Chemical species characteristics and air pollution sources tracing by Cd isotopic composition of aerosol particles in a megacity, Southwest of China

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Air pollution is becoming increasingly serious along with social and economic development, southwest China. In this study, in order to effectively improve the atmospheric conditions of Chengdu, a megacity located in the western Sichuan basin, combined with meteorological conditions, the temporal-spatial distribution of PM mass concentration, the characteristics and secondary conversion of PM bearing heavy metals and water-soluble ions at different pollution levels during haze periods were studied. The results showed that at different pollution levels, heavy metals were more likely to be enriched in fine particles and may be used as a tracer of primary pollution sources. Sulfate and nitrate were produced to a large extent through secondary conversion, and the contribution of mobile sources to the formation of haze in this studied area was significantly increased. The ions in PM were mainly secondary inorganic aerosol (SIA) (SO_4^{2-}, NO_3^-, NH_4^+ in $PM_{2.5}$ accounted for 43.02%, 24.23%, 23.50% respectively; SO_4^{2-}, NO_3^-, NH_4^+ in PM_{10} accounted for 34.56%, 27.43%, 19.18% respectively), while NOR and SOR increased with the increase of pollution levels. NO_3^-/SO_4^{2-} also increased with increasing pollution levels ($PM_{2.5}$ increased from 0.52 to 0.95; PM_{10} increased from 0.57 to 1.20). Meanwhile, Cl^- and K^+, as combustion sources, had a greater contribution to $PM_{2.5}$. SIA had significant contributions to the PM at different pollution levels, and more attention should be paid to control the air pollution effectively. Furthermore, air pollution sources were identified by using Cd isotopic tracing method for the first time in this study. The results showed that the dominating sources of PM in urban air were gasoline exhaust, road dust and fly ash from coal combustion.