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Parameterization of Turbulent Transport in the Top Meter of the Ocean

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ABSTRACT

A hypothesis of hydrodynamic similarity is proposed in respect to both the atmospheric and oceanic boundary layers just above and below their interface. Both layers are combined through an identical geometric surface roughness h which is composed of the high-frequency components of waves. The logarithmic current profiles, hitherto measured in the upper ocean and wind-wave facilities, can be satisfactorily interpreted with the present purely turbulent transport hypothesis. The roughness Reynolds number hv^*/ν characterizes three surface regimes of the current. The hydrodynamic roughness length and the thermometric and mass transport coefficients are obtained in terms of hv^*/ν. The roughness Reynolds numbers of the oceanic boundary layer are found to be about half those of the atmospheric boundary layer, which implies that the transitions of the oceanic boundary layer to various regimes lag behind those of the atmospheric boundary layer.

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