Evaluation of the Potential of Hyperion for Fire Danger Assessment by Comparison to the Airborne Visible Infrared Imaging Spectrometer

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Abstract
Parameters derived from remote sensing that can be used to assess fire danger include surface reflectance, live and dead biomass, canopy water content, species composition, and fuel state. Spectral bands and wavelength locations of traditional multispectral data make assessment of fire danger in Mediterranean shrublands difficult, although fire danger parameters have been derived from AVIRIS data. We compare near simultaneous acquisition of Hyperion and AVIRIS to evaluate spaceborne monitoring potential of fire danger in Southern California chaparral. Field spectra were acquired to support reflectance retrieval and construct a spectral library for vegetation mapping. Reflectance spectra retrieved from Hyperion and AVIRIS had similar shape and albedo but signal to noise ratio was 5 times higher in AVIRIS. Fuel condition was assessed using the endmember fractions from spectral mixture analysis, with both Hyperion and AVIRIS imaging spectrometer data providing similar fractions and spatial distributions. Hyperion demonstrated good capability for separating spectral signals from bare soil and dry plant litter. Canopy water content was compared using the 980 and 1200 nm liquid water bands, the Water Index and the Normalized Difference Water Index. Results showed that Hyperion is capable of retrieving canopy water at 1200 nm, but demonstrates poor performance at 980 nm. Sensor noise and instrumental artifacts account for poor performance in this spectral region. Overall, full spectrum measures outperformed band ratios because of a lower sensitivity to sensor noise in individual bands. Species and community mapping showed similar patterns with better accuracy for AVIRIS relative to Hyperion, but with both instruments achieving only 79% and 50% overall accuracy, respectively.