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Interannual variations of freshwater in Hornsund

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Hornsund is a fjord situated at the south-west coast of Spitsbergen. The main goal of this study is to calculate and describe the interannual variations of freshwater content in Hornsund. In addition to this, we aim to trace the freshwater sources to the fjord and calculate the fractional contributions from these by using oxygen isotope data. The mixing between these freshwater sources and oceanic waters is described as well as the general summer hydrography of the fjord. Calculation of freshwater content is based on Conductivity-Temperature-Depth data obtained in July of 2001 to 2014. Oxygen isotope data are obtained in Autumn 2013/2014 and Spring 2014. The freshwater in Hornsund is assumed to be provided by either meteoric freshwater sources (glacial melt/precipitation/river-runoff) or the melting of sea ice. Both sources can be produced locally or advected into the fjord. The fraction of the ^{18}O isotope (δ^{18}O) is an effective tracer for freshwater sources in the Arctic due to the progressive depletion of this isotope in water molecules during poleward atmospheric transport (Ostlund and Hut, 1984). Calculation of fractional contribution from the two freshwater sources is done based on a method presented in Ostlund and Hut (1984), where the mass-balance, salinity-balance and δ^{18}O-balance are utilized to calculate the fractions of seawater, meteoric water and sea ice meltwater. Preliminary results show freshwater content varying between 0.211km^3 and 1.068km^3, based on a reference salinity of 34.2. In Autumn 2013, meteoric water was the largest contributor of freshwater to the fjord. However, there was a significant contribution of sea ice meltwater which had a deeper vertical distribution than the meteoric water.

References:
H. G. Ostlund and G. Hut. 1984. Arctic Ocean water mass balance from isotope data. Journal of Geophysical Research: Oceans 89(C4):6373-6381