

Differentiating local and regional sources of Chinese urban air pollution based on the effect of the Spring Festival

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The emission of pollutants is extremely reduced during the annual Chinese Spring Festival (SF) in Shenzhen, China. During the SF, traffic flow drops by ~50% and the industrial plants are almost entirely shut down in Shenzhen. To characterize the variation in ambient air pollutants due to the “Spring Festival effect”, various gaseous and particulate pollutants were measured in real time in urban Shenzhen over three consecutive winters (2014–2016). The results indicate that the concentrations of NO_x , volatile organic compounds (VOCs), black carbon (BC), primary organic aerosols, chloride, and nitrate in submicron aerosols decrease by 50–80% during SF periods relative to non-Spring Festival periods, regardless of meteorological conditions. This decrease suggests that these pollutants are mostly emitted or secondarily formed from urban local emissions. The concentration variation in species mostly from regional or natural sources, however, is found to be much less, such as for bulk fine particulate matter (PM2.5). More detailed analysis of the Spring Festival effect reveals an urgent need to reduce emissions of SO_2 and VOCs on a regional scale rather than on an urban scale to reduce urban PM2.5 in Shenzhen, which can also be useful as a reference for other megacities in China.