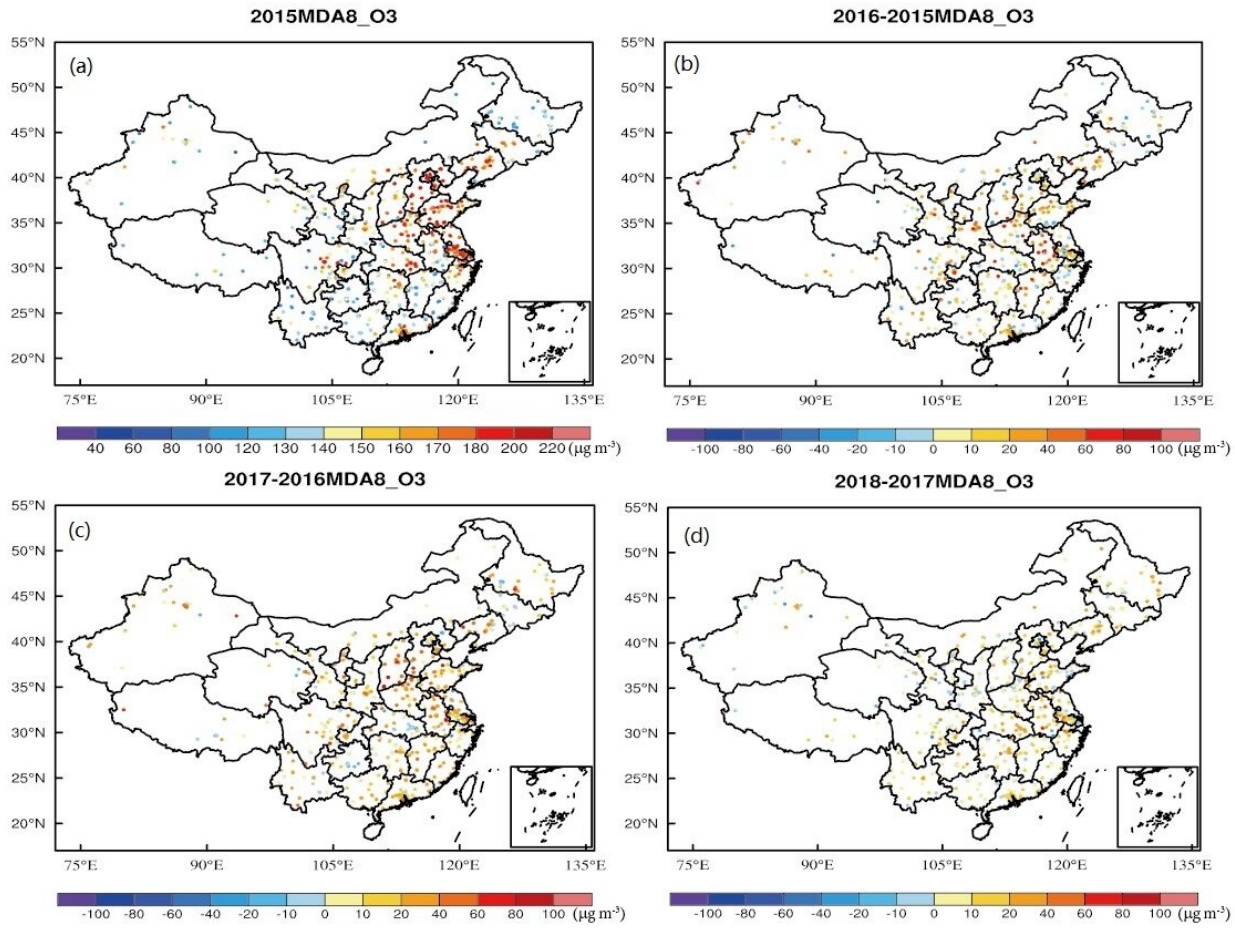
Scientists call for long-term research on ozone source apportionment

June 12 2020



The 90th percentile of annual MDA8_O3 in (a) 2015 and the difference values during (b) 2015–16, (c) 2016–17, and (d) 2017–18 at the network of 1484 sites operated by the China Ministry of Ecology and Environment. Credit: Chinese Academy of Sciences

Tropospheric ozone is produced via the photochemical reaction of volatile organic compounds, carbon monoxide, and nitrogen oxides in the presence of sunlight. Over the past 20 years, serious ozone pollution has been found in the most highly populated and industrialized city clusters in China, such as the Beijing-Tianjin-Hebei, Yangtze River Delta, Pearl River Delta, and Sichuan Basin regions.

To control ozone pollution is a great challenge because of the diverse range of precursors and the nonlinear relationship between ozone concentrations and these precursors. Accurately determining the main sources of ozone is therefore the key to the formulation of a reasonable and efficient ozone control strategy.

A recent article published in *Atmospheric and Oceanic Science Letters* by the research team of Prof. Zhang Meigen, from the State Key Laboratory of Atmospheric Boundary Layer Physics and Atmospheric Chemistry, Institute of Atmospheric Physics, Chinese Academy of Sciences, summarizes the approaches and main conclusions of studies on the sources of ozone and its precursors for both regional and sectoral sources in China, including back-trajectory analyses and ozone source apportionment based on the observation-based method (OBM) and emissions-based method (EBM).

"The OBM avoids the uncertainties of the emission inventories required in the EBM. However, in practical applications, results based on the OBM are limited to a fixed time and fixed site, without the regional results obtained, due to the high requirements for the accuracy and representativeness of the observational data," explains Professor Zhang.

The results of ozone source apportionment over China suggest that, in addition to contributions from local and surrounding areas, super-regional (outside the simulated area) transport also makes a significant contribution to the high concentrations of ozone in China, indicating the

importance of strengthening regional defense and control measures. Mobile and industrial sources are the major sources of surface ozone, and this is where future control actions should be focused.

"Existing ozone sensitivity analysis and source apportionment are mostly limited to a single ozone pollution episode or one particular month, with few long-term studies," says Professor Zhang. "In the future, more long-term research should be carried out to provide references for the development of emission reduction strategies to achieve long-term ozone attainment in China."

More information: Hailing Liu et al, A review of surface ozone source apportionment in China, *Atmospheric and Oceanic Science Letters* (2020). DOI: 10.1080/16742834.2020.1768025

Provided by Chinese Academy of Sciences