



Evaluating the influence of COVID-19 pandemic on NO₂ concentration variation in selected regions in China using TROPOMI data, surface measurements and modeling approaches

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During the COVID-19 pandemic outbreak at the beginning of 2020, many Chinese urban agglomerations experienced noticeable air quality improvement. For example, recent analysis of surface measurements suggested that the concentration of NO₂ decreased by on average 30% during the pandemic lockdown period in China in 2020 compared to 2019, although how much of this reduction is due to the pandemic or other factors (such as weather variation) is uncertain. We apply TROPOMI (Tropospheric Ozone Monitoring Instrument) NO₂ Level 2 data (converted to Level 3 data) to analyzing the spatial and temporal evolution of NO₂ in major Chinese city clusters including Jing-Jin-Ji and Yantze River Delta. These observational results are compared with monitoring station data, as well as predicted results from machine learning techniques and a chemical transport model (SILAM), taking meteorological factors into account. We then evaluate the impact of COVID-19 and lockdown measures on the concentration of NO₂ comprehensively. For example, initial results indicate the NO₂ concentration in Shanghai area decreased by about 37% during late January to early March in 2020, comparing the prediction by a machine learning technique (random forest) and the observed surface data, partly due to the pandemic control measures. It is expected the COVID-19 pandemic would be a long-term challenge accompanying the human development. Based on these findings, relevant mechanism of NO₂ pollution and control, affected by the pandemic and periodic lockdown measures in China, will be discussed.