Abstract View

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Variation of Bulk-Derived Surface Flux, Stability, and Roughness Results Due to the Use of Different Transfer Coefficient Schemes

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ABSTRACT

Ten published bulk transfer coefficient schemes are used with more than 2600 sets of shipboard observations made in the North Atlantic at Ocean Station C over a one-year period. Using the same input data, the differences in the various coefficient schemes were found to produce substantial variations in the resulting flux, stability, and roughness determinations. A conservative analysis found that the scheme-to-scheme differences resulted in a typical maximum variation of 45% for an average stress determination of 0.2 N m^{-2}, 70% for an average sensible heat flux determination of ±25 W m^{-2}, 45% for an average latent heat flux determination of ±40 W m^{-2}, 60% for an average Bowen ratio determination of ±0.06, 500% for an average roughness length determination of 3×10^{-4} m, and 700% for an average roughness Reynolds number determination of 6. It is argued that much of the differences in the various coefficient schemes is due to the widespread use of indirect flux measurements, rather than eddy-correlation, and that little is to be gained by using dissipation flux measurements. The ten coefficient schemes are outlined, and the formulas necessary to compute the flux, stability, and roughness parameters using the bulk method are reviewed. The difficulties encountered in past experiments are briefly critiqued, and a novel experimental approach, using eddy-correlation measurements made from a blimp, is presented.