Paper ID: 13279
oral
student

EARTH OBSERVATION SYMPOSIUM (B1)
Earth Observation Applications and Economic Benefits (5)

Author: Ms. Melanie Phillips
University of Alabama in Huntsville, United States

Dr. Tom Sever
University of Alabama in Huntsville, United States
Mr. Daniel Irwin
NASA Marshall Space Flight Center, United States

REMOTE SENSING THE ENVIRONMENTAL EFFECTS OF REFORESTATION: MULTI- AND HYPERSPECTRAL TEMPORAL ANALYSIS FOR PUNJAB, INDIA

Abstract

This project enhances the understanding of reforestation and land cover dynamics in two Indian states: Chhattisgarh, an area rich in forest and mineral resources, and Punjab, the grain bowl of India. Using multi- and hyperspectral satellite datasets, we investigate the impact of reforestation on agriculture, climatic patterns, biodiversity and the subsequent economic benefits in Punjab and Chhattisgarh over a 15 year span.

In coordination with NASA's Mesoamerican Regional Visualization and Monitoring System (SERVIR), the University of Alabama in Huntsville, and the International Centre for Integrated Mountain Development (ICIMOD), we are currently analyzing ALI and Hyperion satellite data acquired over the study areas during the last decade. Along with the US-based assets, we will acquire data from the Indian Space Research Organization (ISRO) satellite, Resourcesat 2. Analysis of the hyperspectral imagery is particularly beneficial because it provides more accurate and detailed information extraction than possible with any other type of remotely sensed data. The simultaneous collection of hundreds of bands of data on Hyperion allows us to analyze narrower bandwidths and determine the spatial patterning of reforested areas, their species composition, and ecological succession.

We are using GIS and image processing software, ArcGIS 10 and ENVI 4.7, to analyze several aspects of land cover indicative of vegetation stress. These indices, along with composited hyperspectral data bands, enable us to accurately map the distribution and health of land cover in the study regions. In addition, air temperature and rainfall data over the same 15 year period are being gathered from the Climatic Research Unit and the India Meteorological Department. These inputs will form the basis of a model in which our analysis of temporal change detection will illustrate the relative effects on each variable on the overall efficacy of reforestation efforts. Ultimately, an atmospheric and land cover model will be used to determine future scenarios for impacts on agriculture, weather patterns, and biodiversity.

This paper reports on the current status of this ongoing research. It focuses on the ways in which remote sensing is providing a unique perspective for the study of an often-overlooked process in environmental land management. This investigation of forested landscape recovery and its effect on rainfall, agriculture, and biodiversity will provide a template for scientific environmental modeling using remote sensing as well as satellite-based operational model development of potential value to many deforested regions around the world.