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Circulation, heat exchange and vertical structure of the Hornsund – the Svalbard Archipelago fiord.

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The Hornsund fjord is located in the southwestern part of Spitsbergen– the biggest island of the Svalbard Archipelago. The fjord is influenced by two major currents in this area. The first one is the current carrying the cold and less saline waters around the southern Spitsbergen tip, often called the Sørkapp Current or the South Cape Current. The second is the well-known West Spitsbergen Current (WSC), carrying salty and warm Atlantic Waters through Fram Strait into the Arctic Ocean. From a biological point of view, Hornsund can be treated as a young unstable system or cold system, which suggests that it is under an influence of the South Cape Current. Because of limited measurements in this area, the hydrodynamic model MIKE3D has been implemented for this fjord to diagnose which current has the main influence on Hornsund. The fjord domain was extended into the shelf area. At the lateral boundary of the extended domain, data from the ROMS simulation of the Svalbard area made by the Norwegian Institute of Marine Research (IMR) with resolution of 800 m have been used. Atmospheric data from European Centre for Medium Weather Forecast (ECMWF) were employed as well as from the Global Data Assimilation System (GDAS, 1 and 0.5 degrees) reanalysis that uses metrological data from Polish Polar Station located in Hornsund.
Based on 5 years of simulation (2005-2010) seasonal and annual general circulation in the fjord has been described. Estimation of the heat transport between fjord and ocean, and between fjord and atmosphere will permit to establish the heat budget and help to evaluate the influence of the South Cape Current and WSC on the fjord ecosystem development. An influence of the fresh water fluxes and vertical structure of water masses and their transformations will be also discussed.

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