Norwegian Meteorological Institute

AIRQUIP

Forskningsrådet

Forecasting local air quality in Norway

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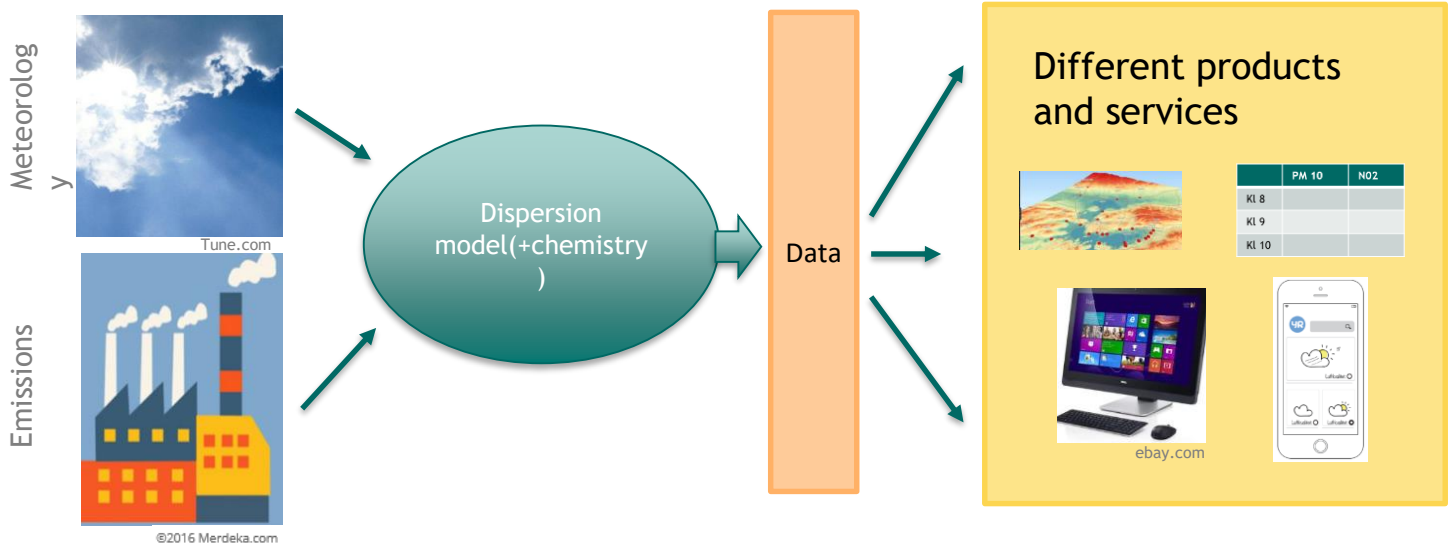
Statens vegvesen

Ambition

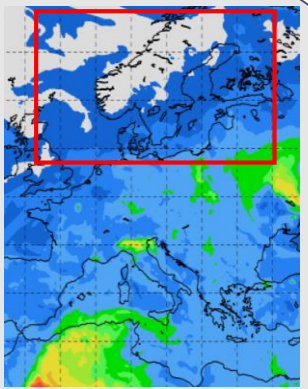
- To provide a national air quality modelling system to support both local and national authorities in their air quality obligations
- The modelling system will be used, and be useful, for the following applications
  - Air quality forecasting
  - Short term air quality measures
  - Providing information and raise awareness of the public
  - Long term air quality planning
- Because such a system must work on the local level then involvement of local authorities is essential

How is air quality calculated?

