

Oceanography Seminar

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“Effects of Sea State and (High) Wind Speed on Air-Sea Gas Exchange of CO₂, DMS, Methanol, and Acetone: Results from the 2013 HiWinGS Project”

A recent field project in the Labrador Sea focused on the relationship between gas transfer and sea state under high wind speed conditions. Eddy covariance fluxes of gases with quite different solubility, CO₂, dimethylsulfide (DMS), methanol, and acetone, were used to assess transfer velocity enhancement due to wave breaking. Normalized transfer coefficients (k_{660}) for CO₂ and DMS exhibit a strong power-law correlation to wind speeds (U) up to 25 m/s. For k_{CO_2} the power-law exponent is surprisingly somewhat less than quadratic ($U^{1.7}$, $r = 0.78$) and for DMS it is still lower ($U^{1.4}$, $r = 0.84$). Peak wave period (T_p) and significant wave height (H_s) were obtained for swell and wind-sea components by direct measurements and model. A ‘breaking Reynold’s number’ (R_b), formulated to account for effects of wind stress and sea state, shows an improved correlation to k_{660} compared to wind speed alone. These results have been incorporated into the COAREG physical gas transfer model.

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