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Stable Carbon Isotopic Composition of Diacids, Oxoacids, α-Dicarbonyls and Fatty Acids in $PM_{2.5}$ at Tianjin, North China: Implications for origins and secondary formation pathways

PEISEN LI, CHANDRA MOULI PAVULURI, ZHICHAO DONG, ZHANJIE XU, PINGQING FU AND CONGQIANG LIU

Institute of Surface-Earth System Science, School of Earth System Science, Tianjin University

Presenting Author: Lipeisen227@tju.edu.cn

Organic aerosols (OA), a complex of hundreds of organic compounds, that represent 20~80% of fine particles ($PM_{2.5}$) mass in the atmosphere, have serious impacts on the Earth's climate system, visibility and human health. They can also play an important role in atmospheric chemistry. However, their origins, secondary formation and photochemical transformation as well as seasonality are not fully understood yet. Stable carbon isotopic composition ($\delta^{13}C$) of specific organic compounds is very useful for investigating the origins and photochemical processing (aging) of OA in the atmosphere and to assess the contribution of effective mixing processes of the compounds during the long-range transport. High aerosol loadings and poor visibility are common in North China Plain (NCP) and often suffers from haze episodes. Tianjin is a typical metropolis in NCP and receives the pollutants derived from Siberia, Mongolia and parts of northern China. To better understand the application of $\delta^{13}C$ of diacids and related compounds as a proxy in identifying origins and aging of OA, we studied $PM_{2.5}$ samples collected at an urban and a suburban (background) sites in Tianjin over a one-year period from July 2018 to June 2019 for bulk components, organic molecular distributions and $\delta^{13}C$ of diacids, oxoacids, α-dicarbonyls and fatty acids. Here, based on the $\delta^{13}C$ of diacids and related compounds and their seasonal variations over Tianjin together with backward air mass trajectories, we discuss the origins, aging and seasonality of OA in North China.