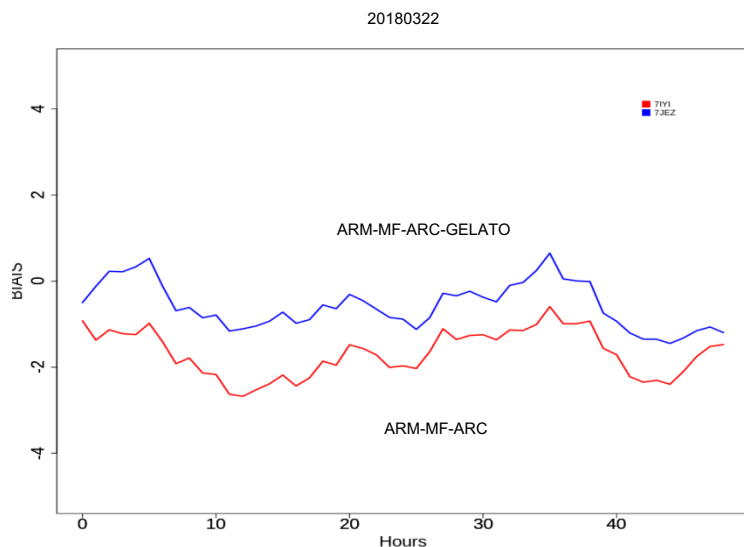
'The Svalbard case' T2m

14 stations
- Lower bias with GELATO
- Inland/sea model point extraction
- Altitude observation/model point extraction

➡️ BIAS calculation?

Diff. ARM_GELATO/ARM 48h frc

Further Work

- Evaluation of GELATO spin-up duration (24h, 48h,…)

- GELATO variables initialization

- SIC.guess Vs SIC GELATO

- AROME-MF-ARCTIC/GELATO at 1.25km

THANKS!

Barents Sea, Svalbard, Norway. Credit: Cindy Hopkins/Alamy Stock Photo.