

**FLPP**  
FUNDAMENTAL AND  
APPLIED RESEARCH  
PROJECTS



# Operational modelling of Baltic Sea - port of Liepaja - Liepaja lake system

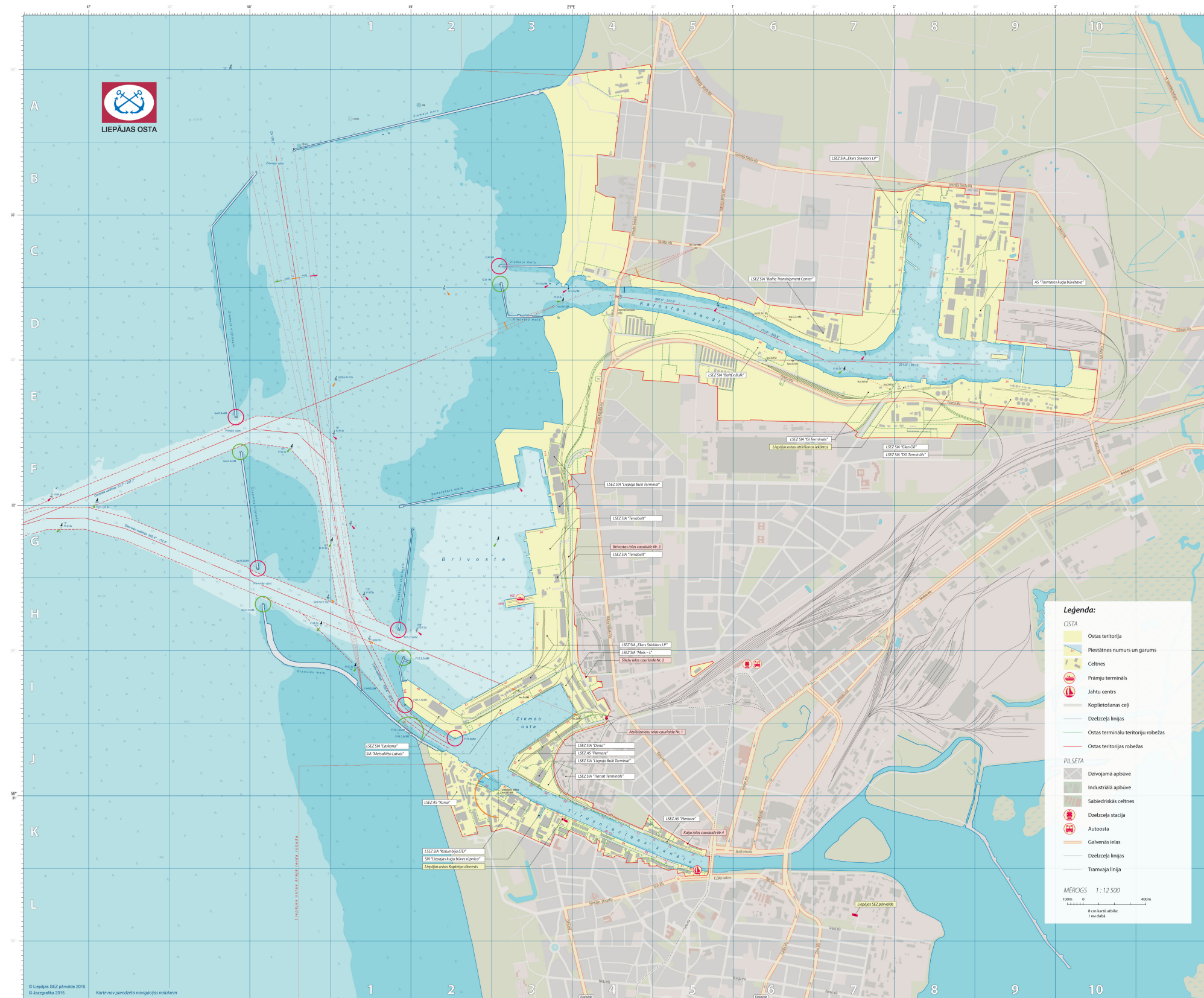
Vilnis Frishfelds, Juris Sennikovs, Uldis Bethers, Andrejs Timuhins  
University of Latvia  
frishfelds@latnet.lv



