



Methane in a Swedish sill fjord - Benthic fluxes, inventory and atmospheric emission

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Methane (CH₄) is a potent greenhouse gas, which has the second largest radiative force after carbon dioxide. Oceans, including their coastal areas, contribute to the natural CH₄ budget in the atmosphere, but measurements are still sparse, and no measurements of CH₄ in Swedish fjord systems have been made. For this purpose we measured CH₄ concentrations in the water column as well as benthic CH₄ fluxes by using in-situ chambers on four occasions during 2009. The study area, the By Fjord, is a sill fjord on the Swedish west coast. Benthic flux measurements were done on a depth transect in the fjord and included both sediments with overlying oxic and anoxic water.

The collected data were used to calculate the total fjord integrated net CH₄ release from sediments, the transport through the water column, and finally the exchange between water and atmosphere. Moreover, we used modeling to estimate the total CH₄ emission to the atmosphere from the By Fjord, which could be used as proxy for similar Scandinavian fjord systems. We will furthermore discuss our findings on CH₄ in relation to simultaneous measurements of oxygen, NO₃⁻, Fe, Mn and H₂S, and the extent of CH₄ oxidation in the water column. The presented results are of special importance even on a European scale, as they fill a gap in CH₄ investigations according to a recent review of CH₄ in European coastal waters.