ExSIRA – Experimental Study to Investigate Risk of selected Amines (project no. 199874/S60)

Tore Flatlandsmo Berglen and ExSIRA project team

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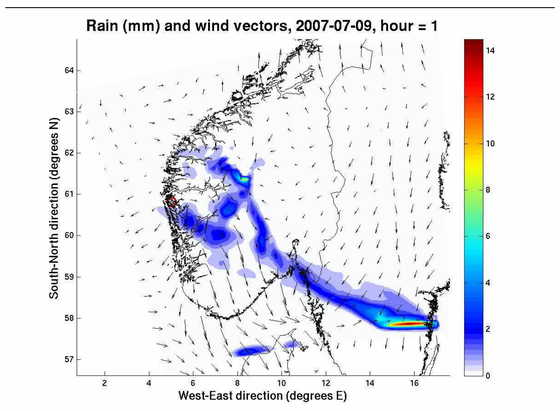
What is ExSIRA

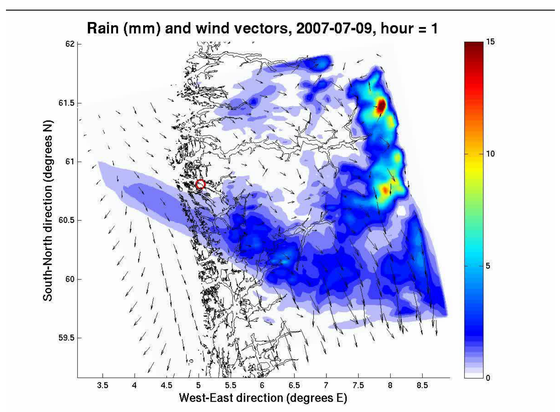
KMB-project funded by Gassnova (80%) & industrial partners Statoil, Shell and Vattenfall.

- Project period 2010-2014.
- Total budget 11'560 mill. NOK.
- The main objective of the project is to investigate the environmental effects of amines and amine degradation products.
- I.e. the project does not contribute to realization of CCS as such, but will give valuable information on possible effects.
- 4 main tasks: Atmospheric chemistry modelling, aquatic ecotoxicology, terrestrial ecotoxicology and corrosion.
- Scientific partners: NILU, NIVA, NINA, UiO and UMB.

Task 1: Atmospheric chemistry modelling:

- WRF-Chem model (Weather Research and Forecast with chemistry module included) is set up for Mongstad region.
- WRF-Chem is a community model developed at NCAR/NOAA (US)
- Possibility of nested grid down to 1×1 km^2 around Mongstad
- First step is to include MEA gas phase chemistry, i.e. reactions with OH (day time) and NO_3 (night time).
- It is crucial to represent wet deposition correctly. Sensitivity tests will be performed to investigate rain fall patterns.
- Principal investigators: Anna Velken (PhD student), Frode Stordal (UiO) and Matthias Karl.

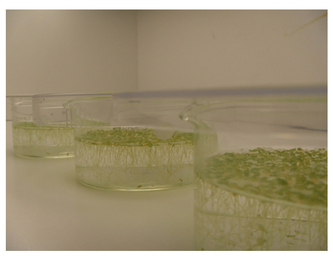




Rainfall Mongstad region 9th July 2007 using a 9×9 km^2 grid (upper panel) and a 3×3 km^2 grid (right panel) respectively

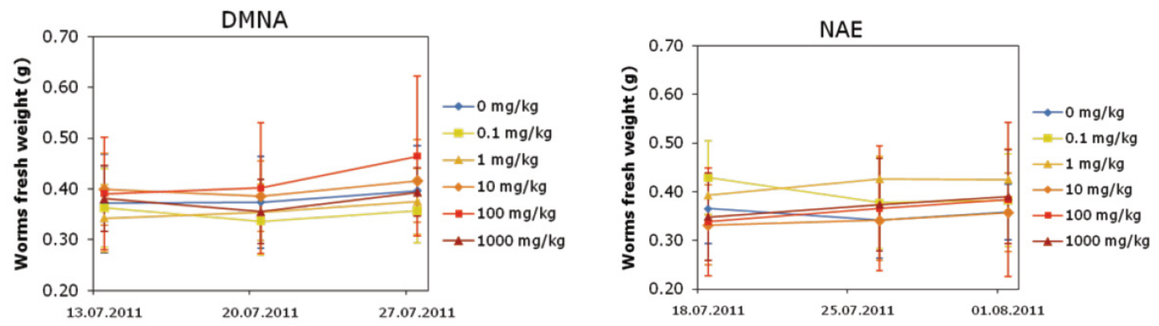
Task 2: Aquatic ecotoxicology:

