

Stepwise decrease in atmospheric trace gases near the ground associated with rapid vertical mixing observed by 3-D coherent Doppler lidar and in-situ gas measurements

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Stepwise decreases, which occur over several minutes, in nitrogen oxides (NO_x) and carbon monoxide (CO) concentrations, in which the main source of these gases is supposed to be near the surface, are sometimes observed in Fukuoka, urban site in Japan, during the summer-winter seasons. In the most cases, ozone (O₃) content, which could be higher at higher altitudes, increases. Wind observations by 3-D coherent Doppler lidar suggest there is a thin surface layer (up to ~50-300 m thickness) near the ground before the stepwise change, and then rapid vertical mixing associated with the local meteorological system occurs. The surface thin layer plays a role as a cover of pollutants near the ground, and the vertical mixing within the boundary layer rapidly dilutes/reduces the pollutant contents near the ground.