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Long-term observations of tropospheric CHOCHO, HCHO and NO_2 by MAX-DOAS in Beijing and Baoding, China

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Multi Axis Differential Optical Absorption Spectroscopy (MAX-DOAS) observations were performed at Beijing (39.95°N, 116.32°E) and Baoding (39.15°N, 115.73°E), China. Vertical Column Densities of NO_2, HCHO and CHOCHO were retrieved from 1-year simultaneous measurements. The Case-study was conducted to compare different retrieval settings in order to reveal best DOAS fit settings for CHOCHO; furthermore, effect of haze and non-haze days on CHOCHO concentration was examined. We estimated the ratio of CHOCHO to HCHO concentrations (RGF), which has been suggested to be an important tracer indicative of changes in volatile organic compound emissions. We also assess changes in the RGF among seasons and evaluate the reasons for these changes. The diurnal variations in RGF during both seasons were similar to those of CHOCHO. Because both HCHO and CHOCHO are photochemical degradation products of VOCs, the temperature dependence of the trace gases was discussed. To examine the influence of biomass burning on RGF, burning events during the measurement period are identified from the Fire Information for Resource Management Systems (FIRMS) based on MODIS satellite observations. To assess the effect of biogenic emissions on RGF, EVI data from MODIS were used. Nitrogen oxides and VOCs play important role in the formation of ozone by complex photochemical reactions. Understanding the photochemical regime at regional scales is a vital for endorsing guidelines to alleviate tropospheric O_3 level. The HCHO/NO_2 ratio is used as a proxy to investigate the photochemical O_3 production. The results show that the O_3 is mainly VOCs limited during winter, while it is mainly mixed VOC-NOX limited in summer. These results indicate that reduction in VOCs would result in reduction of O_3 pollution in Beijing and Baoding area.