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Long-term Trend of Ozone over Taiwan

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An analysis of air quality monitoring data in Taiwan from 1993 to 2003 shows a long-term decreasing trend of the days of poor air quality (PSI>100). In addition, while most of the pollutant concentrations (such as CO, NO_x, SO_2, and PM_{10}) were decreasing, surface ozone showed an opposite trend. This contributed to a shift of dominant pollutant from PM_{10} to ozone since 1997. Based on chemical mass balance concept, we decompose the factors contributing to the ozone trend into transport, emission, and photochemical factors, then each factor is analyzed statistically with meteorological and air pollutant observations. The annual average ozone level shows a positive correlation with the wind speed over northern and southern Taiwan, but a negative correlation over central Taiwan. Mixing layer height is positively correlated with ozone concentration, but negatively correlated with other pollutant. These indicate that transport or dilution by mixing works differently at different regions of Taiwan and for different chemical species. We further analyze the characteristic times of different processes in order to determine the cause of the ozone increasing trend. Our preliminary conclusion is that the increase of ozone in Taiwan is most likely a result of the decrease of the titration process due to reduced NO emission. Also, long-range transport as well as near-range upstream transport are both of significant importance.

Keywords: ozone trends; chemical mass balance; characteristic time; Taiwan.