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Element budgets in an Arctic mesocosm CO2 perturbation study

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Recent studies on the impacts of ocean acidification on pelagic communities demonstrated changes in carbon to nutrient dynamics with related shifts in elemental stoichiometry. In principle mesocosm experiments provide the opportunity of determining the temporal dynamics of all relevant carbon and nutrient pools and performing elemental budgets. In practice, attempts to budget mesocosm enclosures are often hampered by uncertainties in some of the measured pools and fluxes, in particular due to air/sea exchange, particle sinking, and wall growth. In an Arctic mesocosm study on ocean acidification using KOSMOS (Kiel Off-Shore Mesocosm facility for future Ocean Simulation) all relevant element pools and fluxes of carbon, nitrogen and phosphorus were measured, using an improved experimental design intended to narrow down some of those uncertainties. Water column concentrations of particulate and dissolved organic and inorganic constituents were determined daily. New approaches for quantitative estimates of material sinking to the bottom of the msocosms and gas exchange in 48 h temporal resolution, as well as estimates of wall growth were obtained to close the gaps in element budgets. Element pools, fluxes and their stoichiometry at selected days of the experiment will be presented and critically examined with regard to achieving closed budgets.