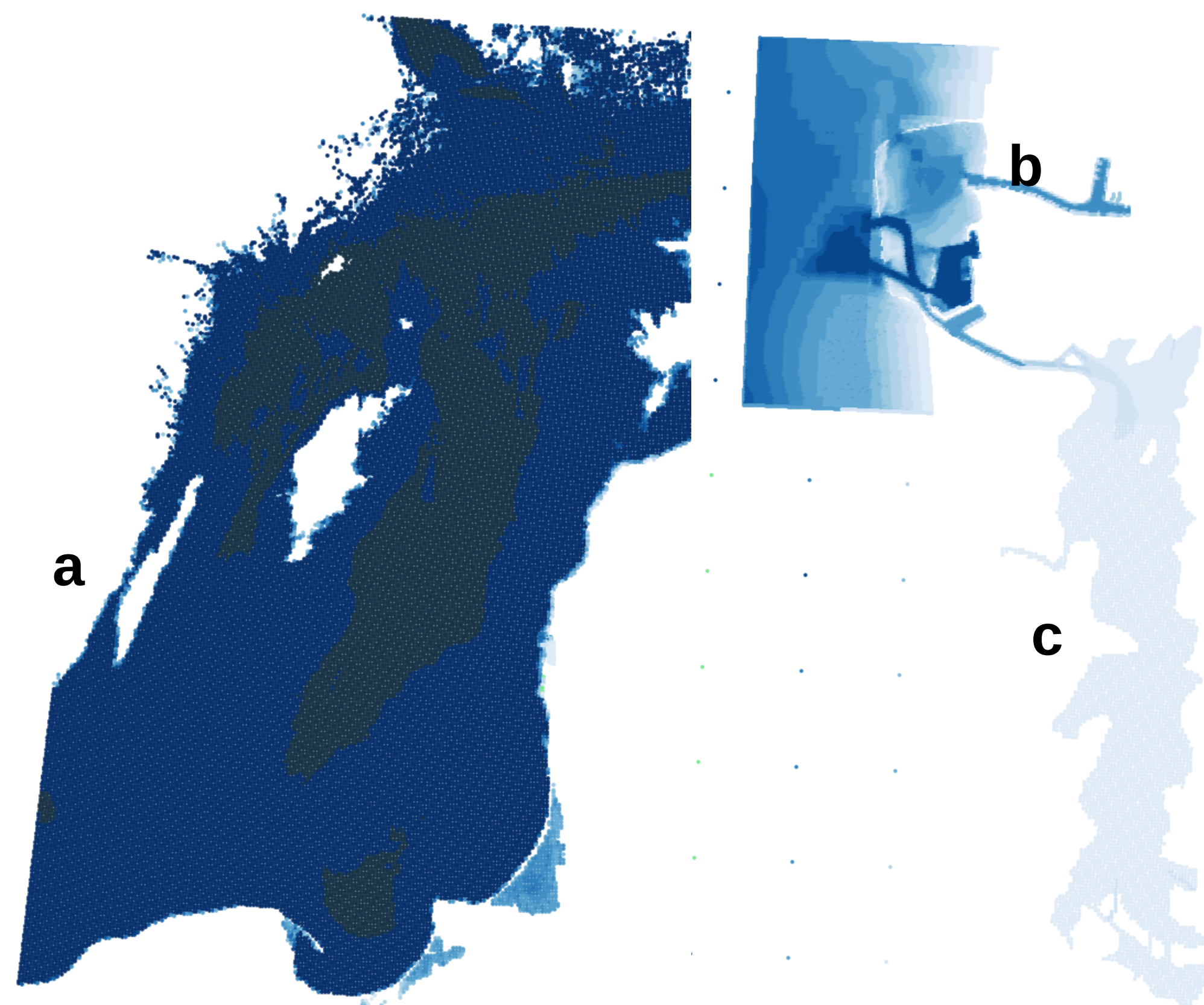
## Coastal area



Port of Liepaja, Lake of Liepaja and Baltic sea



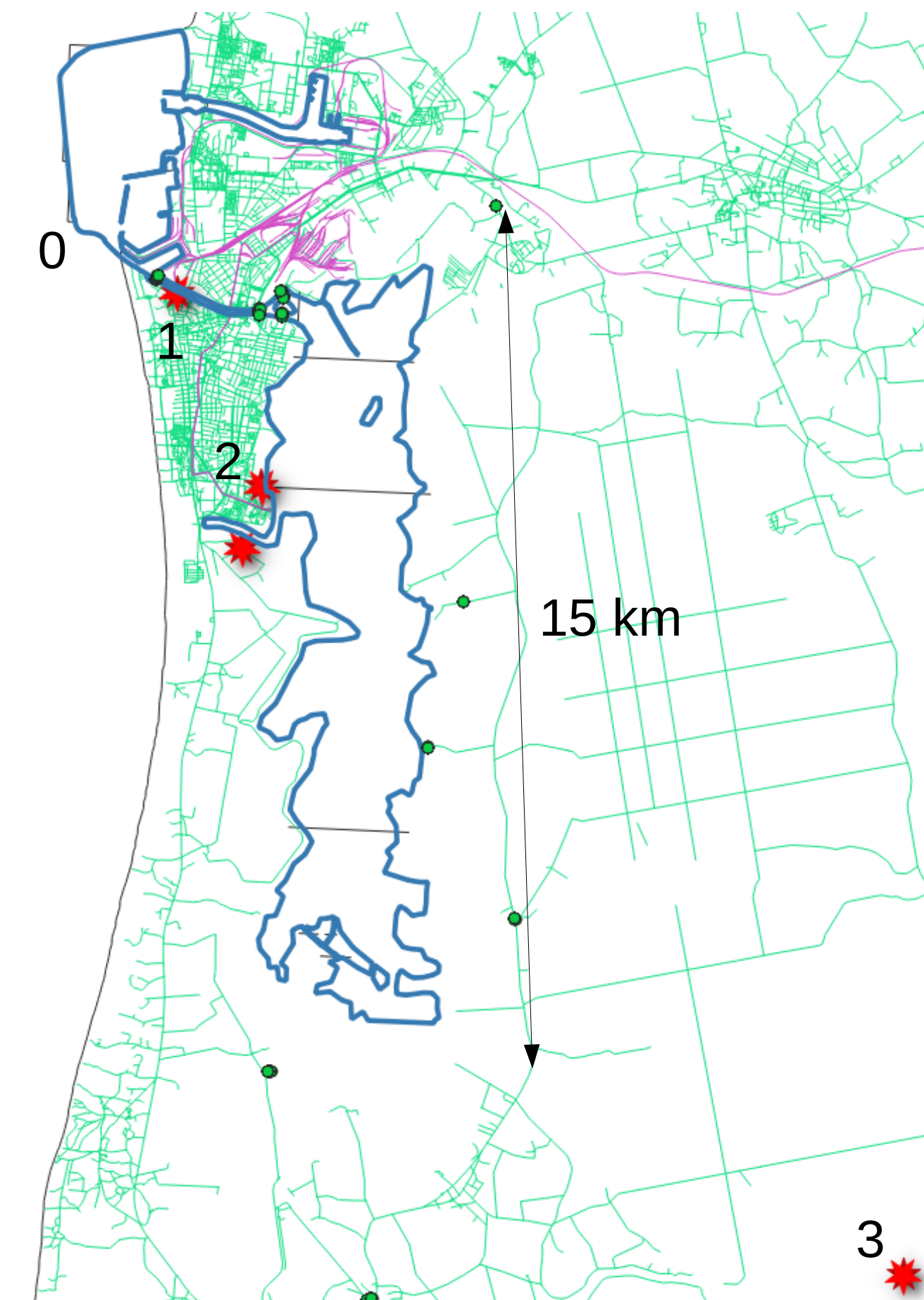
Port of Liepaja



## Setup of coastal model

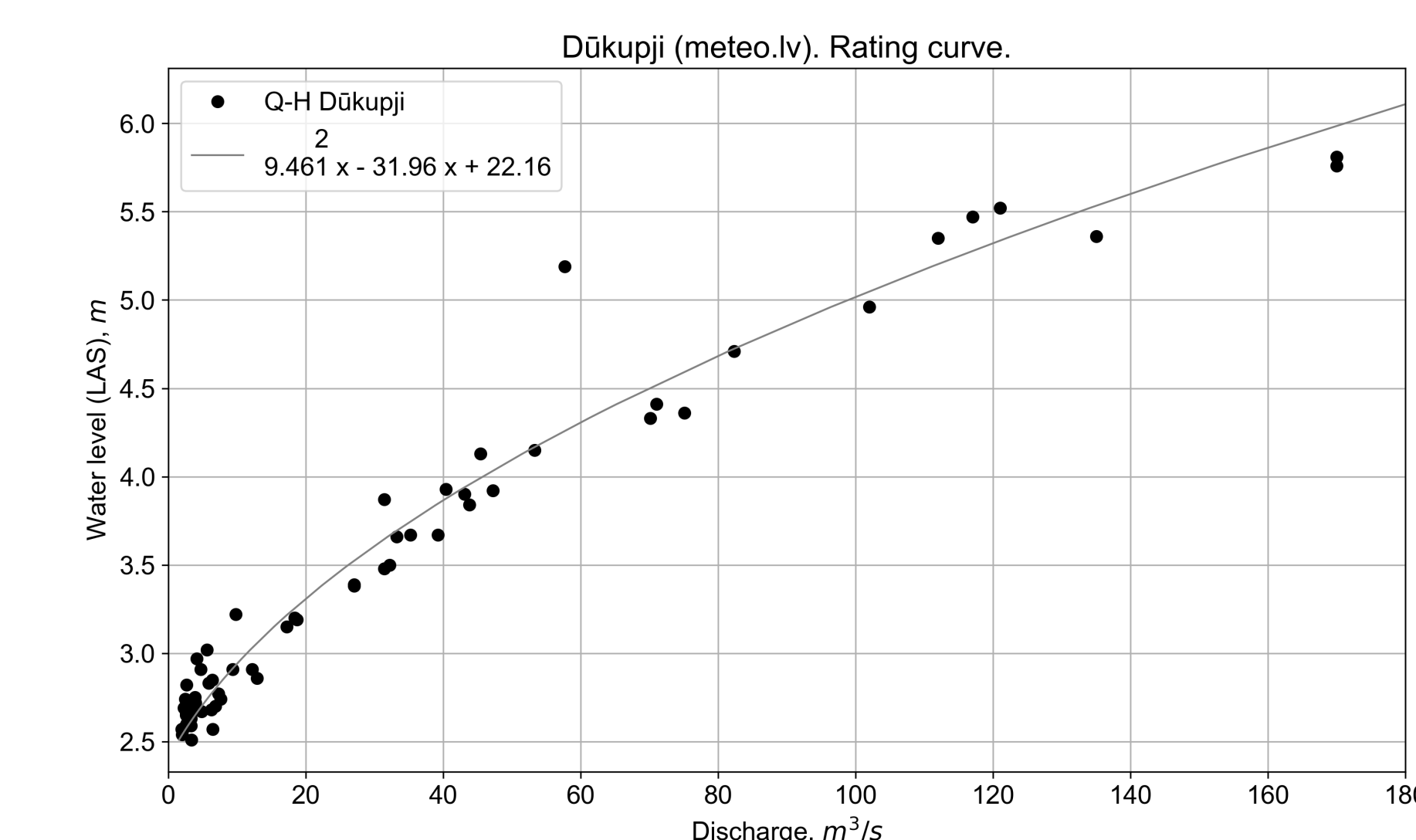
- Multi-scale coastal model with 3D HBM and two-way nesting
- 3 nested areas:
  - a) coarse resolution (1 nm) - Baltic proper,
  - b) fine resolution (30 m) - Liepaja port and entrance to lake,
  - c) average resolution (60 m) - Liepaja lake
- Outer boundary conditions - CMEMS HBM model
- Weather forcing - DMI Harmonie with 2-3 km resolution
- River run-off according to observations

