

Estimation of activity-based vessel emission and analysis of dispersion pattern of ship emission in a port-city

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Abstract

High levels of PM₁₀ have been observed in major port cities around the world. Many researchers report that this situation is commonly caused by ship emission. In addition, for shipping emission reduction, International Maritime Organization (IMO) will also implement the guideline to limit the content of sulfur oxides in all ocean transportation down to 0.5 percent from 2020. There are two methods for estimating ship emissions, one based on national fuel sales statistics and the other based on ship activities taking into account the actual activities of ships. The fuel supply/consumption based approach is insufficient to fully cover ship emissions in case of ships refueling from other domestic ports or foreign ports. On the other hand, since AIS (automatic identification system) data providing information about ship main characteristics, position and voyage required for ship emission calculation, it is possible to estimate the actual fuel consumption being consumed in any concerned area like a port. In this study, we estimated the air emissions from ships in and out of Incheon port and analyzed the spatial extent of ship emissions impact at several coastal areas in Korea. Sea/Land breeze often occur in the port city located on the coast such as Incheon and Busan city. Thus, the characteristics of vessel emission transport by coastal air environment were analyzed as well. HOTMAC-RAPTAD (now A2C flow/t&d) model was used to simulate mesoscale weather events like a sea breeze. As a result of ship emissions movement characteristics at 10 Korean port cities (Incheon, Busan, Yeosu/Gwangyang, Mokpo, and Donghae, etc.), it is divided into 3 groups according to the air movement. The penetrate length by sea breeze is about 25~30 km in the western coast, 27~35 km in the southern coast, and 15~20 km on the eastern coast, respectively.

Keywords: *Shipping pollution, Estimation approaches, Sea breeze, Dispersion modeling*

Biography

Dr. Heekwan Lee is a Professor for Environmental Engineering at Incheon National University, Republic of Korea, since 2002. He is interested in the field of Air quality modeling, Indoor environment, and its control, Ventilation design and its application, Air pollution control technology, Climate change, etc. He holds Ph.D. in Building Service Engineering from the University of Reading, UK (2001), M.Sc. (1994) and B.Sc. (1992) both in Environmental Engineering from University of Seoul, Korea.