Jul 11th, 10:30 AM - 10:50 AM

Validation and Application of an Integrated Air Quality Model: From Source Dispersion to Respiratory Deposition

Vikas Kumar  
*Universitat Rovira I Virgili*, vikas.kumar@urv.cat

Francisco Sánchez-Soberón  
*Universitat Rovira I Virgili*

Joaquim Rovira  
*Universitat Rovira I Virgili*

Montse Mari  
*Universitat Rovira I Virgili*

Marta Schuhmacher  
*Universitat Rovira I Virgili*

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Kumar, Vikas; Sánchez-Soberón, Francisco; Rovira, Joaquim; Mari, Montse; and Schuhmacher, Marta, "Validation and Application of an Integrated Air Quality Model: From Source Dispersion to Respiratory Deposition" (2016). *International Congress on Environmental Modelling and Software*. 38.  
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Validation and Application of an Integrated Air Quality Model: From Source Dispersion to Respiratory Deposition

Vikas Kumar, Francisco Sánchez-Soberón, Joaquim Rovira, Montse Mari, Marta Schuhmacher
Environmental Engineering Laboratory, Departament d’Enginyeria Química, Universitat Rovira i Virgili,
Av. Països Catalans 26, 43007 Tarragona, Catalonia, Spain (vikas.kumar@urv.cat)

Abstract: Particulate matter (PM) is considered as a harmful air pollutant. Guidelines to calculate human health risk of PM are based on average activity intensity and outdoor concentrations of PM. However, most people in developed countries spend more than 85% of their time indoors, where PM composition and levels could vary significantly from those found outdoors. To deal with this problem, we present an integrated air quality modelling exercise focused on calculating the PM emission, dispersion and concentration out and indoors, as well as its associated health risks. To do so, we applied the dispersion model AERMOD in the Tarragona County, where several PM sources (harbour, petrochemical complex, incinerators) are located. Within the affected area we selected ten schools where activity patterns of the students were recorded. Sampling of both indoor and outdoor PM was simultaneously carried out and three fractions of PM (10, 2.5 and 1) were analysed. Indoor air quality results were compared and validated with the results of the popular simulation software IAQX v 1.1 (simulation tool for indoor air quality). Finally, an assessment of the exposure and risks was performed taking into account the student’s activity patterns by using the dosimetry model MPPD v 2.11. Results obtained from this study will help to better understand the indoor infiltration patterns of different PM fractions and improve the accuracy of the integrated air quality modelling.

Keywords: Particulate matter (PM); Air quality model; Integrated modelling; Model validation; Indoor & outdoor sampling.