Geophysical Research Abstracts
Vol. 21, EGU2019-10546, 2019
EGU General Assembly 2019

Observation based pan-Arctic dataset of riverine carbon and nutrient fluxes and their impact on Arctic Ocean primary production and acidification

Jens Terhaar (1,2), Ronny Lauerwald (2), Pierre Regnier (2), and Laurent Bopp (3)

(1) Laboratoire des Sciences du Climat et de l'Environnement, LSCE/IPSL, CEA- CNRS-UVSQ, Université Paris-Saclay, 91191 Gif-sur-Yvette, France , (2) Biogeochemistry and Earth System Modelling, Department of Geoscience, Environment and Society, Université Libre de Bruxelles, Belgium , (3) LMD/IPSL, Ecole Normale Supérieure / PSL Research University, CNRS, Ecole Polytechnique, Sorbonne Université, Paris, France

The Arctic Ocean is more than any other ocean influenced by rivers. Although this ocean represents only 1% of the global ocean volume, it receives 11% of the global river runoff and 13-15% of global riverine delivery of dissolved inorganic carbon (DIC). The extent to which riverine delivery of carbon and nutrients enhances primary production and alters ocean acidification on the Arctic shelves is highly uncertain. In this study, we construct for the first time an observation-based, monthly, pan-Arctic riverine forcing data set including DIC, dissolved organic carbon, dissolved inorganic nitrogen, dissolved organic nitrogen, total dissolved phosphorous, and dissolved silica. When using this data set to force a high-resolution ocean biogeochemical model, the total simulated Arctic Ocean primary production agrees within 6% with observations. Riverine nutrients are responsible for ∼25% of the Arctic primary production and locally close to 100%. Being continuously recycled, riverine nutrients are found to contribute up to 10 years to coastal primary production. As a side effect, this riverine driven primary production reduces surface DIC and thereby increases the aragonite saturation state during the summer bloom by up to 40%, a significant attenuation of coastal ocean acidification. The here presented estimates exceed earlier estimates of the influence of riverine carbon and nutrient fluxes on the Arctic Ocean biogeochemistry. This can be explained by two mechanisms: The high simulated recycling rate of riverine nutrients in the Arctic Ocean and the recent upward correction of DON lability (∼75%), which we used in our simulations. These results call for observational analyses of the recycling rate and the lability of riverine nutrients and indicate at the same time that an adequate representation of Arctic riverine delivery of carbon and nutrients is essential when modeling the Arctic Ocean.