Geophysical Research Abstracts
Vol. 21, EGU2019-11101, 2019
EGU General Assembly 2019

Ground-based and mobile MAX-DOAS measurements of tropospheric HCHO and CHOCHO in the Pearl River Delta region

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Pearl River Delta (PRD) Metropolitan Region including the megacities of Guangzhou, Hong Kong, and Macau is the largest urban area in the world in both size and population of about 60 millions. The industrial cities in the Pearl River Delta have been called the "Factory of the World" with GDP of about 1.5 trillion US dollar in 2017. Environmental problems have drawn a lot of attention due to the rapid industrialization and dense population in the PRD region. Satellite observations show that formaldehyde (HCHO) and glyoxal (CHOCHO) columns in the PRD region are the highest values measured around the world (at the spatial resolution of the satellite instruments). Since the sources and chemistry of volatile organic compounds (VOCs) in this region are still not fully understood, there is a requirement for studying the sources of VOCs and their contributions to atmospheric pollution. Ground-based Multi Axis (MAX-) Differential Optical Absorption Spectroscopy (DOAS) technique is a state of the art remote sensing technique for deriving vertical profiles of trace gases (e.g. NO_2, SO_2, HCHO, CHOCHO) and aerosols with the advantage of automatic measurements. Mobile MAX-DOAS measurements can provide horizontal distributions of these trace gases. We performed mobile MAX-DOAS measurements during the period of 21 Sep. to 6 Oct. 2018 in the PRD region. Meanwhile one ground based MAX-DOAS station has been operated since 21st September. 2018. The vertical and horizontal distributions of NO_2, SO_2, HCHO, and CHOCHO are retrieved from both measurements and compared to TROPOMI satellite observations and MECO(n) model system (COSMO regional model coupled online with the global model ECHAM) simulations in order to understand their sources.