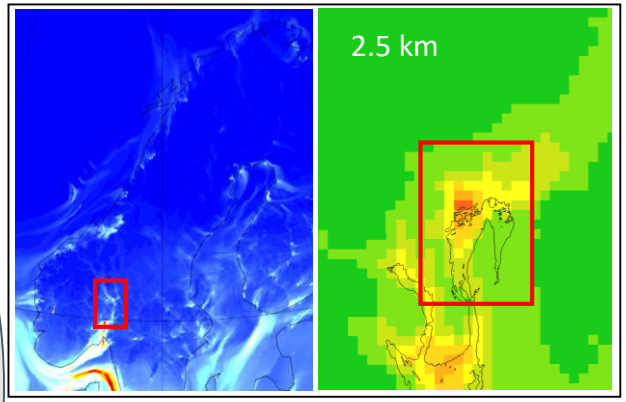


The operational air quality model system

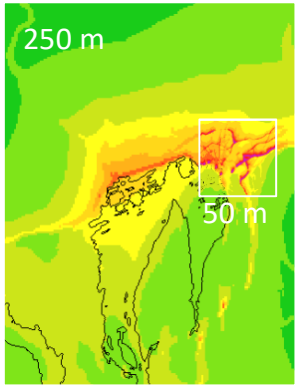
CAMS



EMEP model for Europe

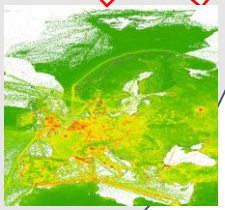


EMEP model for Norway (with local fraction)



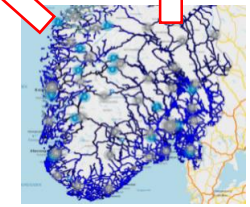
uEMEP

ECMWF global meteorology



European emissions

AROME meteorology



Local emissions

Emissions

- uEMEP calculates the most important emissions sources in Norway for high resolution modelling. These are:
  - Traffic exhaust (per road segment)
  - Traffic non-exhaust (per road segment)
  - Shipping emissions (250 m grid)
  - Residential wood burning emissions (250 m)
  - Industrial emissions (per industry)
- All other emissions are calculated on the larger scale using CAMS emissions + the EMEP model

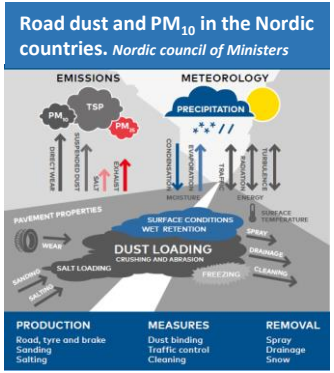


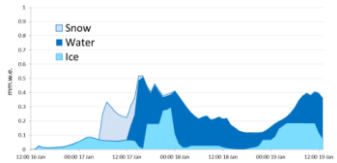


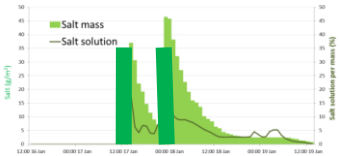
Road dust

- NORTRIP road-dust model calculates:
  - emissions from road, tyre and brake wear, plus road salt
  - road surface conditions, accumulation and suspension of road dust particles
  - direct emissions from studded tyres
  - Salting and dust binding (potentially)

- Road surface conditions are very important for road dust emissions and is strongly affected by precipitation and temperature ⇒ **Use of NRT data has a large potential**

