

4.209 Recent changes and influences of the springtime circulations on the atmospheric chemistry in the lower free troposphere of coastal East Asia.

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Abstract:

The biomass burning emissions from the Southeast Asia as well as the Asian continental outflow are believed to remarkably influence the regional air quality and atmospheric chemistry over the western North Pacific. In this study, we report the measurement results at the Lulin Atmospheric Background Station (LABS, 23.47°N, 120.87°E, 2862 m a.m.s.l.) as a regional representative site for the baseline atmospheric compositions in the East Asia. Since the establishment of the LABS in April 2006, the seasonal maximum of most air pollutants observed in March-April was most likely caused by the long-range transport of biomass burning emissions from the northern Indochina peninsula, which was mainly driven by the westerly winds (group WWZ) in the lower free troposphere. However, the springtime air masses arriving at the LABS became much more contributed to the Asian continental outflow originated from the coastal China area (group C) since 2015. Based on the cluster analysis of four-day backward trajectories, the percentage of the group C increased from about 6% to 48%. By contrast, the WWZ groups decreased from about 51% to 14%. As a result, the mean O₃/CO ratio in March and April increased for approximately 37% from 0.21±0.08 ppb ppb⁻¹ during 2007-2011 to 0.29±0.10 ppb ppb⁻¹ during 2015 to 2017, implying a signature of aged urban pollution. The seasonal variation of CO and O₃ remained similar to the previous pattern with a maximum and a minimum in spring and summer, respectively.