

Project information

Project title

Modeling – transport, fate and bioaccumulation of contaminants

Year

2011/2012

Project leader

Eldbjørg S. Heimstad, NILU

Participants

Participants:

- E. Heimstad, NILU
- Sabine Eckhardt & Knut Breivik NILU
- Luca Nizzetto, Jostein Starrfelt, Katrine Borgå, Evgeniy Yakushev NIVA
- Anita Evenset APN
- Justin Gwynn NRPA
- Henning Jensen, NGU

Flagship

Hazardous substances, Theme: Human health and society

Funding Source

Fram Centre

Summary of Results

Air masses

With FLEXPART a Lagrangian Particle Dispersion model NILU has a tool where one can model the transport pathways of air masses reaching Zeppelin station. By using emission inventories and considering specific species properties for POPs (i.e. removal by deposition and OH radical reaction) POP concentration on various sites can be predicted. This tool was successfully applied for HCH and PCB at the Birkenes station (Eckhardt et al., 2009). For the Zeppelin station episodes of elevated concentration most of the POPs could be related to severe biomass burning in Russia and boreal forest in North America. To explain the general PCB time series at Zeppelin by using FLEXPART and PCB emission inventory was not possible. Therefore, it is assumed that other sources than the primary sources influence the station. FLEXPART was run for all air samples over a 10 years period and the source regions for low and elevated measured concentrations were compared. There is a strong indication that the sea acts as a source for high concentration at this Arctic measurement site. With an inverse method all samples will be further analysed for all substances in order to estimate to what extent the ocean acts as a source.

Aquatic

modeling

SedFlex of NIVA is model for contaminant distribution in marine and freshwater and linkages for food web accumulation. Initial steps are taken to better integrate the SedFlex food web model and the biogeochemical processes. Future work will be publications on food web accumulation of methyl-mercury in Arctic marine food webs on Svalbard; annual (2007-2008) and seasonal (2007). Integrated model of biogeochemical processes and food web accumulation of organic contaminants and organic contaminants in Svalbard marine food webs 2011.

Modelling workshop, October 5 2011

In addition to flagship participants, two external scientists Gary Stern (Canada), Terry Bidleman (University of Umeå/Canada) participated in the workshop.

Presentations:

- •CoZMoMAN: A dynamic model predicting environmental fate and human food-chain bioaccumulation of organic contaminants (NILU, Breivik)
- •Investigating source regions of POPs with Lagrangian models (NILU, Eckhardt)
- •Modelling contaminant behaviour in aquatic environments and food webs (NIVA, Borgå)
- •Modelling tools for radionuclides at NRPA (Iosjpe and Ytre-Eide)
- •Tidsserier og prognoser for metaller og PAH i humus og grunnvann i Sør-Varanger og indre Finnmark (NGU, Jensen)
- •Modeling of ecosystem-ecotoxicology interactions in Norway's northern sea areas (Akvaplan-niva, Leikvin)

Each presentation was followed by questions and discussions. Last hour of the workshop was used to discuss most important scientific questions of the flagship, such as multistressor effects, climate change effects and that modelling competence from other scientific disciplines (not presented at the workshop) also could be useful for the flagship and provide new knowledge and application areas. Joint project in the coming years and preferentially with a 3 years perspective will be aimed at. Minutes from the meeting have been sent to the Framcentre Ecological Modelling (FEM) group lead by UiT.

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Published Results/Planned Publications

Eckhardt, S., K. Breivik, Y. F. Li, S. Mano, and A. Stohl (2009), Source regions of some persistent organic pollutants measured in the atmosphere at Birkenes, Norway, *Atmospheric Chemistry and Physics*, 9(17), 6597-6610.

Eckhardt, S., K. Breivik, S. Manoe, A. Stohl: Record high peaks in PCB concentrations in the Arctic atmosphere due to long-range transport of biomass burning emissions, *Atmos. Chem. Phys.*, 7, 4527-4536, 2007

Borga K., Saloranta T., Ruus A. (2010) Simulating climate change induced alterations in bioaccumulation of organic contaminants in an Arctic marine food web. *Environ Toxicol Chem.* 29, 1349-1357

Future publications:

Integrated model of biogeochemical processes and food web accumulation of organic contaminants.

Communicated Results

Workshop *October 5 2011*

organized by the flagship and reported to the modeling network FEM at the Fram Centre

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Interdisciplinary Cooperation

Ecology, chemistry, physics

Budget in accordance to results

The funding gave the possibility to initiate modeling of air at Zeppelin station (NILU) and better integrate the SedFlex food web model and the biogeochemical processes (NIVA)

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Could results from the project be subject for any commercial utilization

No

Conclusions

- Better integration between models of various parts of the aquatic system.

- How models can be used to evaluate how climate change affect transport of fate of pollutants
- Future objective: integration or combination of air-water modeling modules for a holistic risk assessment of environmental contaminants