

微気象学的手法を用いた外洋域における海面フラックスの直接測定 Direct measurement of turbulent fluxes at sea-air interface by micrometeorological technique

*近藤 文義¹、小宮 秀治郎²、登尾 浩助³、相木 秀則⁴、轡田 邦夫⁵、植松 光夫⁶、塚本 修⁷

*Fumiyoshi Kondo¹, Shujiro Komiya², Kosuke Noborio³, Hidenori Aiki⁴, Kunio Kutsuwada⁵, Mitsuo Uematsu⁶, Osamu Tsukamoto⁷

1. 海上保安大学校、2. マックス・プランク生物地球化学研究所、3. 明治大学、4. 名古屋大学、5. 東海大学、6. 東京大学、7. 岡山大学

1. Japan Coast Guard Academy, 2. Max Planck Institute for Biogeochemistry, 3. Meiji University, 4. Nagoya University, 5. Tokai University, 6. The University of Tokyo, 7. Okayama University

Accurate parameterizations of sea-air momentum, sensible and latent heats, trace gases (e.g. greenhouse gases including CO₂ and CH₄), and aerosol fluxes are important in sea-air interaction. Coupled ocean-atmosphere global climate models require high accuracy of the net surface heat flux for the prediction of climate change, and process-based understanding of particle formation from bubble bursting to realistically predict the climate effect of marine aerosols. Precise measurements of the CO₂ gas transfer across the air-sea interface provide a better understanding of the global carbon cycle. The eddy covariance technique is the definitive method to directly determine these sea-air fluxes, but it requires measurements of the vertical and downwind components of air velocity, air temperature, humidity, trace gases, and aerosol over a sufficiently long averaging period (> 30 min) and with sufficient frequency response (< 10 Hz). One of the greatest difficulties in measuring sea-air flux by the eddy covariance technique over the open ocean is the apparent wind velocity caused by the wave-induced platform motion. As a result, the uncorrected eddy covariance results are all strongly biased, and especially represent unrealistic momentum fluxes. Improved ship motion correction scheme with Kalman filter results in a significant reduction in both the bias and the scatter of momentum fluxes. Previous studies over the oceans have shown that the eddy covariance CO₂ flux was larger than the bulk CO₂ flux estimated by the mass balance technique. Our results suggest that the density correction due to the air pressure fluctuation, which is assumed to be negligible in the WPL correction, is required to evaluate the accurate eddy covariance CO₂ flux over the ocean.

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