TREE SPECIES DIVERSITY ESTIMATES OF SELECTED FOREST COVERS OF INDIA: AVIRIS-NG APPROACH

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ABSTRACT

Background: Tropical forests are Earth's most diverse ecosystems, and India, with its diverse climatic conditions, stands out as one of the most diverse countries, supporting rich floral diversity. Assessing species diversity and monitoring vegetation health is crucial for long-term forest management and biodiversity conservation. Remote sensing, increasingly useful for estimating biodiversity, bridges the gap between forest ecology and technology. The airborne visible and infrared imaging spectrometer-next generation (AVIRIS-NG) sensor, part of a collaborative effort between NASA and ISRO, was flown over numerous sites in India. Despite its high spatial and spectral resolution, studies utilizing AVIRIS-NG data in India are limited. Thus, the present study is proposed to advance the understanding of targeted forest covers in India using AVIRIS-NG datasets.

Objectives: 1. To develop tree species map of selected forest covers of India and 2. To estimate how tree species diversity is correlated with spectral diversity in different spectral regions of AVIRIS-NG spectra.

Methods: The study focused on three protected areas (PAs) in India: Shoolpaneshwar Wildlife Sanctuary (SWS), and Vansda National Park (VNP) in Gujarat, and Mudumalai Tiger Reserve (MTR) in Tamil Nadu. Combining field data from these PAs with AVIRIS-NG data, species classification maps were generated using Random Forest (RF) and Support Vector Machine (SVM) classifiers. Spectral diversity was assessed through Convex Hull Volume (CHV) computed from the first three principal components of AVIRIS-NG spectra.

Results: AVIRIS-NG datasets exhibited a capability to classify tree species in Indian forests with an accuracy range of 77-81%. CHV demonstrated a positive correlation with the number of species, emphasizing the potential of spectral diversity metrics in estimating species diversity. The study revealed the positive impact of higher rainfall (MTR) on species and spectral diversity compared to PAs with lower rainfall (SWS and VNP). Specific spectral regions showed superior discriminatory ability, shedding light on characteristics closely associated with tree species diversity.

Conclusion: This study enhances estimates of tree species diversity in India's forest cover, providing valuable maps for efficient forest resource management. The findings offer essential inputs for conservation efforts, highlighting the substantial potential of an integrated approach that synergizes remote sensing and field data in understanding tropical forest vegetation.