METHODOLOGY FOR QUANTITATIVE ESTIMATION OF ATMOSPHERIC LOADINGS DURING ASIAN DUST EVENTS OBSERVED OVER KOREA IN 2002

Sang-Keun Song, Yoo-Keun Kim, and Hwa Woon Lee

Department of Atmospheric Sciences, Pusan National University, Busan, South Korea, songsk@pusan.ac.kr

ABSTRACT

Dust transport and its impacts, which are frequently observed in East Asia, have attracted public attention increasingly in recent years. In this study, in order to quantitatively estimate the impacts of Asian dust transport on the air quality in South Korea, we analyzed the relationship between Asian dust frequency and meteorological variables (e.g., wind speed, air temperature, relative humidity, and aridity) in the source regions and estimated the dust emissions from a transport model, well showing the distribution of dust particles concentration. The event periods chosen in this study are 21-23 March 2002 (or March 2002 event) showing the biggest dust phenomenon over Korea and 11-12 November 2002 (or November 2002 event) contrasting with the dust event in the springtime. We here found that there was a close correlation between Asian dust frequency and three variables (wind speed, aridity, and relative humidity). In particular, the dust frequency with high-value aridity in Gobi Desert and its surrounding regions was higher than that in the other regions. From the modeling results based on the selected input variables, we found that a total dust emission amount in the source regions was estimated to be approximately 3.01×10^6 ton and 0.57×10^6 ton in March and November event, respectively. In addition, the mass contributions of the total emission amount to atmospheric loadings categorized into inflow, transit, and deposition amounts of Asian dust were evaluated. As the results, the ratio of the total emission amount to dust inflow (approximately 1.03 (0.17) $\times 10^6$ ton in March (November) event) was found to be 0.34 and 0.30, respectively. The ratio of the dust inflow amount to transit and deposition amount to Asian dust were found to be 0.69 (0.72) and 0.31 (0.28) for two dust events, respectively.

Keywords: Dust impacts; Dust loadings; Quantitative estimation; Inflow amount; Transit amount; Deposition amount