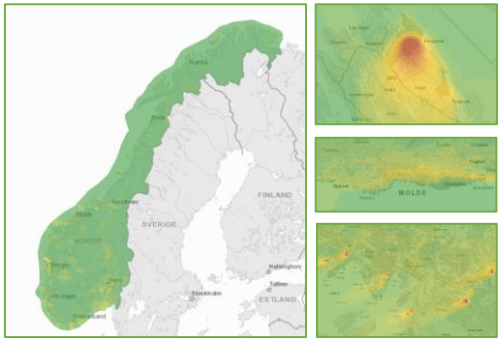


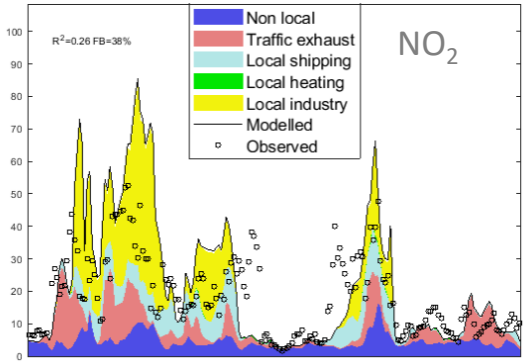




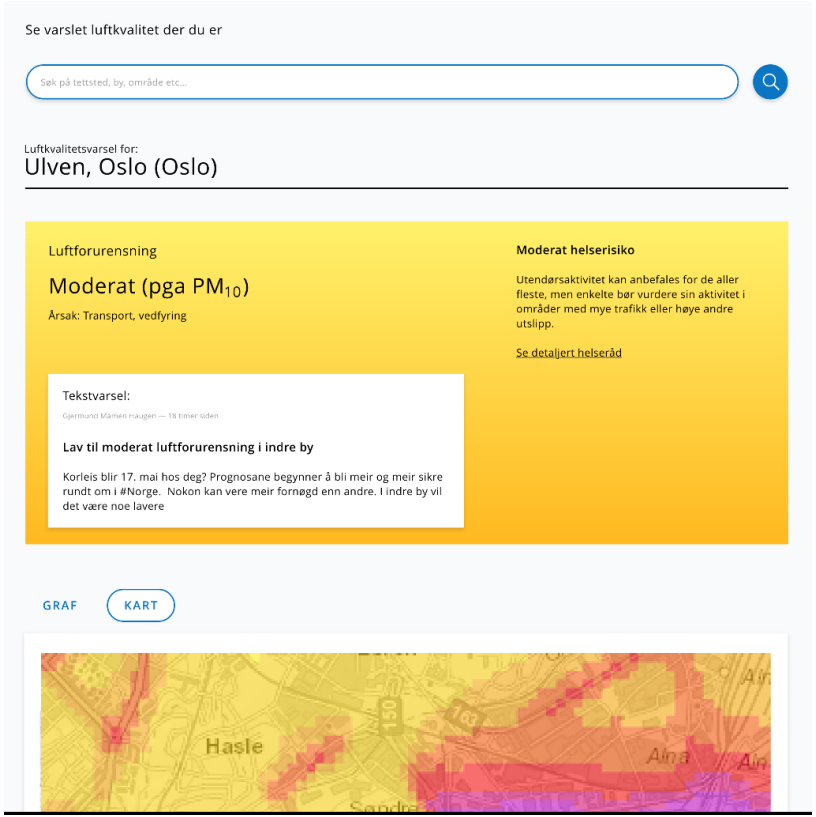
What does the forecasting system deliver

- 2 day hourly forecasts for all of Norway at 500 – 50 m for the pollutants PM_{10}, $PM_{2.5}$, NO_2 and O_3
- A forecasted Air Quality Index (AQI) for all of Norway for each forecast hour. AQI is a combined pollutant health index
- Local source contribution for each pollutant:
  - Traffic exhaust
  - Traffic non-exhaust (mostly road dust)
  - Shipping emissions (exhaust only)
  - Industrial emissions
  - Residential wood combustion
  - Other sources (mostly non-local contributions)



