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Arctic Ocean shelf biogeochemical cycling under climate change

Richard Bellerby (1,2), Anna Silyakova (3,2), and Dag Slagstad (4)

(1) Norwegian Institute for Water Research, Oceanography and Marine Biogeochemistry, Bergen, Norway (richard.bellerby@niva.no), (2) Uni Research, University of Bergen, Bergen, Norway, (3) Department of Geology, University of Tromsø, Tromsø, Norway, (4) SINTEF, Trondheim, Norway

Changes to Arctic Ocean biogeochemistry will result from a complex array of climate and chemical perturbations over the next decades. Changes to freshwater and nutrient supply through ice melt and continental runoff; warming of the ocean and an increasing ocean acidification through partial equilibrium with a rising anthropogenic CO_2 load will change the nature of Arctic Ocean ecological and biogeochemical coupling. This is no more apparent on the shelf regions where there is strong influence from land sources of freshwater and total alkalinity. This presentation will document our combined approach of studying Arctic biogeochemical change through coupled observational, experimental and modelling campaigns. We have identified large changes in recent anthropogenic carbon transport to the Arctic and have characterised the associated regional and water mass ocean acidification. We have determined, through targeted Arctic pelagic ecosystem perturbations experiments, changes to ecosystem structure, succession and biogeochemical cycling under high CO_2. Observations have been incorporated into regional, coupled physical-ecosystem-carbon biogeochemical models (informed at the boundaries by downscaled global earth system models) to develop scenarios of change in biogeochemical pathways. We have identified large regional variability in ocean acidification that is shown to impact on shelf biogeochemistry, ecosystems and climate feedbacks in the Arctic Ocean.