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Effects of PBL parameterizations on nocturnal low-level jets reproduced with the WRF model.

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In association with the Plains Elevated Convection at Night (PECAN) field campaign (June-July 2015), the ability of WRF model to accurately reproduce the Great Plains nocturnal low-level jet (NLLJ) was investigated. Our previous work evaluated the effects of numerical grid spacing on the NLLJ. It resulted in the identification of an optimal grid spacing for Great Plains NLLJ studies: 4-kilometer horizontal spacing and 40-meter vertical spacing. The present work focuses on identifying the most appropriate planetary boundary layer (PBL) parameterization scheme for modeling the NLLJ with this grid spacing. Specific attention is paid to understanding why each scheme may or may not appropriately describe the NLLJ. WRF-modeled NLLJs were compared to high-resolution observations collected during the PECAN field campaign and during phase one of the Lower Atmospheric Boundary Layer Experiment (LABLE) at the Southern Great Plains (SGP) Atmospheric Radiation Measurement (ARM) site. Three PBL schemes were evaluated: the Yonsei University (YSU) scheme, the Mellor-Yamada Nakanishi Niino (MYNN) scheme, and the Quasi-Normal Scale Elimination (QNSE) scheme. Preliminary results indicate that the QNSE scheme is best suited for application to the NLLJ. The YSU scheme resolves the jet, but misses some temporal and structural features of it. The MYNN scheme appears to over-mix the layer in which the NLLJ occurs resulting in a weak and diffuse NLLJ.