Modeling of Land Surface Temperatures to Determine Temperature Patterns and Detect their Association with Altitude in the Kathmandu Valley of Nepal

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ABSTRACT

Land Surface Temperature (LST) data around Kathmandu Valley of Nepal from 2000 to 2015 were analyzed to determine the temperature patterns. The cubic spline function was used to find the seasonal patterns, which were similar for all sub-regions, with a single summer peak and a winter trough. The data were then seasonally adjusted to remove seasonal effects and filtered with the first-order autocorrelation. The second-degree polynomial regression model identified fifteen different patterns; 65.4% of the area had an 'accelerating' pattern and 34.6% had a 'non-accelerating' pattern. The logistic regression confirmed that the patterns were significantly associated with altitude (P = 0.006). This study identified a varying pattern of temperature by location and time and the methods can be generalized to larger areas.

Keywords: Land Surface Temperature, Cubic spline function, Polynomial regression model, Temperature patterns

INTRODUCTION

Temperature change, a crucial environmental problem, can hit low-income countries hard, with their reliance on natural resources. Warming of the land surface is particularly problematic, as it directly affects the surrounding ecosystem. The land surface temperature is both related to and can affect a range of natural and human activities, including agriculture (Schlenker and Roberts, 2009; Smith et al., 2009), health (Dhimal et al., 2015; Xu et al., 2015), the environment (Jones et al., 1999; Johannssen et al., 2004), and energy (Paniagua-Tineo et al., 2011; Jaglom et al., 2014); it affects every sphere of human life.