

Characterization of Forest Fire Fuel in Shivalik Himalayas Using Hyperspectral Remote Sensing

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Abstract : Fire fuel map is one of the most critical factors for planning and managing the fire hazard and risk. One of the most significant forms of global disturbance, impacting community dynamics, biogeochemical cycles and local and regional climate across a wide range of ecosystems ranging from boreal forests to tropical rainforest is wildfire. Assessment of fire danger is a function of forest type, fuelwood stock volume, moisture content, degree of senescence and fire management strategy adopted in the ground. Remote sensing has potential of reduction the uncertainty in mapping fuels. Hyperspectral remote sensing is emerging to be a very promising technology for wildfire fuels characterization. Fine spectral information also facilitates mapping of biophysical and chemical information that is directly related to the quality of forest fire fuels including above ground live biomass, canopy moisture, etc. We used Hyperion imagery acquired in February, 2016 and analysed four fuel characteristics using Hyperion sensor data on-board EO-1 satellite, acquired over the Shivalik Himalayas covering the area of Champawat, Uttarakhand state. The main objective of this study was to present an overview of methodologies for mapping fuel properties using hyperspectral remote sensing data. Fuel characteristics analysed include fuel biomass, fuel moisture, and fuel condition and fuel type. Fuel moisture and fuel biomass were assessed through the expression of the liquid water bands. Fuel condition and type was assessed using green vegetation, non-photosynthetic vegetation and soil as Endmember for spectral mixture analysis. Linear Spectral Unmixing, a partial spectral unmixing algorithm, was used to identify the spectral abundance of green vegetation, non-photosynthetic vegetation and soil.

Keywords : forest fire fuel, Hyperion, hyperspectral, linear spectral unmixing, spectral mixture analysis

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