Evaluation of local ozone production through source apportionment of volatile organic compounds in Hong Kong

Z.B.Yuan, K.H.Lau, J.Z.Yu, J.Fung

AMCE Program, The Hong Kong University of Science and Technology

Speciated VOC was measured in four air quality monitoring stations with distinct environmental background in Hong Kong from August of 2002 to August of 2003. Two advanced receptor models, Unmix and Positive Matrix Factorization (PMF), were used to analyze the dataset for identification of the major VOC emission sources. Both models identified five stable sources. Mixed solvents, including various types of industrial and architectural solvent use, surface coatings and paintings, are the main contributors to ambient VOC level in Hong Kong. In most of the stations its contribution goes beyond 50%. Regional transport accounts for about 19% of the total VOC, while the two vehicle-related sources, vehicle exhaust and gasoline vapor, are responsible for 26.5%. Biogenic emission is only significant in rural areas. It associates with nearly 10% of the VOC level at the rural station (Tap Mun). Such derived daily source contributions could be further matched with hourly monitored wind profiles to further identify general locations for each source.

By weighing the abundance of each VOC species in the source profile on its reactivity, local ozone formation attributable to the identified VOC sources could be estimated. Owing to the strong influence and fairly large ozone forming potential of individual components, mixed solvent serves as the largest contributor of local ozone. The next largest is the vehicle exhaust, accounting for about 28% in the residential location (Yuen Long). Regional transport and gasoline vapor is of lower influence due to the relatively low ozone forming potential of their components. Biogenic emission is responsible for nearly 20% of the ozone generation at the rural station (Tap Mun) but this figure seems to be underestimated.