

## 4.241 Sources of carbonyls and their contributions to photochemical O<sub>3</sub> formation in the Pearl River Delta.

Early Career Scientist

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Abstract:

Formaldehyde (HCHO) and acetaldehyde (CH<sub>3</sub>CHO), key components of airborne carbonyl compounds, play important roles in atmospheric photochemistry and air quality because of their abundance and photochemical reactivity. Sources of HCHO and CH<sub>3</sub>CHO in the Pearl River Delta were investigated by using the positive matrix factorization (PMF) and a photochemical box model with master chemical mechanism (PBM-MCM) based on the data collected at a rural (TMS) and urban site (TW) in Hong Kong, and an urban site (GPEMC) in Guangzhou. In Hong Kong, the PMF and PBM-MCM results showed that in-situ formation and vehicular emissions were the major contributors to both HCHO and CH<sub>3</sub>CHO at the urban site, while the in-situ formation and the transport of photochemically formed HCHO and CH<sub>3</sub>CHO were the most important source of HCHO and CH<sub>3</sub>CHO at TMS, followed by vehicular emissions, biogenic emissions, biomass burning and solvent usage. On the other hand, secondary formation contributed the most significant fraction to ambient HCHO in Guangzhou urban environment, followed by vehicular exhaust (31%) and solvent usage (16%). For the secondary formation, in-situ formation of HCHO and the transport of photochemically formed HCHO contributed  $45 \pm 4\%$  and  $8 \pm 3\%$  to the observed HCHO, respectively. Among all the precursors, trans-2-Butene had the largest contribution to secondary HCHO formation, followed by *i*-butene, *cis*-2-butene, propene, isoprene and *m,p*-xylene. Furthermore, the sensitivity analysis from the PBM-MCM model suggested that secondary HCHO and HCHO emitted from vehicular emissions contributed comparably to ground-based measured O<sub>3</sub> and HO<sub>x</sub> radical in the urban environment of Guangzhou.