COLD SURFACE OCEAN VENTILATION AND ITS EFFECT ON ATMOSPHERIC CO_2

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Greater dust and aerosol concentrations in polar ice cores during glacial periods indicate a much windier climate than during interglacials. This implies that there is a much greater gas exchange rate between ocean and atmosphere during ice ages. In the modern northern Atlantic Ocean, solubility pumping of atmospheric CO_2 into newly formed deep water is maintained by northward flow of well-ventilated, warm surface waters, cooling and subsequent sinking. The potential for greater ventilation of this type of cooled surface water to lower atmospheric CO_2 is examined with a two-box model of the surface ocean. This potential is found to depend on whether the modern ocean's cold surface water would be re-equilibrated with atmospheric CO_2 on a time scale comparable to the warm-to-cold water conversion rate. If so, it is conceivable that greater ice-age polar ventilation has produced as much as 70% of the decrease observed in ice cores. There is a good inverse correlation between the concentrations of marine aerosol derived sodium (Na_m) and trapped-air CO_2 found in the Vostok ice core. The relationship is given by

$$PCO_2 = \frac{281.9 \text{ ppm}}{\left(1 + .00409 \, Na_m\right)}$$

where Na_m is in ng g^{-1}. This sort of correlation would be expected if a link between polar surface water ventilation and atmospheric CO_2 concentration exists.

PELAGIC LAMINATED DIATOM OOZE IN THE EASTERN EQUATORIAL PACIFIC: A RECORD OF PEAK NEOGENE PALEOPRODUCTIVITY

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Laminated diatom ooze has been recovered from several geographically widespread sites in the eastern equatorial Pacific during ODP Leg 138 and DSDP Leg 85 drilling. This remarkable sediment records episodes of massive primary production during the Neogene between 15 and 4.4 Ma. Mats of the (up to 4 mm long) diatom *Thalassiothrix longissima* were deposited as successive laminations at unparalleled high deep sea sedimentation rates of over 10cm/1000 years. Laminations were preserved by the physical subjugation of benthos by a diatom meshwork, rather than by low concentrations of dissolved oxygen.

Some of the main intervals of laminated sediment deposition coincide with periods of major change in the Ocean system. The occurrence of these "rare major events" of massive production and flux have major implications for the behavior of the equatorial ocean system and present unique opportunities to 1) quantify fluxes by direct measurement of individual depositional events rather then depending on interpolation from a homogenized (bioturbated) record, and 2) to study sub-Milankovitch band variability which can be related to the time scales of current studies of atmosphere/ocean interaction.