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Observing System Simulation Experiment (OSSE) for a future Doppler Wind Lidar satellite in Japan:

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A feasibility study of tropospheric wind measurements by a coherent Doppler lidar aboard a super-low-altitude satellite is being conducted in Japan. We consider a coherent lidar with a laser light source at 2.05 μm whose characteristics correspond to an existing ground-based instrument (power=3.75 W, PRF=30 Hz and pulse width=200 ns). An Observing System Simulation Experiment (OSSE) has been implemented based on the Sensitivity Observing System experiment (SOSE) developed at the Japanese Meteorological-Research-Institute using the Japan Meteorological Agency global Numerical Weather Prediction model. The measurement simulator uses wind, aerosol and cloud 3-d global fields from the OSSE speudo-truth and the aerosol model MASINGAR.

In this presentation, we will first discuss the measurement performances. Considering measurement horizontal resolutions of 100 km along the orbit track, we found that below 3 km, the median horizontal wind error is between 0.8-1 m/s for a vertical resolution of 0.5 km, and that near 50% of the data are valid measurements. Decreasing the vertical resolution to 1 km allows us to maintain similar performances up to $\sim$8 km almost over most latitudes. Above, the performances significantly fall down but a relatively good percentage of valid measurements (20-40%) are still found near the tropics where cirrus clouds frequently occur.
The potential of the instrument to improve weather prediction models will be discussed using the OSSE results obtained for both polar and low inclination orbit satellites. The first results show positive improvements of short-term forecasts (<48 hours), in particular, on the wind speed at 850 hPa and 250 hPa.

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