

Reanalysis and future climate projections of the physical state of the Gulf of Riga 1993-2100

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Data sets

There are two data sets in the folder: (1) reanalysis (1993-2021) and (2) future projection (2015-2100). Future projection data set is split into 10 files.

The dataset provides gridded monthly mean values of physical parameters in the Gulf of Riga, Baltic Sea. The variables of the dataset of the physical state of the Gulf of Riga are as follows (Long name: *acronym, units*)

- Potential temperature: *thetao, °C*
- Sea water salinity: *s, g/kg*
- Eastward sea water velocity: *ocu, m/s*
- Northward sea water velocity: *ocv, m/s*
- Deviation of sea-level from the mean sea level: *zos, m*
- Sea ice area fraction *siconc, m²/ m²*
- Sea ice thickness: *sithick, m*
- Bathymetry: *bathymetry, m* (included only in reanalysis data set)

The grid size of the dataset is 15 (depth) x 203 (latitude) x 187 (longitude). The horizontal grid spacing is 0.5 nm; the vertical grid has 15 depth layers – 2 m deep surface layer and 4 m step for deeper layers. The time resolution of the dataset is monthly – the monthly mean value is provided in the 1st day of the month in time dimension.

The original climatic calculations are based on the University of Latvia (UL) set-up of the Hiromb-BOOS model routinely implemented for the operational oceanography in the Baltic Sea and the Gulf of Riga in Latvia. Its parametrization is empirically suited for climatological reanalysis in the Gulf of Riga domain. The original output of the model run is hourly data series.

Reanalysis

Time period: 1993-2021 (29 years).

The main characteristics of the input data and approach for the reanalysis run are as follows:

- EMODNET2020 bathymetry.
- Initial conditions – bias corrected Copernicus Marine Service (CMS).
- Atmospheric forcing – ERA5 meteorology with improved cloudiness.
- Boundary conditions from CMS 1993-2018 reanalysis and CMS operational archive (2019-2021) with bias correction for waterlevel in CMS forecast.
- River inflow – 15 main rivers taken into consideration according to E-HYPE hydrological model data. E-HYPE discharge multiplied by 0.75.
- Tides: astronomic calculations.

Future climate projection

Time period: 2015-2100 (86 yrs)

The main characteristics of the input data and approach for the future climate projections run are as follows:

- Emodnet2020 bathymetry.
- Initial conditions – bias corrected Copernicus Marine Service (CMS).
- Boundary conditions from downscaled CMIP6 climate projection model NorESM2-MM_ssp585_r1i1p1f1 (search string – project:'CMIP6', source_id:'NorESM2-MM', experiment_id:'ssp585', variant_label:'r1i1p1f1').
- River inflow – 15 main rivers taken into consideration according to E-HYPE climatological model (SMHI_RCA4_HadGEM2-ES_rcp45). E-HYPE discharge multiplied by 1.093.
- The past period data was used for the downscaling:
 - ERA5 reanalysis data was used for the downscaling of the atmospheric forcing time series of CMIP6 climate projection model,
 - CMS reanalysis model data was used for the downscaling of the sea state time series.
- Downscaled variables: eastward and northward components of the near surface wind, air temperature, air pressure, water temperature, water salinity, sea level.

Acknowledgements

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