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## ACTIVITIES RELATED TO HIROMB AND LOCAL MODEL DEVELOPMENT IN FINLAND

### Abstract

*Coastal area fine resolution models have been developed to enhance the operational and ecosystem modelling in the Gulf of Finland. A user interface has been developed for both the transport and ecosystem models which both utilise 3D precalculated flow fields. Also a user interface development for the chemical module has been ongoing in the year 2001. A two year project plan indicates the future activities related to the operational Helsinki-Espoo model development. The project includes development of system software, improvement of data communication links and training workshops. A permanent flow measurement device and a new meteorological station, will be established to the Helsinki lighthouse and drift experiments arranged so that model validation can be continued.*

The recent modelling work in SYKE has been focused on the development of coastal area local models. Fine resolution grid models exist for the coastal areas of Helsinki-Espoo, Porvoo, Kotka and Neva Bay. The operational and ecosystem models, both utilise the calculated 3D flows. The operational model is able to predict transport of oil and chemical leakage as well as drifting of any floating objects. The ecosystem model calculates transport of biologically available nutrients, growth of three groups of algae, nitrogen fixation, settling and sedimentation of algal biomass as well as regeneration of nutrients.

A project plan, for the operational model development, has been prepared for the years 2002-2003. The objective is to bring the Helsinki-Espoo local drift model into routine use by the authorities responsible for marine oil spill combating as well as search and rescue operations. In the future the results and experience, gained from the Helsinki-Espoo project, will be utilised to enhance the usage of drift models in different parts of Finland. The Helsinki-Espoo model is usable in the coastal area and in the fragmented archipelago where the HIROMB resolution is not high enough and the local conditions, especially weather, necessitate adaptation of the models and input data. The model system is based on a 3D flow model, which utilises nested calculation grid with variable horizontal resolution. The whole Gulf of Finland is presented in the nested model with resolution of 5000 m. The resolution increases in two steps towards the main model area being 1000 m between Helsinki and Tallinn and 250 m in front of Helsinki and Espoo.

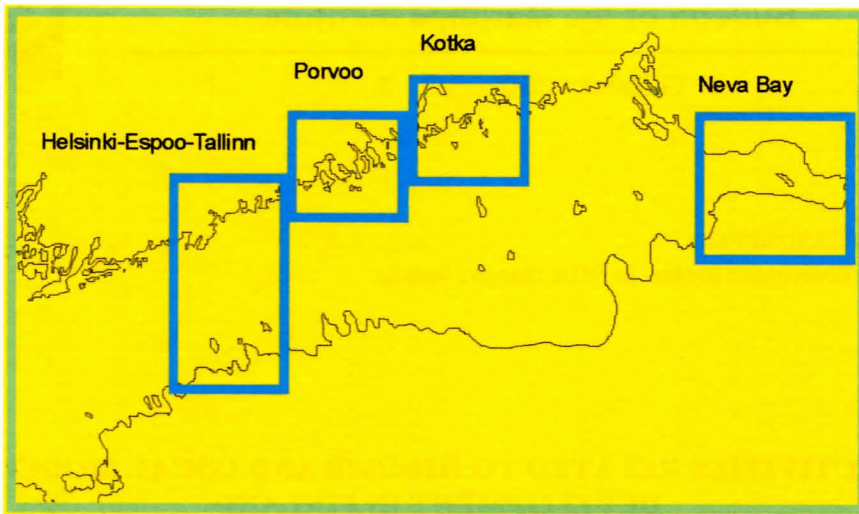


Fig. 1. Local models in the Gulf of Finland

The project includes development of system software for operational needs (e.g. a user interface for the model), improvement of data communication links and training workshops. The dynamics of drift calculations will be increased by implementing the input data delivery. The accuracy and ease of use of drift forecasts will be increased by implementing the data communication links. Local wind forecasts and measurements will be used as inputs and the coupling of local models and HIROMB forecasts will be arranged. A permanent Doppler current meter flow measurement and a full meteorological station, will be established to the Helsinki lighthouse ( $59^{\circ} 56,9'N$ ,  $24^{\circ}55,8'E$ ). The measurements will be started in the year 2002 and near-real-time current data will be delivered for users in 2003. Model validations will be done with measured data and data from drifting experiments.

The Gulf of Finland Coast Guard District is going to carry out about 30 drift experiments per year. The experiments will be arranged at the open sea around the Helsinki lighthouse and the Kalbådagrund lighthouse ( $59^{\circ}59'N$ ,  $25^{\circ}36,1'E$ ). In the beginning, the drifting objects to be used, are a life raft with and without a mooring, a dummy with a life jacket and a life buoy. There is also interest in arranging special experiments to simulate oil drifting. Validation of different available models, including HIROMB, will be carried out. A summary report of the drift calculation results will be made.

The following institutions are participating to the project:

- Finnish Environment Institute
- Finnish Meteorological Institute
- Finnish Institute of Marine Research
- Environmental Impact Assessment Centre of Finland Ltd
- Gulf of Finland Coast Guard District (competent authority in SAR)
- Rescue Departments from Helsinki and Espoo (oil combating in coastal areas)
- Police Departments from Helsinki and Espoo (competent authority in drowning cases)

Model improvement and validation of local fine grid models are task that will be done jointly with Estonian partners. The main partner in Estonia is the Estonian Marine Institute.

The estimated total cost of the 2-year project is 350,000 €. Part of the project financing (140,000 €) has been applied for from the EU-program: Interreg IIIA - Southern Finland

Coastal Zone. The program is a joint programme with Phare CBC Estonia and the partners in the Estonian side are making application for funds from the Phare-Programme.

A user interface for a chemical spill model that calculates the evaporation and dissolution of chemicals lighter or denser than water, has been developed during the year 2001. The programme takes into account different kinds of weathering processes and chemical reactions affecting spillages at sea. The user interface enables the easy use of the model and graphical presentation of changes in mass, area, diameter or concentration of chemical versus time. The chemical spill model can be coupled with a larger modelling system e.g. HIROMB when advection would be included to the process.