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China's international trade and air pollution: 2000 – 2009

Ruijing Ni (1), Jintai Lin (1), Da Pan (2), Jingxu Wang (1), Yingying Yan (1), and Qiang Zhang (3)

(1) Department of Atmospheric and Oceanic Sciences, Peking University, Beijing, China, (2) Department of Civil and Environmental Engineering, Princeton University, Princeton, The United States, (3) Ministry of Education Key Laboratory for Earth System Modeling, Center for Earth System Science, Tsinghua University, Beijing, China

As the world's top trading country, China is now the most polluted country. However, a large portion of pollution produced in China is associated with its production of goods for foreign consumption via international trade. Along with China's rapid economic growth in recent years, its economic-trade structure and volume has been changing all the time, resulting in large changes in total emissions and the shares of trade-related emissions. Here, we assess the influence of China's changing total and export-related emissions between 2000 and 2009 on its atmospheric pollution loadings and transport, by exploiting simulations of a global chemical transport model GEOS-Chem. We find that both air pollution related to Chinese exports (PRE) which including nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), black carbon (BC), and primary organic aerosol (POA), and its share in total Chinese pollution have experienced continuous rapid growth until 2007, exposing more and more people to severely polluted air. After 2007, PRE decreases due to strengthened emission controls accompanied by declined exports as a result of the global financial crisis. Although production for exports contribute less than 35% SO_2 over China in any year, the increasing trend of trade-related SO_2 contributes 51% of integral trend. The changing PRE of China also affects its downwind regions such as the western United States. The contribution of export-related Chinese pollution to surface sulfate concentrations over the western United States has increased from 3% in 2000 to 12% in 2007. Overall, we find that the interannual variation of trade and associated production is a critical factor driving the trend of pollution over China and its downwind regions.