
Assessment of observation impact on the low troposphere in the GMAO GEOS system

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Abstract

The planetary boundary layer (PBL) is an important interface between the earth and its atmosphere, core to understanding the flux balances across the earth system components. However, due to various limitations in the existing observations and their usages, no single observing system is able to provide adequate information to characterize the PBL structure, therefore advanced data assimilation systems play a critical role by combining a wide range of observations with model physics in a consistent and coherent manner. The GMAO GEOS hybrid Ensemble-Variational (EnVar) data assimilation system assimilates about 4.5 million observations at each analysis cycle. The purpose of this study is to assess the impacts from various observation types on the low troposphere and constraining the PBL in terms of analysis and short-term and medium-range forecasts. A set of Observing System Experiments (OSE) is performed, where different observation types including microwave and infrared radiances and conventional observations are removed respectively, to evaluate the roles of different observation types. To complement the OSE assessment, Forecast Sensitivity to Observation diagnostics are performed. In this study, the dissipative aspect of the model PBL schemes is also discussed.

Keywords: Observation impact, Planetary Boundary Layer (PBL), Low troposphere, Data assimilation, Forecast Sensitivity to Observation, Dissipative

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