



SPRING 2015 SEMINAR SERIES

Annual Ludwick Lecture in honor of Professor Jack C. Ludwick

DEPARTMENT OF OCEAN, EARTH, AND ATMOSPHERIC SCIENCES
3PM – ROOM 200 IN THE OCEANOGRAPHY/PHYSICS BUILDING
THURSDAY APRIL 9th, 2015

“NUTRIENT DEEPENING AND THE ICE-AGE DRAWDOWN OF ATMOSPHERIC CO₂.”

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ABSTRACT

Any combination of chemical, biological and physical factors that leads to a stronger, or more efficient, “biological carbon pump” will lower the concentration of dissolved oxygen in the deep sea. Reconstructing deep-sea oxygen levels in the past, in turn, provides a metric to assess the contribution by the ocean’s biological pump to the ice-age drawdown of atmospheric CO₂. We interpret changes in the preservation of organic compounds in equatorial Pacific sediments to constrain levels of dissolved oxygen during the last ice age. Combined with results from previous work that determined the ice-age concentration of carbonate ion in Pacific deep water, we derive the complete carbonate system chemistry. With reasonable assumptions about the spatial distribution of low-oxygen water during the ice age, we further estimate that the deep ocean held roughly 800 gigatons carbon (GtC) more respiratory CO₂ than today, sufficient to accommodate the 200 GtC lost from the atmosphere and an estimated 600 GtC from the terrestrial biosphere.

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