## Observations

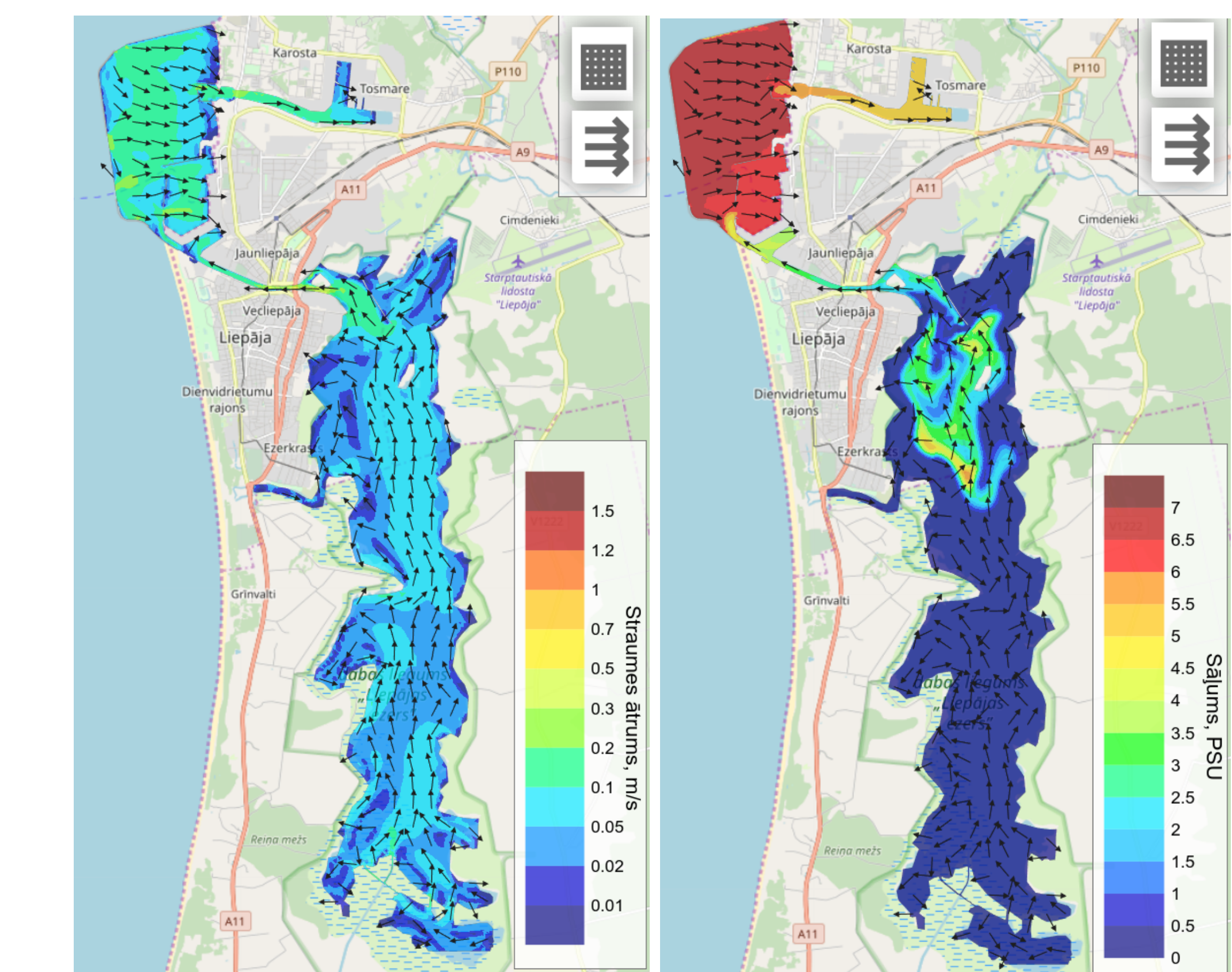
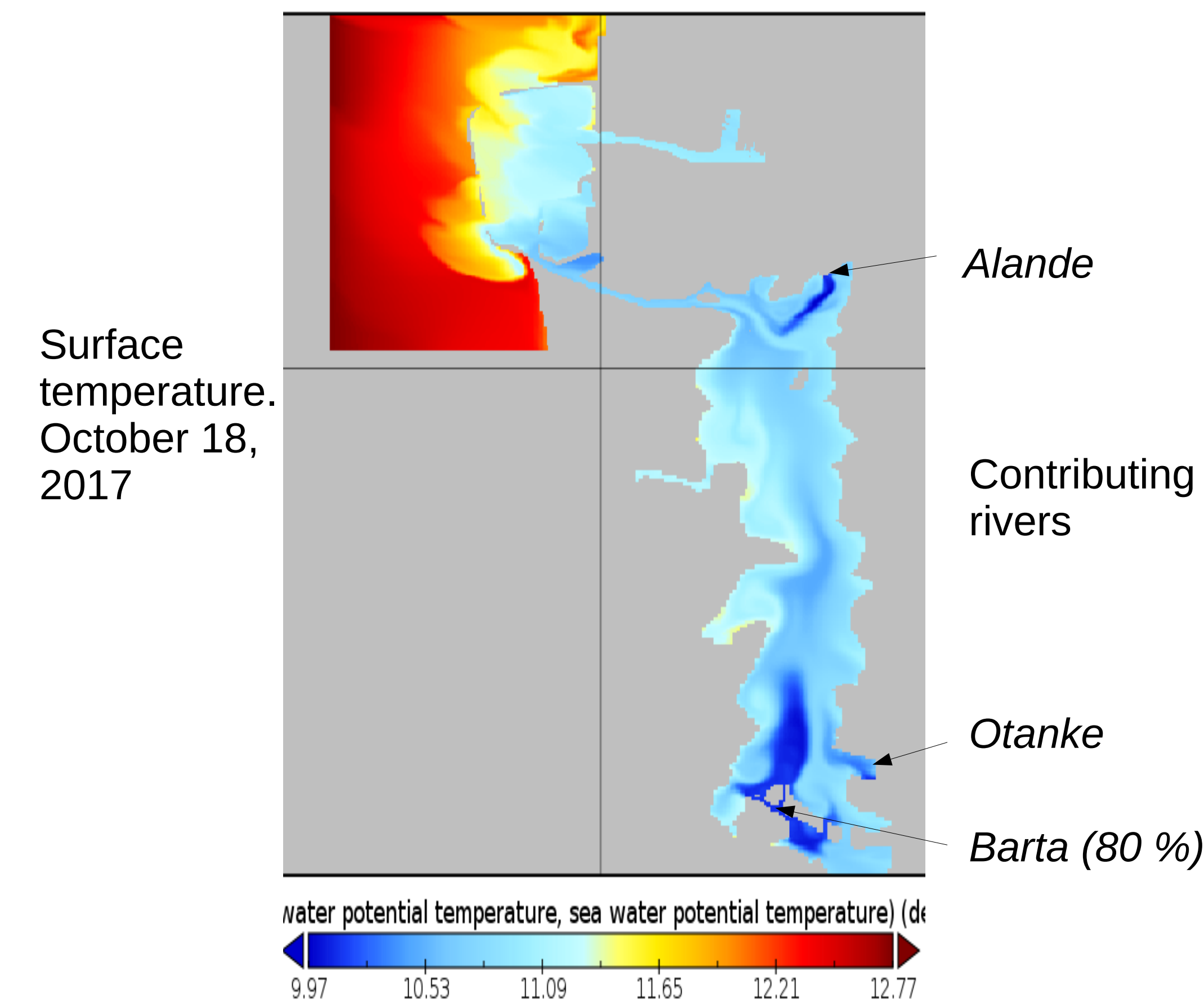


Observation stations numbered (0, 1, 2, 3):

- 0) manual observations – temperature, salinity, waves
- 1) automatic observations – water level, temperature, run-off
- 2) automatic observations – water level, temperature
- 3) automatic observations – water level, temperature



Rating curve of main river Barta contributing to Liepaja lake



Surface currents and salinity in Liepaja port in September 15, 2017 after the storm

