Geophysical Research Abstracts
Vol. 21, EGU2019-15987, 2019
EGU General Assembly 2019

Mobile observations in North China Plain during MOABAI campaign

Ioana Elisabeta Popovici (1,2), Philippe Goloub (1), Luc Blarel (1), Xiangao Xia (3), Zhaoze Deng (3), Hongbin Chen (3), Yitian Hao (3), Nan Yin (3), Disong Fu (3), Christine Deroo (1), Augustin Mortier (4), Fabrice Ducos (1), Benjamin Torres (1), Oleg Dubovik (1), and Stéphane Victori (2)

(1) Univ. Lille, CNRS, UMR8518 – LOA – Laboratoire d'Optique Atmosphérique, 59000 Lille, France (ioanaelisabeta.popovici.etu@univ-lille.fr), (2) R&D Department, CIMEL Electronique, 75011 Paris, France, (3) CAS, LAGEO, Institute of Atmospheric Physics, Beijing, China, (4) Division for Climate Modelling and Air Pollution, Norwegian Meteorological Institute, 0313 Oslo, Norway

MOABAI campaign (Mobile Observations of Atmosphere By vehicle-borne Aerosol measurement Instruments) has been carried out during 5-23 May 2017 in North China Plain, one of the most populated and polluted regions of China, where long-standing heavy aerosol pollution episodes frequently occur. The campaign was purposed to elucidate and quantify the 4-D distribution of aerosols in a polluted region where few aerosol measurements are available, in order to get a comprehensive characterization of aerosol properties and their vertical distribution in variable atmospheric situations and capture signatures of regional transport of aerosols. The measurements were performed using a state-of-the-art instrumented van, including both remote sensing and in situ instrumentation. A CIMEL micropulse lidar and PLASMA mobile sun photometer, performing measurements during motion, were transported and integrated on site in the existing van already equipped with in situ instruments. The in situ instruments consisted of a nephelometer, an aethalometer, a Grimm Sky-OPC and trace gas analyzers for NO_2, SO_2 and O_3. Ten days of mobile measurements have been recorded, six days in Beijing on the 4th, 5th and 6th ring-roads by daytime and nighttime and 4 days outside of Beijing, reaching Baoding, Tianjin and Tangshan. Four types of atmospheric situations were observed: two days of pollution and "background" (moderate pollution) situation in Beijing with a contribution of dust transported from Gobi desert (9 and 11 May), three heavy pollution days, when the air flow moved from south of China (18, 19 and 21 May), one day with moderate pollution (15 May) and one "clean" day, marked by lower aerosol loading (13 May), but with a contribution of long-range transported aerosols in altitude. In the case of pollution days, the PBL extended up to 1 - 1.5 km altitude and marked by high AOD at 440 nm (0.8 - 1.8), highest values being recorded when the air masses were moving from South direction, and Angstrom Exponent (AE) values typical for fine mode particles predominance (1.2 – 1.6). For the "background" and "clean" situations, a contribution of both fine and coarse mode aerosols was evidenced, indicated by lower AE and by transported aerosol layers above 2 km. Three mobile observations were carried out outside Beijing: Beijing – Baoding - Tianjin (16 May), Tianjin - Tangshan (17 May) and Tangshan - Beijing (18 May). The AOD at 440 nm was in the range of 0.2 - 0.7, 0.3 - 0.79 and 0.43 - 1.35 for transects on 16, 17 and 18 May, respectively. The values of AE were in the range of 0.38 - 1.5, 1.02 - 1.9 and 1.22 - 1.74 for 16, 17 and 18 May, respectively. The lidar profiles showed higher particle concentrations when reaching polluted regions of Baoding, Tianjin, Binhai New Area and Tangshan and transport of desert dust from Inner Mongolia at about 2-3 km altitude. Mapping of AOD, Angstrom Exponent and retrieved vertical profiles of aerosol extinction coefficients and column-integrated volume size distribution have been achieved. Results from some case studies in Beijing and along Tianjin coast will be presented.