

## **High-resolution 3D hydrodynamic model for the Finnish Archipelago Sea**

*Elina Miettunen (1), L. Tuomi (2), J. Ropponen (1) & R. Lignell (1)*

*(1) Finnish Environment Institute (SYKE), (2) Finnish Meteorological Institute (FMI)*

Coastal seas are affected by eutrophication, over-fishing, coastal construction and climate change. Monitoring and modelling are needed to get reliable information on the effects of the present and planned actions on the state of coastal waters. Our research area, the Archipelago Sea, is located in the northern part of the semi-enclosed and brackish water Baltic Sea. It has a complex bathymetry with over 40 000 small islands and islets; the average depth is 23 meters but there are some fault lines deeper than 100 meters. It is also very vulnerable area already heavily stressed with eutrophication.

We used 3D hydrodynamic model COHERENS to model the Archipelago Sea with a resolution of 0.25 nmi. Boundary conditions for this high-resolution grid were provided from 2-nmi-resolution Baltic Sea grid. The temperature, water level and currents calculated by the coastal model are used to force the water quality system implemented to the same area. To evaluate the performance of the hydrodynamic model implementation, we compared the simulated temperature and salinity against observations for years 2006-2014.

The coastal hydrodynamic model was able to simulate the surface temperature and salinity fields and their seasonal variation with good accuracy. However, the vertical currents in the steep slopes of the fault lines were too strong, resulting to over-mixing in these areas. Also, the bottom temperatures were too high in sheltered areas in the inner archipelago. Possible reasons for this are that the model bathymetry in those areas was shallow-biased, and that the water exchange between the open sea and coastal areas through narrow channels was not sufficiently well reproduced.