Role of sea ice biogeochemistry in air-ice-ocean exchange of climatically important gases (CO_2 and DMS) in the Arctic: Preliminary results of coupled sea ice-ocean physical-biogeochemical model simulations

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Traditionally, sea ice was considered to act as a barrier for gas exchange between the atmosphere and the ocean. However, recent field work has indicated that sea ice could play an active role in atmosphere-snow-ice-ocean gas flux. Furthermore, biological processes within sea ice can contribute substantially to the biogeochemical cycling in polar marine environments. To address the role of sea ice biogeochemistry in air-ice-ocean exchange of climatically important gases (carbon dioxide and dimethylsulfide (DMS)) in the Arctic under present and future climates, we have developed a biogeochemical model that simulates the lower-trophic level polar marine ecosystem and associated carbon and sulfur cycles. The model has been tested in 1-D and successfully reproduced the observed variability of chlorophyll *a*, carbon, and dimethylsulfoniopropionate. We are currently implementing the biogeochemical model developed in 1-D to an existing coupled 3-D pan-Arctic sea ice-ocean physical-biogeochemical model. We plan to discuss the preliminary results of model simulations including: simulated CO_2 and DMS fluxes, spatio-temporal variability, model-data comparison, parameter sensitivity analysis, and contribution of sea ice biogeochemistry to these fluxes.