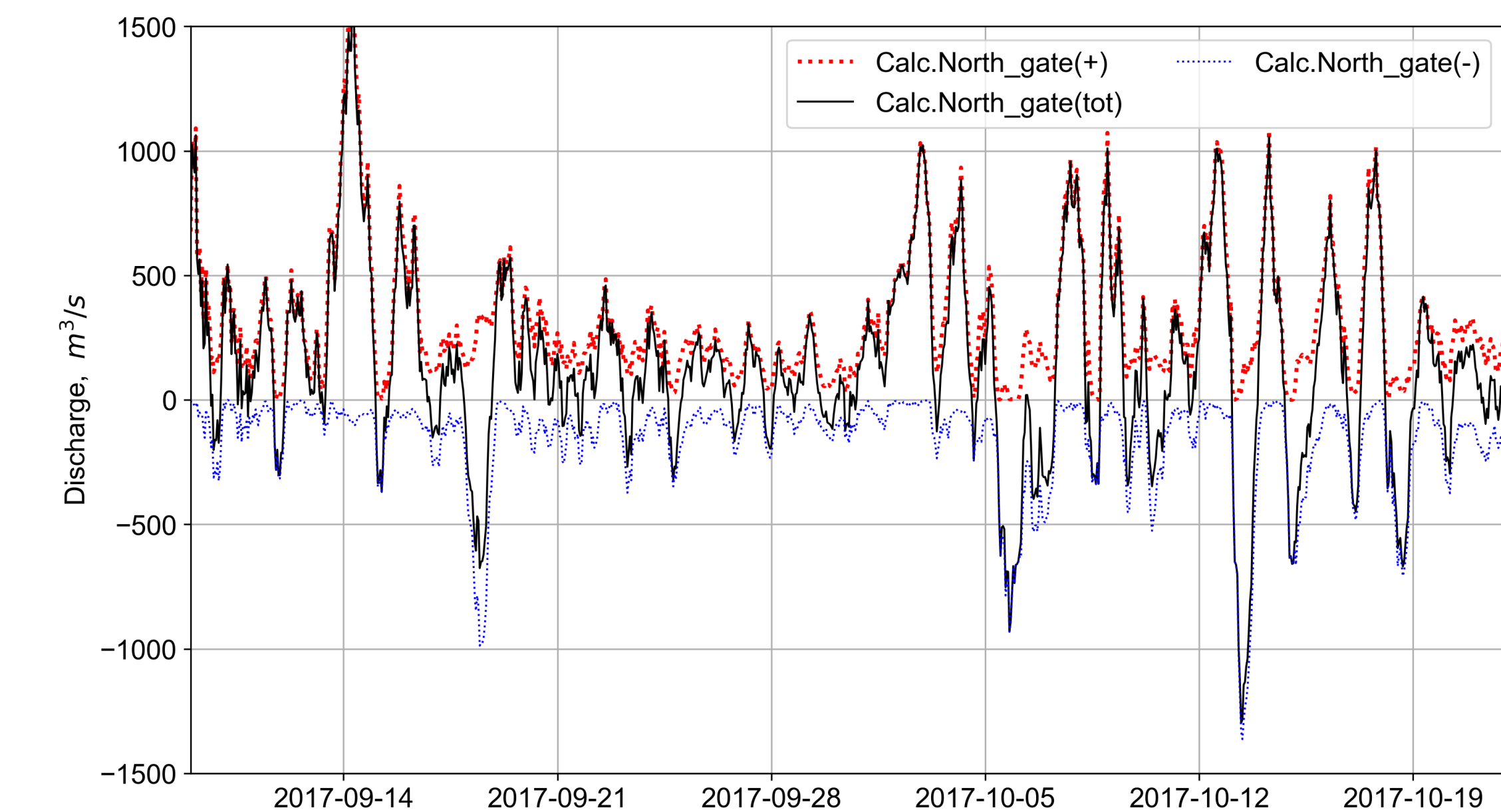
## Advantages of current setup

- Correct currents through the gates of the port
- No need to specify local boundaries
- Multi-layer flows
- Salinity is nice variable to check water exchange
- Interactive web design (see [www.water.lv](http://www.water.lv))

