

Estimating areas threatened by contamination from leaking chemical warfare agents dumped into the Baltic Sea

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Approximately 60,000 tons of chemical munitions were dumped into the Baltic Sea after World War II (the exact amount is unknown and some sources estimate it as more than 200,000 tons). Dumped munitions still pose a risk of leakage caused by erosion and corrosion, and it is important to know the danger areas. Because of wide dispersion of the dumped munitions, modelling is only one tool that could provide wide image of physical state of the sea at all locations and which could also be used for analysing contamination during a potential leakage. Obviously, it is possible to take samples at each dumpsite, but modelling also allows to develop possible scenarios of leakages under specific physical conditions.

For the purpose of analysis of potential leakage a high-resolution model (HRM) of the contamination will be embedded in the hydrodynamic model (HM) of the Baltic Sea. The HRM will use data from general circulation model results of estimated resolution of nearly 2 km. The Parallel Ocean Program will be implemented as the HM for the whole Baltic Sea. Atmospheric data from regional implementation of the Weather Research and Forecasting System (WRF) have been used as the top boundary conditions of the HM, and sea level data from Gothenburg had been included into model barotropic equation as lateral boundary conditions.

Passive tracer will represent the contamination in the HRM and horizontal resolution of the HRM will be close to 50 meters. Passive tracers will also be implemented in the HM – for comparison of the results. For proper representation of potential leakage of chemical warfare agents the HRM will have included diffusion and advection processes. The results from the HM are going to be interpolated into the HRM domain and then integration will be performed. Based on the implemented simulations, estimated contaminated area and its comparison from the HRM as well as from the HM will be presented.

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