



## **Possible influence of urbanization and aerosol on the long-term precipitation in the mid-Korean peninsula**

Seung-Hee Eun (1), Byung-Gon Kim (1), and Ki-Ho Chang (2)

(1) Department of Atmospheric Environmental Sciences, Gangneung-Wonju National University, Gangneung, Korea (bgk@gwnu.ac.kr/+82-33-640-2320), (2) Applied Meteorology Research Laboratory, National Institute of Meteorological Research, Seoul, Korea

Aerosols have a considerably effect on cloud properties and further the initiation of precipitation, the large concentrations of anthropogenic aerosols would decrease the cloud droplet size per given liquid water content, and thus also decrease precipitation formation. Recently aerosol-induced orographic precipitation has been investigated all over the globe and is one of the hot issues in association with air pollution impacts on precipitation. The study analyzes long-term trends (Tr) of precipitation amount, frequency, enhancement ratio (Er), inclusive of considering the synoptic wind direction classification such as westerly and easterly, where Er is defined as the ratio of the precipitation amounts (frequency) of the downstream to those of the upwind location. The analysis period is mainly confined from 1972 to 2007. The analysis stations are Seoul, Wonju, Daegwallyeong and Gangneung from west to east. The trend of population for the Seoul and Metropolitan from 1975 to 2005 shows that urbanization is still ongoing. The visibility of most stations from 1977 to 2007 has significantly decreased except for Seoul, possibly attributed to an increase in aerosols. For the westerly condition, the light precipitation amount and frequency ( $P \leq 1 \text{ mm day}^{-1}$ ) altogether in Wonju have been significantly increasing, whereas those in Daegwallyeong have been decreasing. Therefore Er ratio of Wonju to Seoul for the light precipitation amounts (frequency) has been remarkably increasing by  $0.69\% \text{ year}^{-1}$  ( $1.90\% \text{ year}^{-1}$ ) due to the urbanization effect for the westerly synoptic wind conditions while that of Daegwallyeong to Wonju decreasing by  $1.38\% \text{ year}^{-1}$  ( $2.13\% \text{ year}^{-1}$ ) due to both urbanization and aerosol effect. To quantitatively investigate the role of urbanization and aerosols on precipitation changes in the Korea peninsula, the future study will include the sensitivity study using the mesoscale model with the differing surface roughness and/or aerosol loading.