



Modelling of upwelling propagation in Tvärminne Storfjärden, Gulf of Finland.

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This research is focused on modelling the hydrodynamic conditions in Tvärminne Storfjärden with very high spatial resolution using unstructured grid. Tvärminne Storfjärden is located at the entrance to the Gulf of Finland and is linked with the estuary of the river Mustionjoki. This river and its estuary appear under several alternative Finnish, Swedish, and English names including Karjaanjoki, Pojoviken and Pojo Bay. The size of the study area is about 35 by 15 km with a maximum depth of 44 m.

A finite element based three-dimensional baroclinic model TELEMAC-3D was applied to the study area. The TELEMAC modelling suite is developed by the National Laboratory of Hydraulics and Environment (LNHE) of Electricité de France (EDF). The modelling domain was approximated by an unstructured mesh with element size varying from 10 – 50 m along the coast to 200 m offshore. In vertical direction, the sigma-coordinate with 20 layers was used. Open sea boundary conditions were obtained from a large-scale HIROMB-BOOS model provided by COPERNICUS marine environment monitoring service. The model was calibrated using observations obtained by a field campaign in September 2018 and continuous measurements from the Tvärminne Zoological Station MONICOAST coastal observation system.

In September 2018, a strong upwelling event was observed along the north coast of the Gulf of Finland. Such extreme events in the coastal zone may be very important, because while they usually last from a few days to weeks, their effects on coastal environments may possibly last for multiple months or years. Modelling results for this upwelling event are presented. The importance of the correct boundary conditions, resolution of the meteorological data, as well as different parameterisation of bottom stress are also discussed. The study is a part of the ongoing Baltic Bridge collaboration between Tvärminne Zoological Station, Finland and Stockholm University, Sweden.