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Detection of the regional concentrations of various trace gases using LP-DOAS at Hefei Xinqiao International Airport

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Abstract: A measurement campaign using long-path differential optical absorption spectroscopy (LP-DOAS) instrument at Hefei Xinqiao International Airport to investigate the regional concentrations of various trace gases in the airport's northern area and the variation characteristics of the gas concentrations during an aircraft's taxiing and take-off phases. The total light path of the LP-DOAS system was about 964 meters and the time resolution of the LP-DOAS instrument was approximately 10 seconds. The measured light path of the LP-DOAS passed through an aircraft taxiway and take-off runway concurrently without affecting aircraft operations. The results of NO₂ and SO₂ pollution peaks were clearly visible, and their timing was well matched to the time the aircraft crossed the light path. While the aircraft take-offs increased the regional average NO₂ concentrations by 10-20 ppbV and flight take-offs increased the regional average SO₂ concentrations during the observation period were better than the Class 1 ambient air quality standards in China. Additionally, we discovered that the NO₂ and SO₂ emissions from the Boeing 737-800 aircraft used in this experiment were positively related to the age of the aircraft.

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