

Oceanography Seminar

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*“Bias in Ordinary Least Squares When the Independent Variable is Uncontrolled:
Chlorophyll a and Photosynthetic Rates at Station ALOHA”*

It is well known that ordinary least squares (OLS) provides a biased estimate of the slope of the functional relationship between an independent variable X and a dependent variable Y if there are errors in X and if X is merely measured but not controlled. The errors in X typically include both measurement errors and natural variability. When Y is a function of more than one independent variable, the effect of the independent variables in addition to X on an OLS treatment of X versus Y is mathematically indistinguishable from the effect of errors in X. To argue that an OLS is unbiased when X is uncontrolled amounts to arguing that all the scatter in the data is due to errors in Y. A more likely scenario is that Y is a function of more than one independent variable, in which case repeated measurements of X will provide no clue as to the magnitude of the natural variability that impacts the OLS. I illustrate this conundrum by considering the relationship between chlorophyll a concentrations and photosynthetic rates at the Hawaii Ocean Time-series Station ALOHA, where variability of the productivity indices almost completely obscures the relationship between chlorophyll a concentrations and photosynthetic rates if the data are analyzed by OLS.

Thursday February 12, 2015 3:00 p.m. MSB 100