

Application of VOCs, SO₂ and NO_x for the evaluation of the contribution of a large petrochemical complex to air quality

Yu-Huei Tong (1), Pei-Yu Hung (1), Hung-Chi Chiang (1), Ching-Jui Chiu (1), Yu-Chun Chen (1), Sheng-Po Chen (2), Yuan-Chang Su (1), and Julius S. Chang (2)

(1) Environmental Simulation CO. LTD., Taiwan (yhtong@simenvi.com.tw), (2) Atmospheric Sciences Research Center, University at Albany, SUNY, Albany, NY, USA (yejulius@gmail.com)

The evaluation of the influence of a major petrochemical complex, the largest petro-chemical complex in Taiwan, to air quality is important for environmental management. In order to understand the potential influence of the pollutants from this complex, a high density observation network was established in the surrounding area of this complex. Nine air quality stations were installed within a radius of less than 20 km. In addition, a photochemical assessment monitoring station (PAMS) was also placed at each site.

We used three dimensional modeling coupled with SO₂ and NO_x measurements to study how the study region was affected by the sources. With two years of daily observations of SO₂ and NO_x in the target area we obtained estimates for the background levels of SO₂ and NO_x. Furthermore, the ratios of ethylene/acetylene (E/A) and propylene/acetylene (P/A) were used as indicators to reveal the presence of petrochemical emissions. Wind flow patterns, the time evolution of SO₂, NO_x and VOCs were studied, and the influence of the petrochemical complex to nearby region was assessed.

All methods of assessment yielded results within $\pm 3.8\%$. The observations based assessments agreed well in frequency of direct impacts and magnitudes. At downwind sites, the impacts on VOCs, SO₂ and NO_x can be increases as large as factors of 2.2, 4.2 and 2.5, respectively.