- Main objective: To determine the acute and chronic toxicity of selected nitramines to freshwater, marine and terrestrial organisms.
- 2 nitramines selected: Dimethylnitramine (4164-28-7) and 2-(nitroamine) ethanol (74386-82-6).
- Experiments and tests to be performed both on bacteria, algea, plants, fish and worms.
- Principal investigators: Steven Brooks (NIVA), Knut Erik Tollefsen (NIVA and UMB) + UMB project team.



Lemna gibba

Caenorhabditis elegans (left panel) and earth worm (right panel)



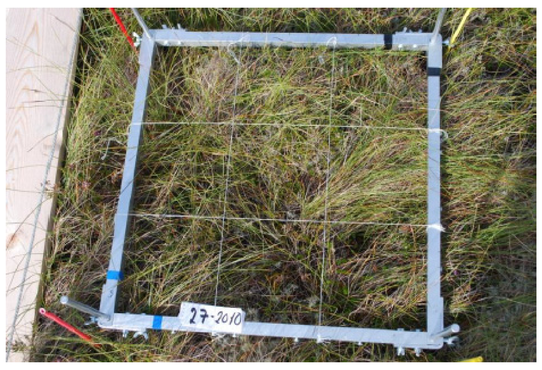
Toxicity of DMNA (left) & 2-NAE (right panel) to the Earthworm *Eiseniafetida* - Acute soil tests. No evidence of toxicity, LOEC > 1000 mg/kg dry soil.

Task 3: Terrestrial ecotoxicology:

- Main objective: investigate effects on vegetation, soil and soil fauna. Empirically assess the effects on the plant/soil ecosystem of different amines.
- Field experiments are carried out at Smøla, N-W Norway
- Spraying of plots with amine solutions.
- Amines to investigate: MEA, DEA and AMP.
- Baseline study in 2010, spraying in 2011 and 2012
- Principal investigators: Bård Pedersen (NINA) and Line Tau Strand (UMB).

Field plots at Smøla

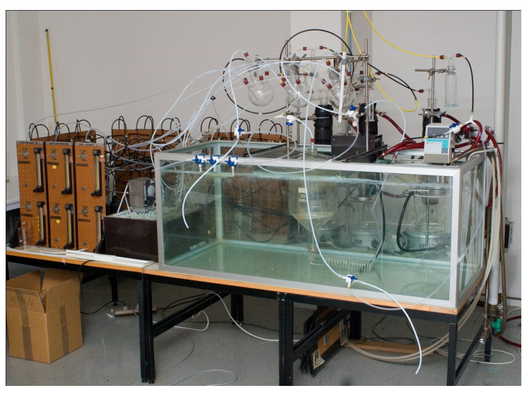
Spraying/watering with amines



Investigate vegetation effects

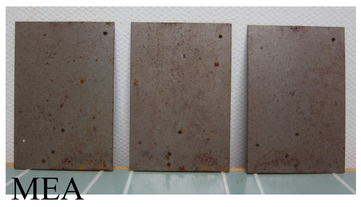
Task 4: corrosion:

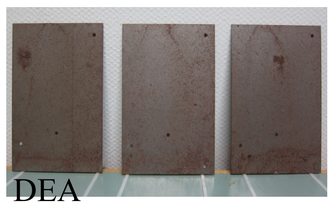
- Main objective: To determine atmospheric corrosion potential of amines and degradation products.
- Work include both field experiments (4 stations) and laboratory chamber experiments.
- Principal investigators: Terje Grøntoft, Thor Ofstad and Christian Dye (NILU)

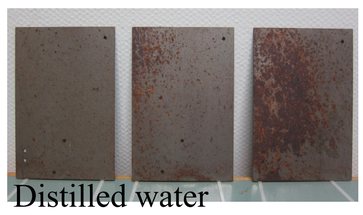


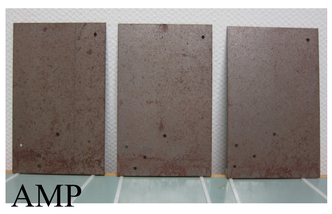
Chamber for laboratory tests

Field station at Skøyen (Oslo)









Results from the field: Skøyen after 3 months