



Chemical & Physical Sciences

UNIVERSITY OF TORONTO

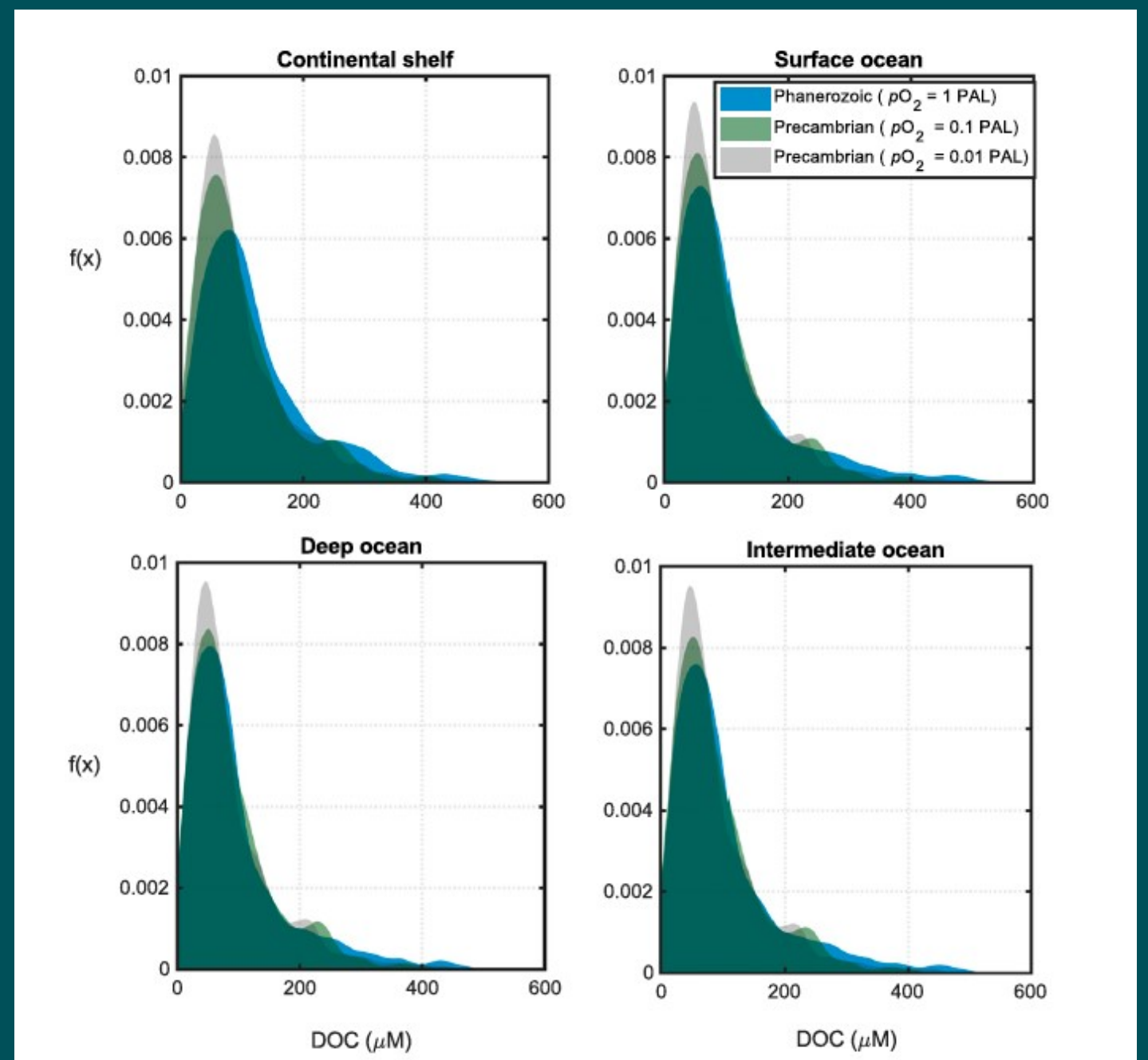
MISSISSAUGA

COLLOQUIUM SEMINAR SERIES

THE EVOLUTION OF THE BIOLOGICAL CARBON PUMP AND DISSOLVED ORGANIC CARBON CONCENTRATIONS



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Distributions of modeled steady-state marine DOC abundance in four major ocean regions for the three idealized Earth system scenarios

Marine dissolved organic carbon (DOC), the largest pool of reduced carbon in the oceans, plays an important role in the global carbon cycle and contributes to the regulation of atmospheric oxygen and carbon dioxide abundances. Despite its importance in global biogeochemical cycles, the long-term history of the marine DOC reservoir is poorly constrained. Nonetheless, significant changes to the size of the oceanic DOC reservoir through Earth's history have been commonly invoked to explain changes to ocean chemistry, carbon cycling, and marine ecology. Here, we present a revised view of the evolution of marine DOC concentrations using a mechanistic carbon cycle model that can reproduce DOC concentrations in both oxic and anoxic modern environments. We use this model to demonstrate that the overall size of the marine DOC reservoir has likely undergone very little variation through Earth's history, despite major changes in the redox state of the ocean-atmosphere system and the nature and efficiency of the biological carbon pump. A relatively static marine DOC reservoir across Earth's history renders it unlikely that major changes in marine DOC concentrations have been responsible for driving massive repartitioning of surface carbon or the large carbon isotope excursions observed in Earth's stratigraphic record and casts doubt on previously hypothesized links between marine DOC levels and the emergence and radiation of early animals.

Colloquium Seminar Series

Wednesday, November 17, 2021

Join us on Zoom at 3:10pm

<https://utoronto.zoom.us/j/84409166490>