

1.065 An Ozone Event During a High Pressure Episode in the North China Plain: Transport and Photochemistry.

Early Career Scientist

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Abstract:

The Air Chemistry Research in Asia (ARIAs) field campaign flew 11 research flights collecting meteorological, trace gas, and aerosol measurements in Spring 2016 in the North China Plain (NCP). In May, the beginning of the ozone (O_3) season, the NCP experienced numerous violations of World Health Organization (WHO) air quality standards to protect human health. We present a case study of an O_3 event during a persistent and anomalous high-pressure episode on May 17 to May 21, 2016. The National Oceanic and Atmospheric Administration's (NOAA) Hybrid Single Particle Lagrangian Integrated Trajectory Model (HYSPLIT) forward trajectories show large recirculation during this period bringing pollutants from the Korean Peninsula to China. The anticyclonic circulation with weak winds at the surface, combined with the position of the Taihang Mountains, inhibited pollutant dispersion and allowed for development of a multi-day O_3 event. An observation-constrained box model simulation study using the called Framework for 0-Dimensional Atmospheric Modeling (F0AM) was used to study O_3 photochemical processes along the flight track and ground site in Xingtai. Preliminary results suggest O_3 production tends to be more VOC-sensitive in the morning with lower O_3 production compared to the afternoon rates (up to 20 ppb/hr). VOC OH reactivity will be used to quantify the potential of a VOC molecule to produce O_3 . Identification of reactive VOCs concerning O_3 formation has significant policy implications; isoprene was relatively unimportant while CO played a major role in HO_2 formation. O_3 during this anomalous high-pressure event was relatively constant and just as high as during other synoptic conditions. Additionally, 3 examples of transport from China to South Korea were identified. These events brought cleaner air into China where it was dispersed and diluted before continuing to the east. These transport events showcase O_3 exceedances in the NCP can occur with and without strong transport.