



# 17<sup>th</sup> IUAPPA World Clean Air Congress and 9<sup>th</sup> CAA Better Air Quality Conference

29 August – 2 September 2016  
Busan, South Korea

## Development of a reactive plume model for the consideration of power-plant plume photochemistry and its applications

Yong H. Kim<sup>\*1</sup>, Hyun S. Kim<sup>1</sup> and Chul H. Song<sup>1</sup>

<sup>1</sup>School of Earth and Environmental Engineering, Gwangju Institute of Science and Technology (GIST),  
Gwangju, 500-712, Korea

### ABSTRACT

A reactive plume model (RPM) was developed to comprehensively consider power-plant plume photochemistry with 255 condensed photochemical reactions. The RPM can simulate two main components of power-plant plumes; turbulent dispersion of plumes and compositional changes of plumes via photochemical reactions. In order to evaluate the performance of the RPM developed in the present study, two sets of observational data obtained from the TexAQs II 2006 (Texas Air Quality Study II 2006) campaign were compared with RPM-simulated data. Comparison shows that the RPM produces relatively accurate concentrations for major primary and secondary in-plume species such as NO<sub>2</sub>, SO<sub>2</sub>, ozone, and H<sub>2</sub>SO<sub>4</sub>. Statistical analyses show good correlation, with correlation coefficients (R) ranging from 0.61 to 0.92, and good agreement with the Index of Agreement (IOA) ranging from 0.70 to 0.95. Following evaluation of the performance of the RPM, a demonstration was also carried out to show the applicability of the RPM. The RPM can calculate NO<sub>x</sub> photochemical lifetimes inside the two plumes (Monticello and Welsh power plants). Further applicability and possible uses of the RPM are also discussed together with some limitations of the current version of the RPM.

**Keywords:** plume photochemical reactions, plume turbulent dispersion, power-plant plumes