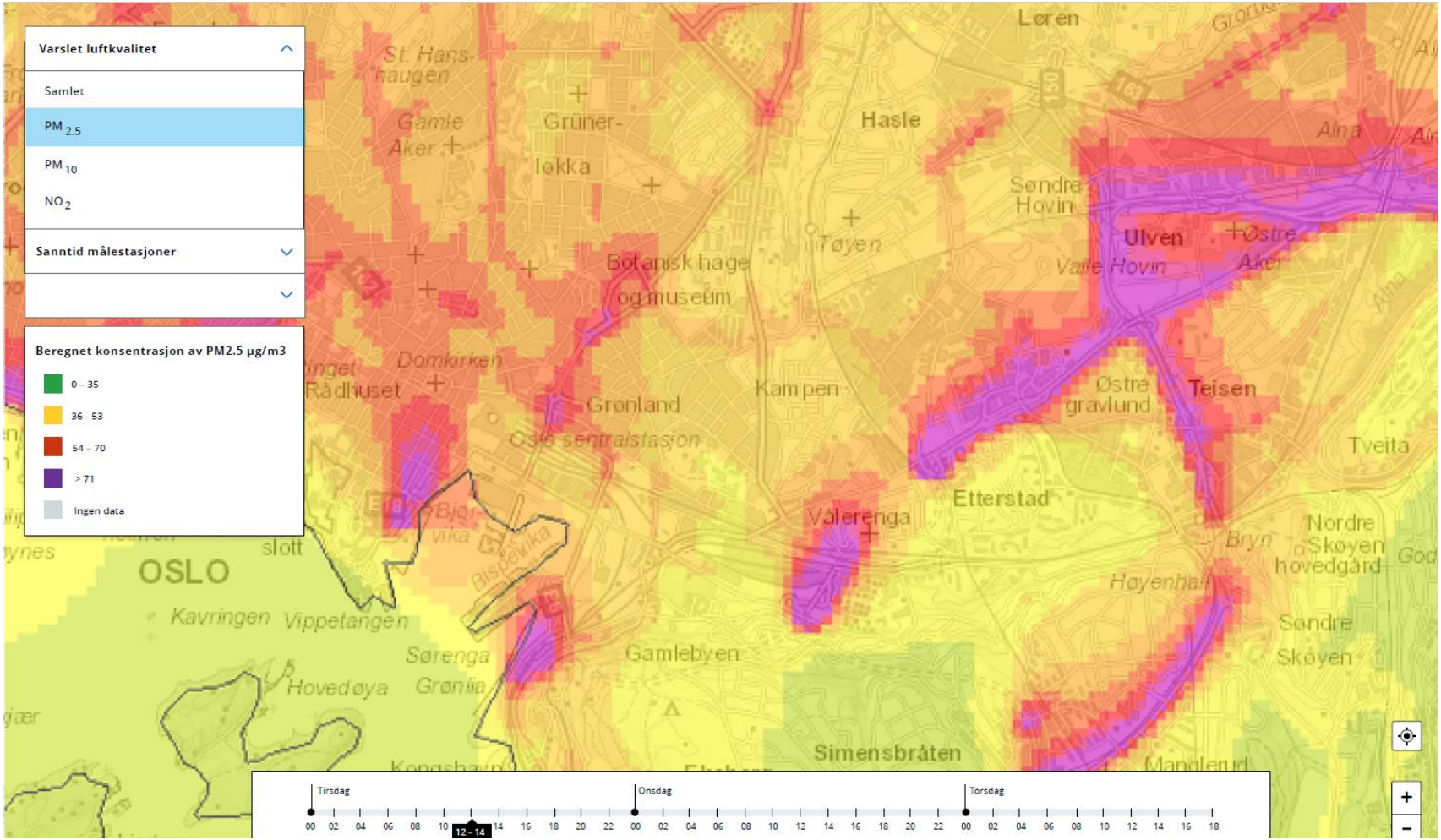


Air quality forecast for all of Norway

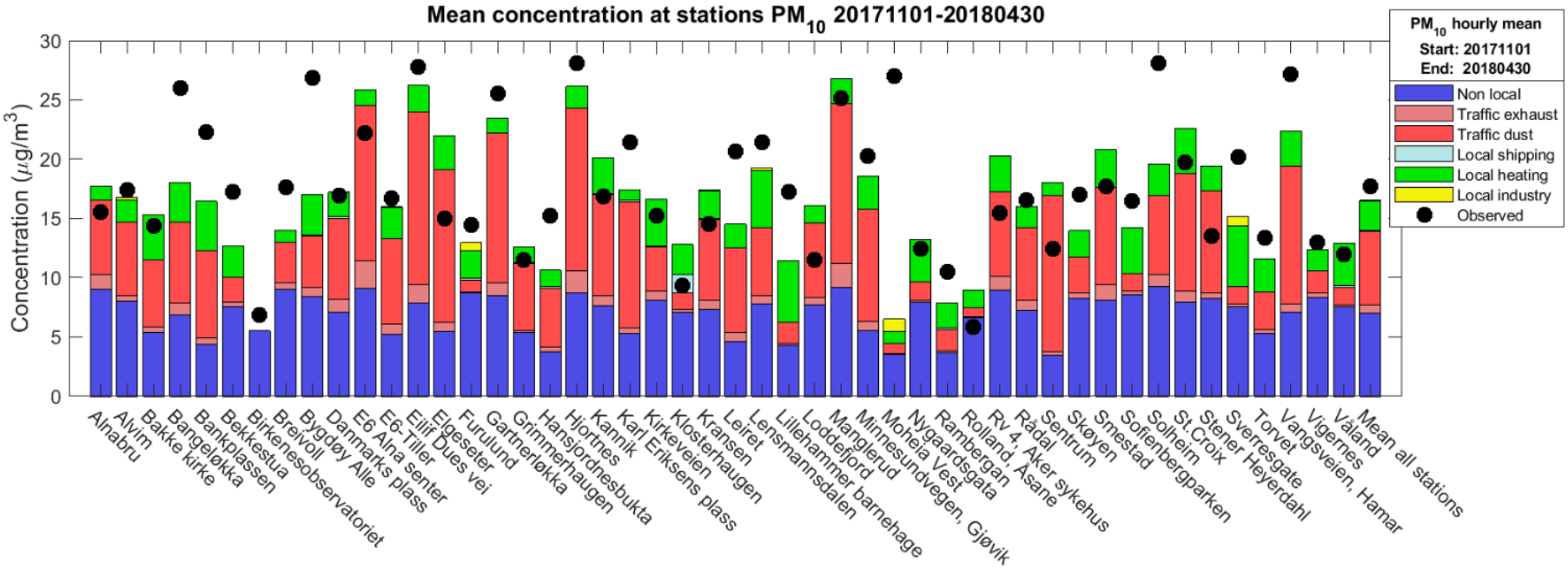


- Test version available for all municipalities from 1.11.18
- Also includes observations
- Available for public later this season
- Yr.no

Luftsamarbeidet


Varslet luftkvalitet
Samlet
PM 2.5
PM 10
NO 2
Sanntid målestasjoner
Beregnet konsentrasjon av PM2.5 µg/m3
0 - 35
36 - 53
54 - 70
> 71
Ingen data
Løren
St. Hans-haugen
Gamle Aker
Grüner-løkka
Hasle
Søndre Hovin
Tøyen
Ulven
Østre Aker
Valle Hovin
Botanisk hage og museum
Domkirken
Rådhuset
Grønland
Oslo sentralstasjon
Kampen
Østre gravlund
Teisen
Tveita
Etterstad
Vålerenga
Nordre Skøyen hovedgård
Bryn
Høyenhall
Søndre Skøyen
OSLO
Kavringen
Vippetangen
Sørenga
Grønlia
Hovedøya
