Abstract View

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Evaporation from a Warm, Wavy Surface: A Laboratory Study

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ABSTRACT

The evaporation rates from small wind-waves by forced convection in a range where the spray of water by strong wind action is not important have been studied in the laboratory. The effects of free stream velocity, wave conditions and temperature differences between air and water (either stable or unstable stratified air flow) on evaporation are investigated. For stably stratified air flow, the evaporation rate correlates well with general dynamical parameters but not for unstably stratified flow. The buoyancy flux near the boundary appears to play an important role in moisture transfer at the air-sea interface.

The effect of the buoyancy flux is considered important inside the diffusion sublayer. The thickness of the diffusion sublayer is not only a function of shear velocity and roughness but also a function of buoyancy flux. Based on this, the final form of evaporation rate can be given in a dimensionless form as where A is an empirical constant, Sh the Sherwood number, C_f the drag coefficient, B^+ the buoyancy flux, and Re the Reynolds number. The above equation applies well to both stable and unstable stratified flow and indicates that the buoyancy flux from the boundary strongly affects the evaporation rate.