Geophysical Research Abstracts
Vol. 18, EGU2016-4353-3, 2016
EGU General Assembly 2016

Foreign versus Domestic Contributions to China's Ozone Air Pollution

Ruijing Ni (1), Jintai Lin (1), Weili Lin (2), and Yingying Yan (1)

(1) Department of Atmospheric and Oceanic Sciences, Peking University, Beijing, China, (2) Key Laboratory for Atmospheric Chemistry, Chinese Academy of Meteorological Sciences, Beijing, China

Ozone is a critical air pollutant because it damages human health and vegetation. Previous studies for the United States and Europe have shown large influences of foreign emissions on domestic ozone levels, whereas the relative contributions of foreign versus domestic emissions are much less clear for China' ozone pollution. Here, we use the global chemical transport model (GEOS-Chem) simulations to quantify the contributions of ozone transport from regions with large anthropogenic emissions to China. Our results indicate considerable influences of foreign anthropogenic pollution on China's ozone air quality. Of all ozone over China produced by global anthropogenic emissions, foreign anthropogenic emissions contribute 40% near the surface, and the foreign contribution increases with altitude and reaches up to 70% in the upper troposphere. The contributions by North America and Europe reach maximum levels in spring, in which season Chinese influence on the western United States also peaks. The springtime maxima are associated with strong westerly winds and frequent cyclonic activities favorable to the long-range transport. European anthropogenic pollution enhanced surface ozone concentrations by 1∼4 ppbv over Western and Northern China in spring and winter. Despite much longer transport distance, the contribution from North America is distinctly greater than that from Europe due to the nearly tripled VOC emissions. Ozone contributed by Foreign Asian countries peaks in summer and autumn, widely dispersed to the upper troposphere over Southern China with strong upwelling. Therefore, although China produces large amounts of ozone precursor emissions, its domestic ozone pollution is still contributed significantly by foreign anthropogenic emissions. Our study is relevant to Chinese ozone pollution control and global collaboration.