Gamlebyen
Simensbråten
Tirsdag
Onsdag
Torsdag
00 02 04 06 08 10 12 14 16 18 20 22 00 02 04 06 08 10 12 14 16 18 20 22 00 02 04 06 08 10 12 14 16 18
12 - 14

PM_{10} source contributions (winter season 2017-2018)



This will be the basis for a ‘Measure calculator’, where we will also take into account different measures

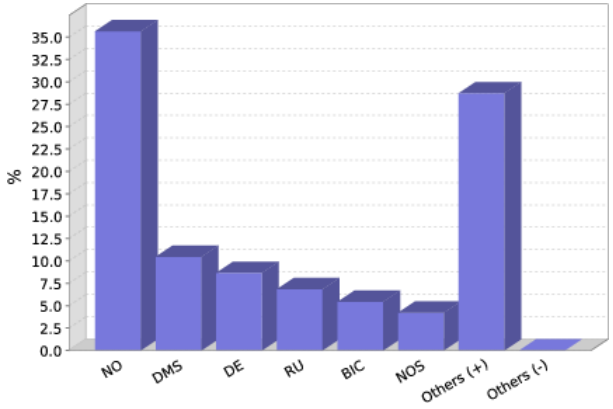
Summary

- A national system for modelling air quality for all of Norway down to a resolution of 50m is running pre-operational, and will go into a test-phase involving all interested municipalities in Norway from Thursday 1.11.18
- All the air quality forecast data will be available from the api (when released to the public)


Norwegian
Meteorological
Institute

Hvorfor modellerer **MET** luftkvalitet?

