Preliminary Analysis of AVIRIS Data Acquired Over the Harvard Forest in Petersham, Massachusetts

M.E. Martin and J.D. Aber
Complex Systems Research Center
University of New Hampshire
Durham, New Hampshire

Abstract. The concentrations of nitrogen, lignin, and cellulose in canopy foliage are related to important ecosystem parameters such as litter decomposition rate, nutrient availability, and plant productivity. Previous work with both agricultural products and forest foliage has shown that relationships exist between reflectance at selected wavelengths in the near infrared (NIR) spectrum and nitrogen, lignin and cellulose concentrations. In this project, we extend this work to both the fresh leaf and canopy scale using data from an NIRS model 6250 spectrophotometer (leaf scale) and AVIRIS (canopy scale).

One-hundred seventy-five samples from eight deciduous and four conifer species were collected for the fresh leaf analysis. The laboratory spectra acquired for these samples ranged from 1100 to 2500 nm at 2-nm intervals with an effective bandwidth of 10 nm. Equations relating chemical concentration to NIR absorbance at 2170 nm (nitrogen), 2260 nm (lignin), and 1212 nm (cellulose) were developed with correlation coefficients of 0.89, 0.88, and 0.82, respectively.

AVIRIS data were acquired over the Harvard Forest in Petersham, Massachusetts, on 8 September 1990. Foliage samples collected from ten sites within several days of the overflight were analyzed for nitrogen, lignin, and cellulose content. A preliminary estimate of canopy lignin has been made using AVIRIS radiance data. Corrections for atmospheric effects will be made on this data using both LOWTRAN7 and field reflectance measurements. Retrieving canopy reflectance from AVIRIS data will be necessary for evaluating temporal changes occurring in canopy chemistry.