P3.8 Evaluation of the Thermal Environment in the Seoul Metropolitan Area

Yeon-Hee Kim[1*], Sung-Nam Oh[1], Hyang-Hee Um[1], Jae-Cheol Nam[1], and Sang-Baek Kim[2]
[1]Meteorological Research Institute/ KMA [2]Korea Global Atmospheric Watch Observatory, Korea

To investigate the spatial and temporal structure of the urban heat island in Seoul, temperature data were measured at 32 automatic weather stations (AWSs) in the Seoul metropolitan area and 12 additional stations operated by the portable device for the measurement of temperature and relative humidity in the Cheonggyecheon area where has a stream across center area in Seoul. Fig. 1 shows the distribution of air temperature in the Seoul metropolitan area averaged for the summertime of 2003. A relative warm region extends in the east-west direction and warm cores are pronounced in industrial and commercial area with high story buildings and heavy traffics. A relative cold region is observed in mountain area and near the borderline of Seoul except near the southwestern and southeastern borderlines where the sprawling expansion of urbanization has already been progressed. Fig. 1(b) shows the additional warm core in the Cheonggyecheon area. The urban heat island is closely linked to that of land-use type, weather and human activities related with anthropogenic heat release, and topography. Similar to previous studies for Seoul, the intensity of urban heat island is stronger in the nighttime than in the daytime, decreases with increasing wind speed, and is pronounced for clear skies (e.g. Kim and Baik, 2002, 2004).

Heat budget model is developed to evaluate the thermal environment on urban area, consist of various land cover types to be lawn, park, forest, asphalt, built-up area, surface water and so on. Meteorological data and surface energy flux were observed to examine the heat budget model in Haenam and Seoul, where land cover types are a grassy place and a built-up area, respectively. The survey of sensitivity for surface parameters (albedo, evaporation efficiency, soil heat capacity) and atmospheric conditions (sunshine, wind speed) on used heat budget model was carried out and the qualitative characteristic of these parameters was confirmed. Among these, sunshine parameters played an important role in evaluation of thermal environment with considering the effect of cloud amounts and sunshine interception by building. The result of heat budget model for two land cover types, lawn and built-up area was well simulated the diurnal variation of surface energy flux from comparison of observation data (Fig. 2). Particularly, we could confirm the seasonal variation of latent heat flux for lawn and high sensible heat flux for built-up area.

*Corresponding author address: Yeon-Hee Kim, Meteorological Research Institute/KMA, 460-18 Seoul 156-720 Korea; e-mail: kyh@metri.re.kr

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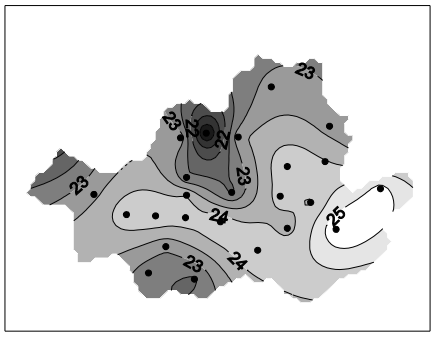
(a) temperature



(b) temperature with 12 points

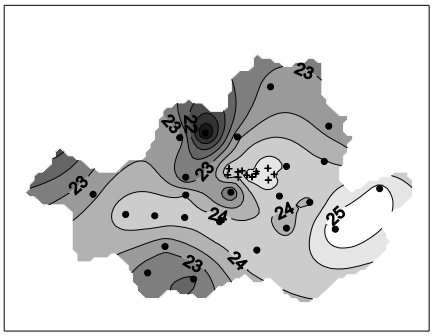


Fig. 1 Distribution of (a) air temperature and (b) air temperature with 12 points in the Seoul metropolitan area averaged for the summertime of June to August 2003. + denote the measurement points of air temperature and relative humidity in the Cheonggyecheon area. The contour interval is 0.5 ℃

References

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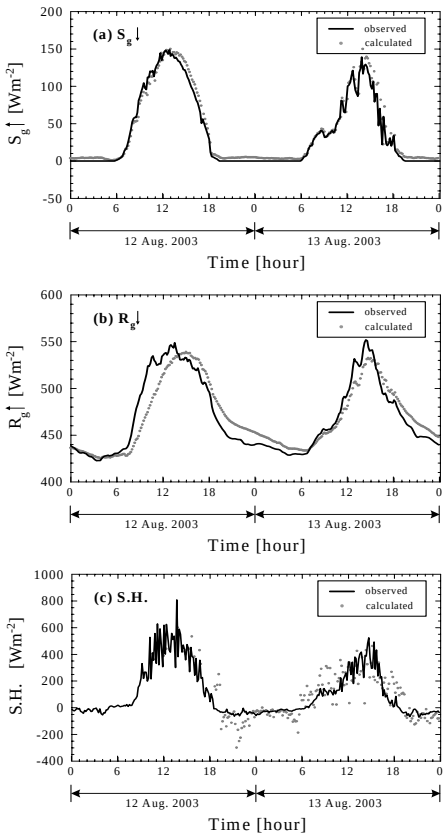

Fig. 2 Comparision of observed and calculated energy fluxes, (a) upward shortwave radiative flux, (b) upward longwave radiative flux, and (c) sensible heat flux at the Seoul site in the period of 12-13 August 2003.