ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

SRNWP at FMI

Karoliina Hämäläinen, Ekaterina Kurzeneva, Pilvi Siljamo, Markku Kangas & Carl Fortelius

Operational 2018

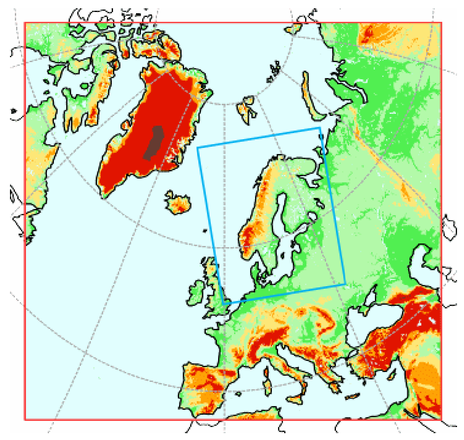
As a member of a Nordic **MetCoOp** cooperation with Norway and Sweden, FMI participates in developing and running a common high resolution ensemble prediction system called **MEPS** based on non-hydrostatic convection-permitting **Harmonie-Arome** developed in a code cooperation with Météo-France and ALADIN. MetCoOp also develops an hourly updated rapid refresh cycle based on Harmonie-Arome, currently running in a pre-operational mode.

Forecast production within MetCoOp is distributed among the participating institutes.

Additionally, FMI continues to run hydrostatic NWP model **HIRLAM** with horizontal resolution of 7.5 km. It is maintained at version 7.4 but not developed any more.

Model Integration areas

Harmonie-Arome (MEPS) Hirlam

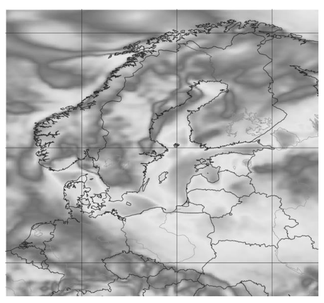


DOWNSTREAM & RELATED APPLICATIONS		
SILAM	Particle dispersion & chemical transport model	Gases CBM-4, CBM-5 expansions, halogens & stratospheric aerosols - nuclear emergency preparedness - forest fires, volcanic ash
-- POLLEN	Long-range natural pollen transport	Alder, birch, olive, grasses, mugwort, ragweed
LAPS	Local analysis and prediction system	Hourly analyses of surface and upper air variables
RoadSurf	Road weather model	State of road surfaces and pedestrian pavements, road maintenance advice, intelligent traffic
Marine models (for Baltic)	WAM OAAS, WETEHINEN 2D HELMI HBM 3D	Wave model forecasts Storm surge forecasts Sea ice forecasts Water circulation forecasts
Hydrological models	Managed by the Finnish Environment Institute (SYKE)	

Use of lidar winds for verification and calibration of IFS-ENS forecasts

Renewable energy production is weather dependent: wind, photovoltaic and hydro power reservoirs are all highly affected by prevailing weather conditions. Due to Finland's northern location also demand of heating (or cooling) and thus energy consumption is largely weather dependent. In VaGe project that FMI is participating, the goal is to investigate how much the weather forecasts can improve the decision making on energy system operations.

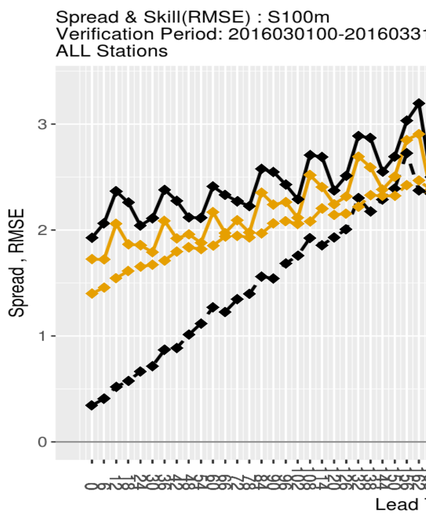
The study indicates that the medium-range probabilistic weather forecasts are under dispersive in general, and thus the calibration is needed. The next step is to test how the developed calibration methods will work with the FMI's high resolution ensample system MEPS jointly developed and run with SMHI and MET Norway.



Experiment domain

MAIN RESULTS

- New calibrated (50 + 1) members are created
- In most cases, ensemble calibration increases the skill
- Positive outcomes:
  1. Calibration increases the spread, which is the goal when trying to correct under dispersity that leads in too narrow spread and larger ensemble RMSE
  2. Root-mean-square error is reduced
  3. Predictability is increased even by 2 days



*Verification results for 100m wind speed. Spread and RMSE presented for **raw IFS-ENS** output and for **calibrated**. Lidar wind measurements from 5 Finnish stations were used for verification and calibration*

Pollen dispersion modelling

- **SILAM** is regional-global scale atmospheric dispersion models (ADM)
- It is widely used in many different kind of air quality applications at FMI (http:\\silam.fmi.fi)
- ADMs are suitable also for forecasting dispersion, transport and movements of biological organisms etc.
  - Pollen, spores, small insects (e.g., aphids)