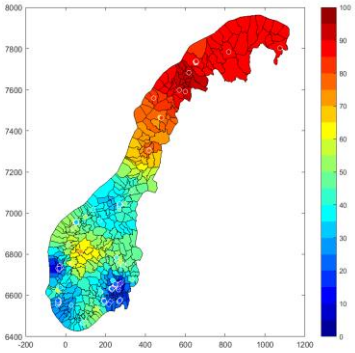
- Meteorologi svært viktig for modellering av luftkvalitet
- MET har vært og er en viktig aktør i Konvensjonen for Langtransportert Luftforurensning (CLRTAP) og er et senter under EMEP programmet i CLRTAP
  - EU, HELCOM, OSPARCOM, EU-prosjekter og andre prosjekter
  - Lokale versus regionale tiltak, helse
- Copernicus Atmosphere Monitoring Service (CAMS)



Bidrag til Norges $PM_{2.5}$. EMEP/CLRTAP beregninger

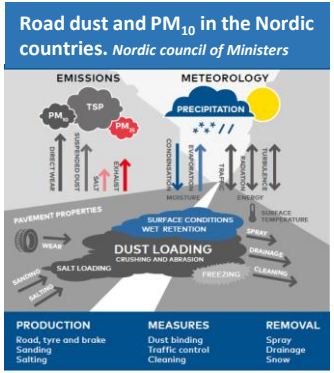
Traffic data and emissions

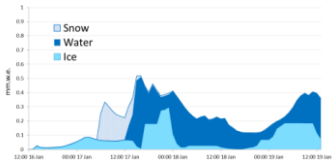
- Road traffic and road network data is taken from NVDB for state roads and from SSB traffic modelling for municipal roads
- In all roughly 700 000 road segments are used containing 8 million individual road links
- NO_x emission factors are set everywhere to the national average, based on total road traffic emissions for Norway (SSB)
- One single time profile for all traffic is currently used
- NORTRIP road dust emission model is used for all roads
- Studded tyre share is derived from ~ 200 counting sites across the country (SVV) from 2017 and distributed to each municipality
- All emissions within tunnels exit at tunnel portals

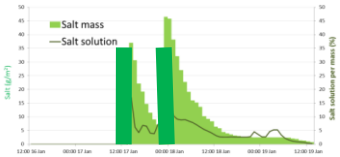


Road dust emissions

- PM emissions from road, tyre and brake wear, as well as road salt, are calculated using the NORTRIP road dust emission model
- Calculates the road surface conditions and the accumulation of wear particles on the road surface
- Calculates the direct emission from studded tyres and the suspension of the road dust particles
- Salting and dust binding are included in the model but these activities are unknown. Salting activities are estimated based on a set of salting rules and snow ploughing automatically occurs above a snow depth threshold
- No information on dust binding activities is available and it is not currently applied in the model

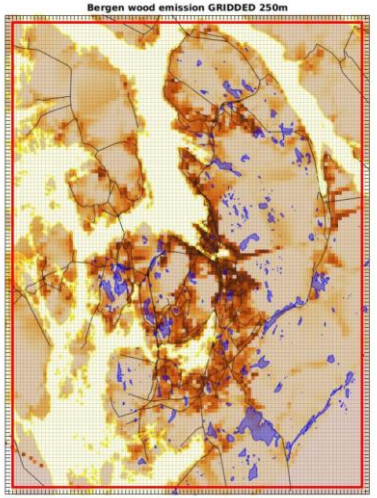


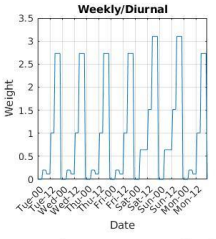


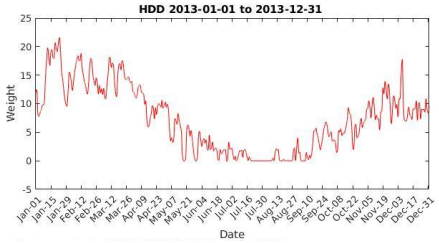


Residential wood burning emissions

- New wood burning emission data has been provided by NILU (MetVed model)
- Uses a range of new data sources to better distribute wood burning emissions on a 250 m grid for all of Norway
- Uses ‘heating degree days’ (temperature dependency) to adjust the emissions on a daily basis







* Images supplied by Susana López-Aparicio, NILU