

Modeling of water masses exchange between Brepolen and the main fjord in the Western Svalbard fjord - Hornsund

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Hornsund is the southernmost fjord of the Svalbard archipelago island – Spitsbergen. It is under the influence of two main currents – the coastal Sørkapp Current (SC) carrying fresher and colder water masses from the Barents Sea and the West Spitsbergen Current (WSC), which is the branch of the Norwegian Atlantic Current (NwAC) and carries warm and salty waters from the North Atlantic. The main local forcing, which is tidal motion, brings shelf waters into the central fjord basin and then the transformed masses are carried into the easternmost part of the fjord, Brepolen. For the purpose of studying circulation and water exchange in this area a three-dimensional hydrodynamic model has been implemented and validated. 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. In spite of model limitations, the model reproduces the main circulation and water pathways in the Brepolen area. Seasonal and annual volume, heat and salt exchanges have been also estimated. The influence of freshwater discharge on shelf-fjord exchange will be also analyzed. The model results allow to study full horizontal and vertical fields of physical parameters (temperature, salinity, sea level variations and currents). The model integration covers only years 2005-2010 and the presented results will be based on this simulation.

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