Affecting parameters

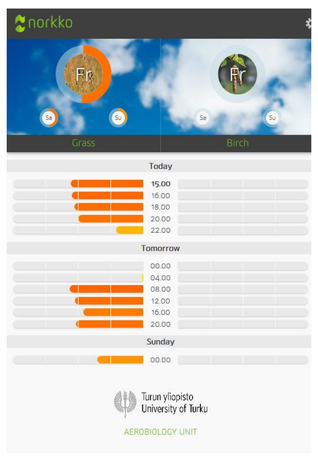
- *temperature:* organism emissions and uplift of the usually controlled by temperature sum
- *wind speed/direction:* important for dispersion pattern
- *relative humidity:* controls emission intensity
- *precipitation:* prevents emissions and washes out pollen/spores/insects from the air

NORKKO : pollen forecast system

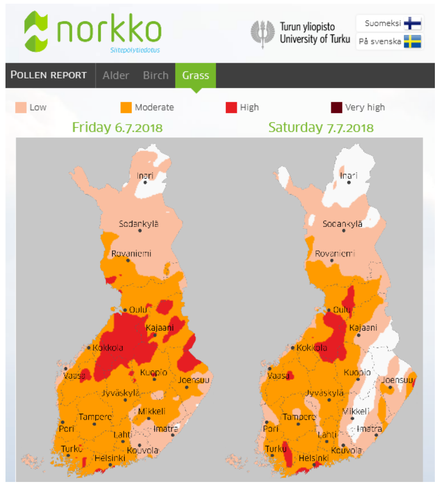
- cooperation between FMI and UTU (University of Turku)
- http:\\norkko.fi; http:\\app.norkko.fi

Based on :

- Weather forecast
  - ECMWF or FMI NWP model or vision of the duty meteorologist
- SILAM-pollen forecasts (FMI)
- Aerobiological observations (UTU)
- Human-made corrections (UTU)
- SmartMet-workstation (FMI)



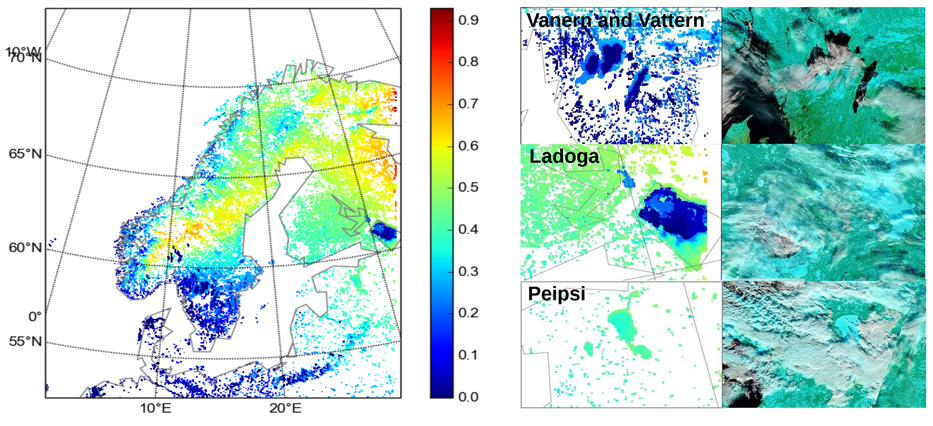
Example: Norkko pollen forecasts for July 6, 2018 through a mobile- (above) and a web-based (below) application.



FLake in Harmonie-Arome

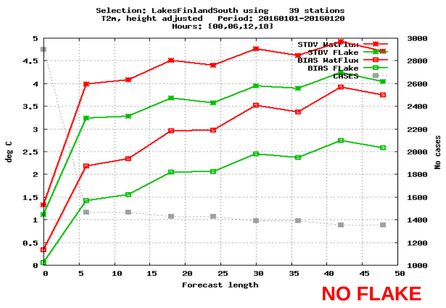
- Lake fraction: ECOCLIMAP, corrected covers
- Lake depth: GLBD3v3
- Aggregation/interpolation, consistency corrections in SURFEX
- Experiments for autumn 2015 – spring 2016
- Comparison with the previous scheme (LST=T deep soil)
- Operational since spring 2018

FLake performance: H ice, m, 15.01.2016.00+00

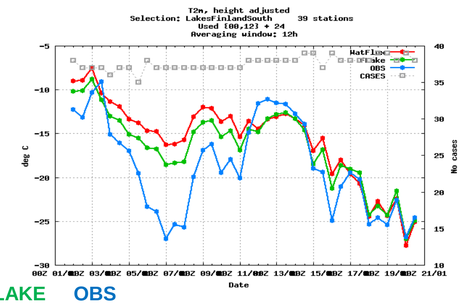


January, 2016, South Finland (39 selected stations around lakes)

T 2m bias and ESTD, K



T 2m, K, timeserie



NO FLAKE FLAKE OBS

Improvement of T2m scores