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Observations of atmospheric pollutants vertical distribution in Shanghai during summer using MAX-DOAS and Lidar measurements

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Ground based Multi-axis differential optical absorption spectroscopy (MAX-DOAS) measurements have been performed during Shanghai (N30.8, E121.5) campaign, China, in May 2016. In this study, vertical profiles of aerosol extinction coefficient, NO_2 and HCHO concentration were retrieved using Heidelberg Profile algorithm. The O_3 profiles were detected by Lidar. For the aerosol profiles result, we found the a priori profile play an important role in the retrieval. The aerosol profile was improved when a Gaussian priori was used in the retrieval. And it show a good correlation with the profile measured by the Mie-Scattering Polarization Lidar. There is also a good correlation between retrieved NO_2 VCDs and OMI data. In addition, the ozone vertical profiles changed obviously and have different characteristic during the campaign. And the ozone new production not only occurred near surface ground but also at the higher altitude (about 1.3km). In order to determine the production of ozone, the horizontal and vertical wind field, PBL (plant boundary layer) were analyzed. We found that the high ozone concentration at ground and 1.3 km is not dominant by the horizontal and vertical transport of ozone itself. Compared to the retrieved NO_2 and HCHO profiles, a similar trend between O_3 and HCHO was observed. As a consequence, a meaningful conclusion can be reached. The PO_3 (the production of ozone) in the near surface ground and high altitude is a VOC-limited condition.