Sensitivity of Planetary Boundary Physics in a High-Resolution Domain over Complex Terrain

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The Research Applications Laboratory (RAL) and the Atmospheric Chemistry Observations and Modeling (ACOM) Laboratory at the NSF National Center for Atmospheric Research (NCAR) have been funded by the Colorado Department of Public Health and Environment (CDPHE) to conduct a five-year meteorological reanalysis at high-resolution (Dx = 1 km) over Colorado, characterized by complex terrain. This effort supports CDPHE's air quality permit modeling process. For this project, the Meteorological Assimilation Data Ingest System (MADIS) observations are assimilated into the WRF-based Real-time Four-Dimensional Assimilation (RTFDDA). Having an optimal model configuration is crucial in generating an accurate reanalysis. In particular, since for CDPHE's application the transport of pollutants is one of their primary concerns, the planetary boundary layer (PBL) physics in WRF is one of the most important processes to be considered. A series of WRF sensitivity experiments under different atmospheric conditions are conducted to select the best PBL physics for the five-year reanalysis. Surface observations and soundings will be compared with the reanalysis to evaluate the fidelity of the simulations.