

Characterization of urban NO₂ transport with WRF-Chem and Differential Optical Absorption Spectroscopy

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Abstract: The temporal and spatial distribution of NO₂ within parts of Kanto region in central Japan were characterized with a Differential Optical Absorption Spectroscopy (DOAS) and a regional air-quality model WRF-Chem initialized by a coherent Doppler lidar. The DOAS system utilizes existing aviation obstruction xenon flashlamps to measure averaged column NO₂ concentration. Simulation of NO₂ emission, transport and dispersion using WRF-Chem reproduced the observations well. Physical initialization of initial and boundary wind conditions was applied using wind velocity data from a high resolution all-fiber coherent Doppler lidar, the initialized simulation case have qualitatively better correspondence to DOAS and ground measurements. The Doppler wind data proves suitable as input in a high-resolution chemical transport model. Moreover, the result reiterates the importance of getting accurate meteorological data in air quality modeling to properly characterize urban pollutants.

Keyword : DOAS, air quality, wind lidar, doppler lidar, WRF-Chem