

# Stability Functions and Their Impacts on the Oceanic Boundary Layer Characteristics

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## Abstract

The Bulk models were used for parameterization of the boundary layer in the weather forecasting models. The accuracy of the bulk models in simulating the ocean boundary layer has been studied by many researchers. Profile of wind in the boundary layer is roughly logarithmic and the stability functions make the wind profile to deviate from the logarithmic profile. The stability functions have lots of effects on the boundary layer characteristics such as monin, obukhov length. Their influences decrease with increasing the wind speed (starting at approximately  $30 \text{ ms}^{-1}$ ). In this paper, ocean boundary layer equations are solved for stable, unstable and neutral state conditions and the results were compared. Diagrams of friction velocity and drag coefficient as the main features of the oceanic boundary layer were plotted. The results showed that the drag coefficient is sensitive to the stability functions when wind speed is less than  $30 \text{ ms}^{-1}$ . Therefore, to achieve the required accuracy in meteorological models, the impact of the stability functions should be considered for calculating the drag coefficient. The friction velocity of the natural and unstable states is almost identical; so we can ignore the effects of stability functions on the friction velocity during unstable condition. Therefore, unstable friction velocity can be approximated by the neutral friction velocity.

Keywords: *Boundary layer, Bulk model, Stability functions, Drag coefficient, Friction velocity.*

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