



Influence fresh water discharge on internal variability of the Hornsund fjord – modelling study

Jaromir Jakacki (1,2) and Anna Przyborska (2)

(1) Institute of Oceanology PAS, Marine Dynamics Department, Sopot, Poland (jjakacki@iopan.gda.pl), (2) Centre for Polar Studies KNOW (Leading National Research Centre)

Hornsund is small, south-west fjord of the Svalbard archipelago. This fjord is under the influence of two main currents – the coastal Sørkapp Current carrying fresher and colder water masses from the Barents Sea and the West Spitsbergen Current, which is the branch of the Norwegian Atlantic Current and carries warm and salty waters from the North Atlantic. One of the main process that has influence on the local dynamics is naturally discharged water from catchment area. The main sources of the fresh water are: precipitation, snow and rivers, ablation and melted fast ice. The melting process begins every winter and fresh water from catchment area enters into the fjord. Because the fjord is under impact of the main two currents, influence of fresh water together with salt and warmer water from shelf area creates hydrological front. The front is seasonally moving due to seasonal fresh water source variability. Thus, it is possible to select two regimes of the main fjord circulation – winter and summer. The horizontal and vertical structure of the hydrological front is not homogenous; thus it has influence on local dynamics. The fjord is under strong control of tides where amplitude of M2 constituent is bigger than half meter. All of above process create vertical structure of the water column which have influence on internal tidal oscillations that appear as seasonal cycle in the internal tidal variability.

For the purpose of this study a three-dimensional hydrodynamic model has been implemented and validated (Jakacki et al. 2017). The model is based on MIKE by DHI product and covers the Hornsund fjord with the shelf area, which is the fjord foreground. It is sigma a coordinate model (in our case 35 vertical levels) with variable horizontal resolution (mesh grid). The smallest cell has a horizontal dimension less than one hundred meters and the largest cells about 5 km. The model is driven by atmospheric data from European Centre for Medium Weather Forecast (ECMWF).

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