P1.12 **Impact of Urbanization on Climate Change in Korea, 1973-2002**

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1. INTRODUCTION

Korea peninsula is the most important region in the global change studies for two major reasons: first, as the center of North East Asia climate region the peninsula has a unique Asian monsoon system which is sensitive to global climate structure; second, the growing human activities of the Asian continental area affect on the major driving force causing climate changes such as the rapid increase of anthropogenic emission of greenhouse gases and aerosol, and land environment change due to industrialization and irrational use of land and biotic resources (Fu *et al.* 1998; Gai and Kalnay, 2004).

The influence of climate change can generally be recognized from the atmospheric surface temperature change. The impact to urbanization has estimated by comparing observations in cities with those in surrounding rural areas, but the results differ significantly depending on what data are used. In Korea peninsula, Ryoo *et al.*(1993) and Kim *et al.*(1999) described respectively that the surface air temperature has increased 1.2℃ at mega city, Seoul and 0.8℃ for 20 century with the most rapid warming (~ 0.2℃ decade^{-1}) has observed over the past twenty years. Here we use the difference between trends in observed surface temperatures in the Korea peninsula, and corresponding trends in a reconstruction of surface temperatures determined from a reanalysis of global weather over the past 50 years, which is insensitive to surface changes such as land use, population and urban developments.

Our studies focused on finding out the differences between urbanization and global warming on the increase of surface air temperature in Korea peninsula. The method include the secular variations of the observed urban and rural surface air temperature during the past 30 years and the derived surface air temperature from the National Centers for Environmental Prediction (NCEP) 50-years reanalysis. In this study, we accept a retroactive air temperature of NCEP reanalysis that is produced for supporting the climate monitoring communities.

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2. RESULTS

We conceive that the differences of temperature variability between the observations and NCEP-reanalysis are attributed by urbanization. However, in the rural and NCEP reanalysis cases, the temperature increases during the long-term period may have effected from the global warming. The anthropogenic effects such as urbanization could be consistent with the general increase in the minimum temperature and the small change observed in the maximum temperature, and contribute to the reduction in the diurnal temperature range (DTR). These effects should be greatest in the growing season as spring and summer, when the surface heating by the solar radiation is strongest. Figs 1 and 2 compare time series of 30 years (1973-2002) of monthly mean surface air temperature anomalies for Seoul, the largest city of Korea, and Chupungnyung, a rural site in Korea, including the average decadal difference between observations and NCEP reanalysis. There are good agreements in the interannual variability as well as the growing trends in the difference between the surface observations and NCEP reanalyzed data that captures well the surface air temperature variations caused by the meteorological conditions.

3. CONCLUSION

The observed daily mean temperature trends are different from previous 50 or 100 year trend estimates because in our computations we did not include the decadal trends corresponding to the 1980s-1970s and 1990s-1980s, and urban and non-urban data adjustments. More studies are needed in

the comparisons and analytical analysis of geographical and human information.

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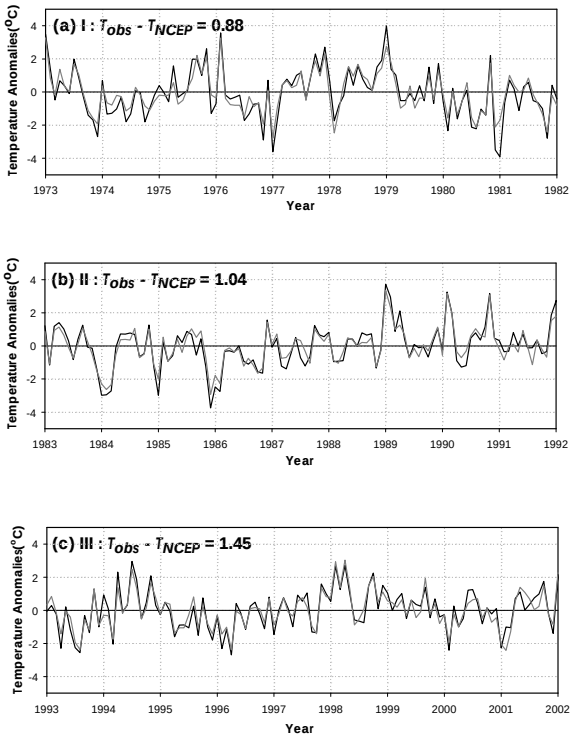

Fig. 1 Comparisons of monthly mean observed and NCEP reanalyzed surface air temperature anomalies with respect to their annual cycles at Seoul. $T_{obs,}$ observed monthly mean air temperature in ^{o}C, shown in black. T_{NCEP}, analyzed monthly mean temperature in ^{o}C, shown in dark gray. Three decades (1973 to 2002) are shown for comparison.

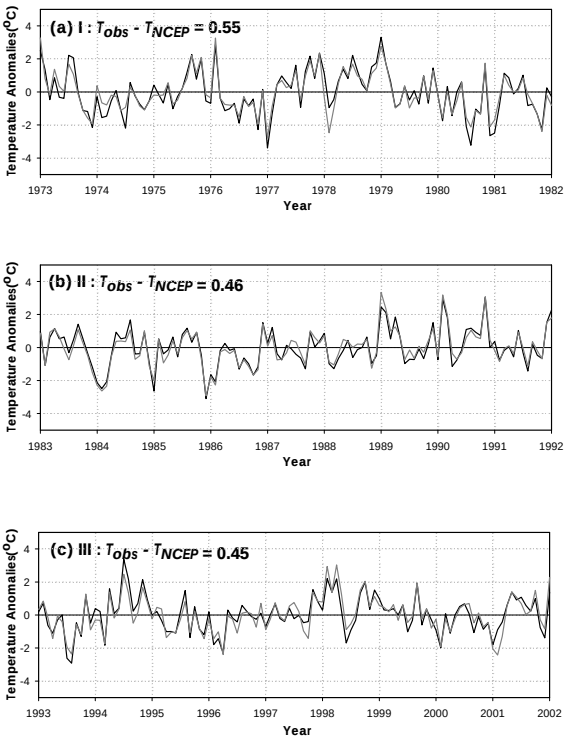

Fig. 2 Same as Fig. 1 except Chupungnyung.