Abstract View

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Modeling the Interaction between the Atmospheric and Oceanic Boundary Layers, Including a Surface Wave Layer

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ABSTRACT

The interaction between the atmospheric and oceanic boundary layers is simulated by solving a closed system of equations including equations of motion, turbulent kinetic energy (TKE), turbulent exchange coefficient (TEC), expressions for air and sea stratification, and processess of air-sea interaction that account for the wave layer. The wave layer is characterized by discontinuities of velocity,.TKE, and mean wind energy across the interface. The mechanism of energy transferred across the interface is taken into account by the method of bulk aerodynamic parameterization. Influences of wave effects on the vertical structure of air-sea turbulence and dynamics are studied numerically by variations of the surface wave state, and by variations of atmospheric stability.

The results demonstrate that diffusion plays an important part in the TKE budget, at least near the interface, and the wave layer acts as an additional source of TKE for the lower/upper parts of atmosphere/sea. The computational results show that waves influence both atmospheric and marine characteristics. This influence is especially large in the distributions of TKE on both sides of the interface, surface drift current velocity, wind velocity at the 10-m height. drag coefficient, and surface roughness. The results of the model are compared, where possible, with the observational data.