Chapter 2
Land Surface Temperature Estimation and Urban Heat Island Detection:
A Remote Sensing Perspective

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ABSTRACT

Earth's land surface temperature is considered to be very important for modeling the environment. Following the trend of increasing global population, urban areas are expanding in spatio-temporal domain. In this way it is affecting the urban climate and subsequently the global climate. Thus, scientific understanding is required to conceive the knowledge about interaction between urban land use/land cover and the atmospheric conditions prevailing in that area. In this chapter the land surface temperature estimation and urban heat island detection are perceived from remote sensing perspective. The chapter in this context highlights three major aspects, viz. the theoretical background, description about some of the common thermal sensors and widely used algorithms to retrieve surface temperature from these satellite sensors.

INTRODUCTION

Land surface temperature (LST) is measured at the Earth's surface. It is considered as the skin temperature of the earth. It is an important quantity for many environmental models like energy and water exchange between atmosphere and surface of the earth; numerical prediction model of weather; global ocean circulation model; climatic variability model, etc. (Dash, Gottsche, & Olesen, 2002; Valor & Caselles, 1996). Urban growth and urban sprawl are the prime factors in regional landscape evolution across the globe. Understanding the interactions among different urban land use and land cover types, atmospheric conditions and land surface temperatures is significant to conceptualize urban climate. Rapid urban expansion due to large scale commercial, manufacturing and transportation development leads to the emergence of Urban Heat Island (UHI) effect (Landsberg, 1981). The urban areas are characterized by higher temperature in comparison with the surrounding rural areas, as shown in Figure 1. The process of urbanization can raise the local temperatures, however, the temperatures of built-up fringed areas will generally remain constant (Resenzweig et al., 2005).

UHI results from differential characteristics of radiation and heat budget in urban landscape. Oke (1982) listed some common causes of the UHI including:

1.   High absorption of short wave radiation because multiple reflection.
2.   Human induces heat sources.

Figure 1. Urban heat island
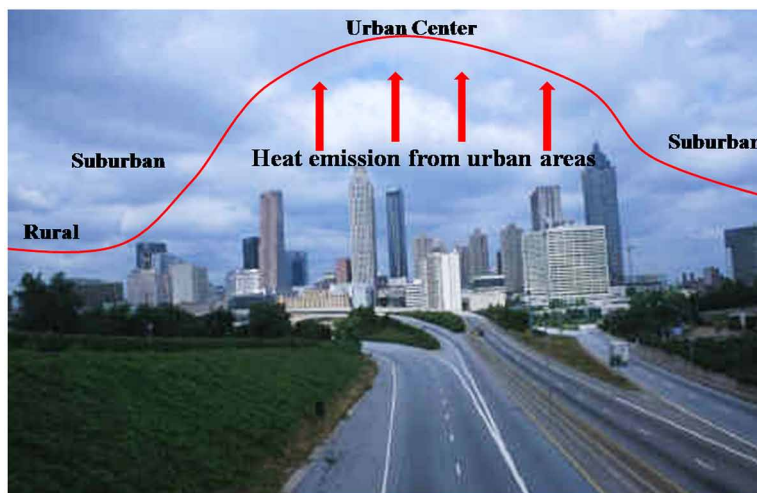
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