Chapter 7
Land Surface Temperature and Its Lapse Rate Estimation Using Landsat-8 TIRS Data in Beas River Basin, India and Computed Differences With MODIS-Terra

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DOI: 10.4018/979-8-3693-1396-1.ch007

ABSTRACT

In the study of snow melt runoff, the temperature lapse rate (TLR) is an essential variable. For the Beas River Basin in the Western Himalayas, it has been approximated in the current study. In this work, the split-window (SW) technique for TLR estimate has been used to recover the land surface temperature (LST). LST in the study area has a negative correlation with elevation values, and the trend shows that LST and elevation have an inverse relationship, according to data from the United States Geological Survey's (USGS) advanced spaceborne thermal emission and reflection radiometer (ASTER) and global digital elevation model (GDEM). The TLRs for the Beas River Basin region vary from 0.71°C/100 m to 0.87°C/100 m during the time period of 18 April 2013 to 27 June 2015. The findings were calculated using lapse rates calculated from maps produced by the moderate resolution image spectroradiometer (MODIS). There is excellent agreement between the MODIS-Terra data and the air temperature and LST from Landsat-8. The modelling of snow and glacier melt flow in the Himalayan region will benefit from the current work.

1. INTRODUCTION

An important consideration in research on snow and glacier melt runoff is the land surface temperature (LST). Typically, it is described as the ground's surface temperature. Recently advanced remote sensing technology is responsible for providing a substitute to mapping LST on a large scale. Many studies have tried to recover this information from satellite data (Jiang, 2013; Tang and Li, 2014; Jiménez-muñoz et al., 2014; Rajeshwari and Mani, 2014; Sattari and Hashim, 2014). These strategies are based on a split-window (SW) technique for estimating LST from the Landsat-8 satellite, which was jointly developed by the National Aeronautics and Space Administration NASA and the United States Geological Survey (USGS). The Landsat Data Continuity Mission satellite carried out the mission (LDCM). When the Landsat-8 satellite was sent into orbit in February 2013, it brought with it two sensors, one of which was a thermal infrared sensor (TIRS) that can detect heat. According to the underlying principle for LST remote sensing, the total amount of radiative radiation released by the ground's surface rises sharply with surface temperature. A ground object's energy emission's spectral distribution changes with ground temperature as well. Sensors that operate in the thermal infrared (TIR) region of the electromagnetic spectrum (8-12 m) at the atmospheric window may remotely detect the thermal energy of the real ambient temperature of the ground surface. The brightness temperature (TB) refers to the temperature of the ground at the satellite level.