

Distribution and origin of inorganic and organic carbon in the sediments of Kongsfjord (European Arctic)

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Marine and lacustrine sediments constitute a long-term natural carbon sink and thus indirectly condition CO₂ in the atmosphere. Accordingly, quantifying both the burial and provenience of carbon in sediments contribute to a better understanding of carbon cycle. This is especially important in the Arctic, where C burial in sediments is relatively high and expected to change in response to warming.

The aim of this study was to estimate the organic (C_{org}) and, the inorganic (C_{inorg}) carbon distributions in sediments of Kongsfjord (Spitsbergen). In addition, given the different characteristics of autochthonous and allochthonous C pools, we develop a method that allowe tracing the provenience of the C_{inorg} (carbonates). Stratified bottom sediments and particulate matter were collected for total, organic, and inorganic C as well as Ca, Mg and Sr.

The obtained results allowed to determine spatial distribution of C_{org} and C_{inorg} delivered from terrestrial vs marine sources to sediments. The horizontal gradient of C_{org} concentrations was attributed to the high supply of glacial mineral material depleted of organic matter, and to the limited contribution from the biota; with both factors having the largest effect close to the glacier front. Using the dependences of C_{inorg}:C_{org} vs C_{org} and the concentrations of sedimentary Ca, Mg and Sr, we developed a method, that allows quantification of glacial and biogenic carbonates contributions to C_{inorg} pool. Although glaciers are an important source of carbonates in Kongsfjord, our results suggest that glacial material does not spread far from the glacier front, and thus carbonates in the outer part of the fjord are almost exclusively biogenic, while those at central part are a mixture of comparable amounts from the two sources.

Our study demonstrates that sedimentary carbonates are an important component of the carbon cycle in the Kongsfjord and, likely, in other Spitsbergen fjords. After identifying their sources (glacial vs. biogenic), C_{inorg} should be introduced to the local carbon budgets.

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