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BN41A-08: Impacts of CO_2 and Riverine-Induced Anthropogenic Perturbations on the Carbon Cycle of the Coastal Ocean

Thursday, February 15, 2018
09:45 AM - 10:00 AM
Oregon Convention Center - D137-D138

The coastal ocean suffers from the convergence of multiple anthropogenic stressors with the climate change at the forefront. Combined stresses from global warming, ocean acidification, eutrophication and deoxygenation threaten coastal ecosystems and thus their services that humans rely on. To evaluate impacts of these anthropogenic stressors, studies focused on the open ocean have relied on coarse-resolution ocean biogeochemical models. For the coastal ocean though, higher resolution is needed, e.g., to resolve coastal ocean bathymetry and currents. Here we report on our effort to use higher resolution circulation models (nominal ½° to ¼°), coupled to a biogeochemical models and run for centennial simulations to evaluate carbon-cycle perturbations over the global coastal ocean. As a first step, we use ½° NEMO configurations coupled to the ocean biogeochemical model PISCES. Impacts from two anthropogenic perturbations – atmospheric CO_2 and riverine nutrient inputs – are evaluated globally. In contrast to previous studies, our model simulations suggest that the rate of coastal-ocean uptake of anthropogenic carbon per unit surface area is half of that of the open ocean. Coastal-ocean uptake is weakened by a bottleneck in offshore transport, which is inadequate to reduce the mean anthropogenic carbon concentration of coastal waters to the mean level found in the open-ocean mixed layer. In parallel to the perturbation from increasing atmospheric CO2, changes in riverine nutrient inputs enhance primary production thus increasing coastal-ocean uptake of anthropogenic carbon by another 25%. Some coastal regions also exhibit substantial increases in bottom-water deoxygenation and acidification.

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Plain Language Summary

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