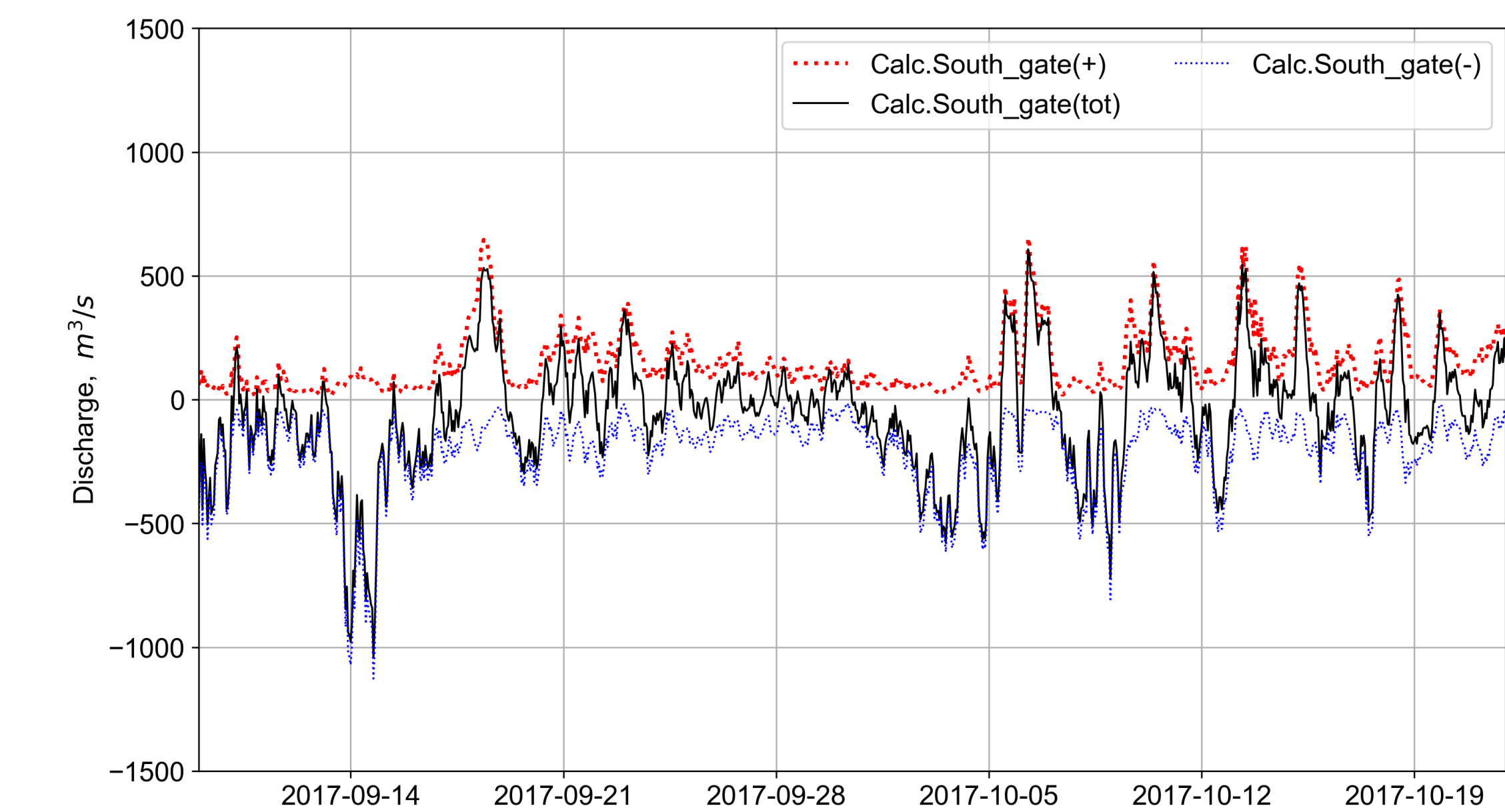
## Disadvantages and things to-do

- Requires more cores to include Baltic proper
- Long-shore currents should be accounted
- Distant location of river station – retardation required
- Should include wetlands in case of flooding

