

Impact of Intercontinental Transport of North American Ozone on Tropospheric Ozone over East Asia

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Ozone is an important trace gas in the troposphere as a major pollutant and greenhouse gas. In this study, we analyzed results from a global 3-dimensional chemical transport, GEOS-Chem, which simulates ozone concentrations from different regions, tracks their transport to each of the regions and thus provides a valuable dataset to study contributions of long-range transport of ozone from different regions to East Asia. With a particular focus on the influence of North American ozone, we compared the simulations with ozonesonde measurements at two sites in USA and found the model can best capture the ozone's interannual variations in the middle and upper troposphere in the region. We also used air parcel trajectory analysis and found that North American ozone can reach the western East Asia within 4-6 days. In the middle and upper troposphere, North American ozone can influence East Asia most significantly in spring and fall. In the lower troposphere, North American ozone's influence is the largest in winter. In fall, the fractional contribution of North American ozone appears to be the largest in the lower troposphere over Europe, while in the upper troposphere it can affect most regions of Eurasia, especially above 30°N. Ozone generated from North America's boundary layer is mainly transported to the west coast of Europe with so-called warm conveyor belts associated with extratropical cyclones, and along with the westerlies to the entire northern hemisphere. It is transported to the lower troposphere with the downdraft in Europe and East Asia. The underlying mechanisms for the seasonal variation on NA ozone influences will be discussed.