MAPPING URBAN SURFACE TEMPERATURE AT DIFFERENT SPATIAL SCALES IN SOUTHEAST QUEENSLAND, AUSTRALIA

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KEY WORDS: Urban remote sensing, thermal, spatial scale, urban heat island, emissivity, land cover

Abstract: A fundamental challenge facing local governments around the world responsible for urban environments is how to manage energy balances to provide a comfortable quality of life and essential community services and infrastructure, while conserving energy. As urban land covers generally increase sensible heat emission and hence urban heat island effects, mapping urban surface temperatures is an essential requirement for developing effective management solutions. The objective of this work was to assess and demonstrate urban surface temperature and heat island effects at different spatial scales using different types of thermal data. The study site was located in Southeast Queensland, Australia, covering parts of Brisbane and the Gold Coast. Time-series of MODIS thermal data provided information on urban surface temperature variability for a 10 year period. The urban surface temperature information provided by the MODIS data was compared to thermal ASTER and high spatial resolution airborne thermal data. In order to produce maps of kinetic surface temperature, the image data were emissivity corrected based on an object-based land cover map produced from very high spatial resolution orthophotos and LiDAR data with assigned emissivity for each land cover class. Field data were also obtained to support the emissivity correction process and provide further understanding of urban surface temperature characteristics of representative land cover classes. The results show how local urban heat island effects are observable from the airborne thermal data and the emissivity corrected ASTER data, while the MODIS data average out some of the local urban hot spots. The results will provide information to local councils on the required spatial scale of mapping with future work focusing on down-scaling high temporal low spatial resolution MODIS thermal data based on detailed land cover maps and associated emissivity characteristics to model urban energy balance and temperature from regional to dwelling levels.