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Modeling the formation of secondary organic aerosol during 2014 over China using NAQPMS

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The Nested Air Quality Prediction Modeling System (NAQPMS) with the updated Volatility Basis Set (VBS) approach instead of the two-product approach was used to investigate the formation of secondary organic aerosol (SOA) over China in 2014. This model considers the multi-generation oxidation process of volatile organic compounds (VOCs) and intermediate VOC (IVOCs), and the chemical aging of semi-volatile primary organic aerosol (POA).

The model capability of reproducing the spatial and temporal distribution of fine particulate matter was confirmed by the comparison with the observation. Overall, the SOA accounted for approximately 60% of total organic aerosol in winter, 50-60% in spring and autumn, and in summer even more than 70% due to the strong photochemical reaction. In winter, more than 60% of the predicted SOA was contributed by the oxidation of IVOCs in central and eastern China. The SOA production from IVOCs is dominant compared to the production from traditional VOCs and the IVOCs oxidation mechanism is expected to improve the SOA model performance in China. However, the emission sources and reactions rates of IVOCs still remained large uncertainties and are needed for further identification and quantification.