## Two level flows

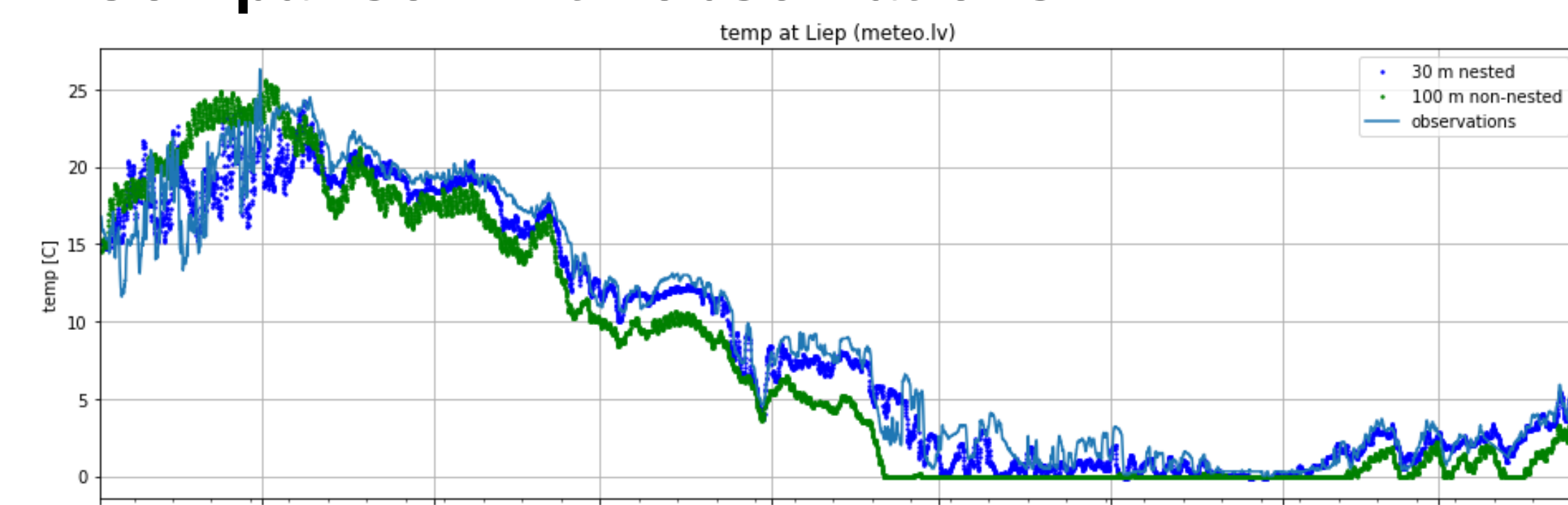


## Run-off through the northern gate



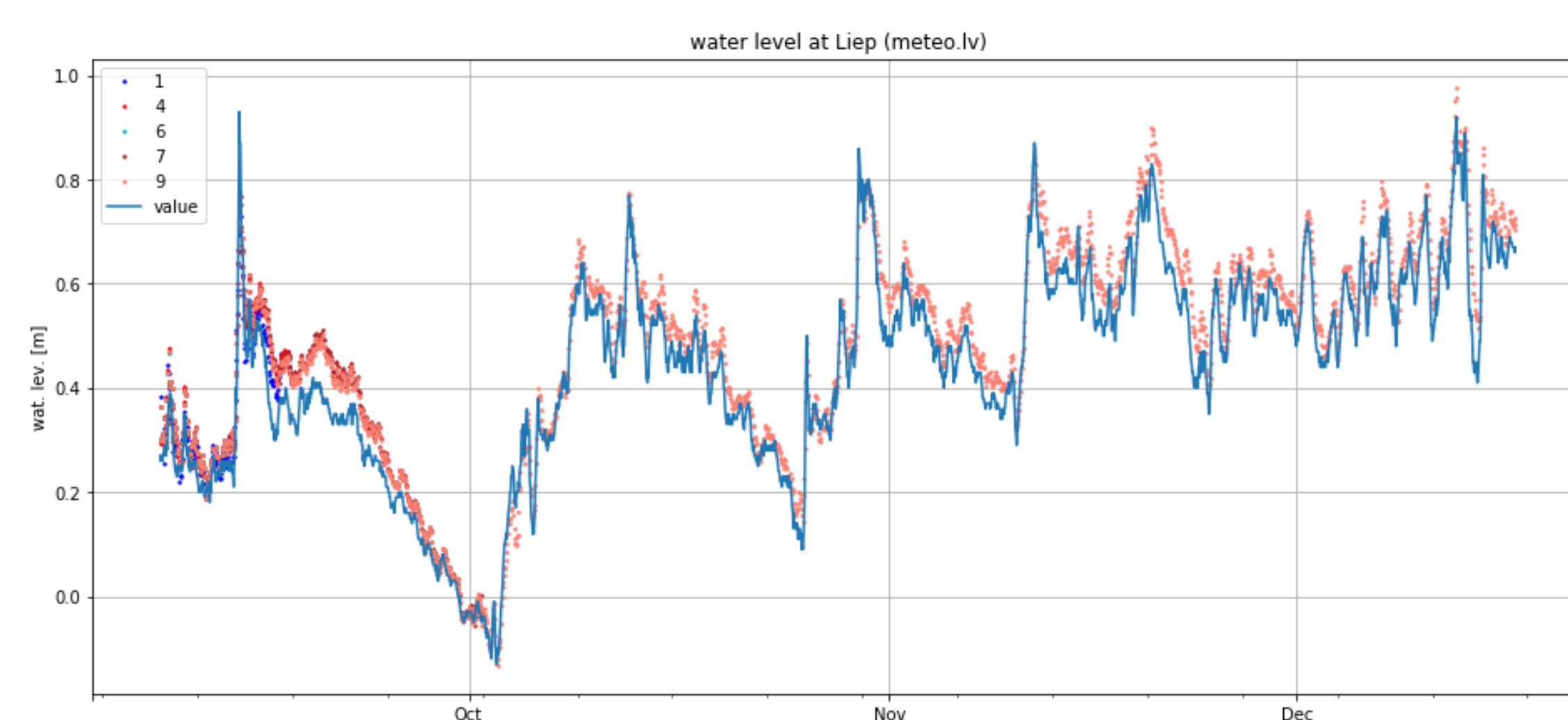
## Run-off through the southern gate

## Comparison with observations



Temperature in the channel connecting Liepaja port and lake.

Green – non-nested model, grey – nested model



Water level in lake of Liepaja with various setups of the model in comparison with observations