# 1 Satellite remotely-sensed land surface parameters for analysis of the climate effect of urbanization in various metropolitan regions

G. Xian (1) and M. Crane (2)

(1) SAIC/USGS Center for Earth Resources Observation and Science, Sioux Falls, SD 57198, USA

(2) USGS Center for Earth Resources Observation and Science, Sioux Falls, SD 57198, USA

This study investigates the impact of urban land use and land cover (LULC) changes on regional scale climate conditions. By using both high resolution orthoimagery and medium resolution Landsat satellite imagery together with other geographic information, several LULC parameters are obtained and utilized to determine LULC conditions and land surface thermal characteristics. Impervious surface area (ISA) is used to quantitatively define urban spatial extent and development densities. Fractional vegetation cover ($f_c$) information is estimated from NDVI-based models and regression tree algorithms. Surface temperatures ($T_s$) are analyzed for different LULC categories to evaluate surface thermal forcing and surface energy balance for the regions. Three geographically distinct urban areas—Seattle, Tampa Bay, and Las Vegas in the United States—serve as the focus of this study. The effects of land surface heterogeneity and associated spatial and temporal changes on surface heat fluxes are calculated using satellite and ground meteorological data to evaluate possible anthropogenic influences. Changes in land surface properties are shown to influence surface energy and moisture budgets because of the removal of vegetation cover, the introduction of non-transpiring surfaces, and reduction in evaporation over urban impervious surfaces. Fifty years of ground climate observation data and over 20-years of surface LULC information are integrated to assess regional climate condition and LULC changes for the study areas. The spatial structure of surface heating influenced by landscape characteristics produces profound influences on regional climate conditions, especially through urban heat island effects.