**OBSERVING SYSTEM SIMULATION EXPERIMENTS FOR SPACE-BASED DOPPLER WIND LIDAR OBSERVATIONS**

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Abstract

The three-dimensional global wind field is the most important remaining measurement needed to accurately assess the dynamics of the atmosphere. Wind information in the tropics, high latitudes, and stratosphere, is particularly deficient. Furthermore, only a small fraction of the atmosphere is sampled in terms of wind profiles. This limits our ability to optimally specify initial conditions for numerical weather prediction (NWP) models and our understanding of several key climate change issues.

Because of its extensive wind-measurement heritage (since 1968) and especially the rapid recent technology advances, Doppler lidar has reached a level of maturity required for a space-based mission. The Optical Autocovariance Wind Lidar (OAWL) concept, which funded by NASA, is expected to provide global wind profile observations with high vertical resolution, precision, and accuracy. The OAWL system uses a direct detection optical-autocovariance technique to measure winds from aerosol backscatter and can operate in a continuous two-look configuration. The assimilation of space-based Doppler wind LIght Detection And Ranging (Lidar) from the OAWL concept is being conducted in the Observing System Simulation Experiments (OSSEs) at the Joint Center for Satellite and Data Assimilation (JCSDA).

This paper sets out to assess the expected impact of Doppler wind lidar measurements from OAWL concept in meteorological analyses and forecasts. To this end, the National Centers for Environmental Prediction (NCEP) Global Data Assimilation System [Gridpoint Statistical Interpolation/Global Forecast System (GSI/GFS)] is used, at a resolution of T382-64 layers, as the assimilation system and forecast model in this lidar OSSE study, and a set of one-month assimilation and forecast experiments from July 28 to August 27, 2005 have been set up and executed. The impacts from the OAWL lidar wind are assessed by comparing the forecast results through 168 hours in this period. The Root-Mean Squared Error (RMSE) of wind vector and anomaly correlations (AC) of geopotential height forecasts are investigated carefully against Nature Run. Forecast impact experiments with OAWL Lidar measurements assimilated into the NECP operational model are a clear indication of the value of lidar-measured wind profiles.