**Evaluation of MYNN PBL Scheme Closure Constants for LLJ Events in a Stable Boundary Layer**

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As wind power generation gains in prominence as an important energy resource in the US, there is an ever increasing demand for higher accuracy in site-specific wind forecasting. Although the forecast capability of numerical weather prediction (NWP) models has improved significantly over the past decades, there still exists significant issues related to model presentation of the complex dynamics of the boundary layer, which impede the realization of turbine-height wind forecast accuracy lower than 3-4 m/s mean absolute error (MAE). This study is an effort to revisit the basic theory of the MYNN PBL scheme with a focus on its function as posed for the stably stratified environment that supports the onset of a low-level jet (LLJ), a mechanism that can often result in wind ramp events, which are of special concern for the wind power industry.

Specifically studied in this work are the closure constants of the MYNN planetary boundary layer (PBL) scheme. The MYNN scheme calculates values for the turbulence covariance variables, which define turbulence momentum and heat flux as well as turbulent kinetic energy (TKE). The theoretical basis of the MYNN scheme stems from a system of prognostic equations that are based on the Reynolds-averaged Navier Stokes equations with certain approximations as deemed appropriate for the boundary layer. These approximations, which often define a linear dependence of a turbulent covariance variable on gradients of other covariance variables or of variables of the mean flow, are greatly influenced by empirically-derived closure constants. The set values for these constants as currently used in the MYNN scheme were determined primarily using data from cases of a near-neutral environment and on similarity theory, which is applicable primarily for the lowest part of the PBL, the surface layer.

The purpose of the work presented herein is to re-evaluate these closure constants specifically for a stable environment and for cases of sustained turbulence above the surface layer such as those that exhibit a LLJ. The large-eddy simulation (LES) version of the WRF model with spatial resolution of 3-4m is used to simulate turbulence response and effect for such cases. These data provide the means to generate Reynolds-averaged values for the covariance variables and TKE, by which the validity of the dynamic approximations as posed in the MYNN scheme can be reconsidered in context of the SBL and for LLJ cases. In particular, the values of the closure constants are considered and updated values are presented.