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Water from land – fresh water outflow from glaciated and non-glaciated catchments into the Hornsund fjord, Svalbard

Adam Nawrot (1,3), Tomasz Wawrzyniak (1,3), Waldemar Walczowski (2,3), Marzena Osuch (1,3)

(1) Institute of Geophysics, Polish Academy of Sciences, Department Polar and Marine Research, Warsaw, Poland (anawrot@igf.edu.pl), (2) Institute of Oceanology, Polish Academy of Sciences, Sopot, Poland, (3) Centre for Polar Studies, Leading National Research Centre (KNOW), Poland

Freshwater processes in South Spitsbergen catchments are facing climate related alterations and issues, such as prolongation of the ablation seasons, water level changes and droughts. Snow accumulation and duration of snow cover in high latitude areas largely determine hydrological and periglacial processes, influencing flora, fauna and their ecology. Hydrological data from this part of the Arctic so far were sparse and major gaps remained in our understanding of freshwater distribution, regime, status and threats.
From 2013 to 2015 as part of multidisciplinary and complex investigations within the framework of “AWAKE2 - Arctic Climate System Study of Ocean, Sea Ice and Glaciers Interactions in Svalbard Area" project, field measurements were conducted around Hornsund, the southernmost fjord of Spitsbergen. This was the first study of the fresh water and snow cover in such scale in this area and included spatial distribution of snow, together with water balance measurements in non-glaciated and glaciated catchments.
During the fieldwork in Hornsund Fjord area, snow thickness and snow density have been measured in 350 and 50 points, respectively. Precipitation was measured in 6 points. Runoff was measured on 7 rivers in different glaciated (Ariedalen, Sofiedalen, Lorchbreen, Bautabreen, Gashamna) and non-glaciated (Fuglebekken, Lisbetdalen) catchments. Meteorological observations were conducted at the Hornsund Polish Polar Station and in the in the surroundings of Hornsund fjord.
The results of this investigation show response of the freshwater hydrological processes to observed seasonal climatic variations in this area. Approximated water balance and known volume of fresh water outflow to the sea are the key components of understanding Arctic fjord ecosystem mechanisms.
This is the first comprehensive investigation of the water balance in this region. Project AWAKE2 is funded by Norway Grants.