

## Measuring Change in Forests with EOS/ASTER

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Global warming and encroachment of man are anthropogenic factors of environmental change whose impact must be viewed against a backdrop of sudden and profound Quaternary climate oscillations. Changes in the distribution of forests and vegetation within forests on a decadal scale can be used to assess rapid change in environmental factors globally. Spatial patterns of change distinguish some anthropogenic and natural factors, especially if measurements are made at high resolution (e.g., 100 m). To do this over large areas requires multitemporal remote sensing.

The EOS AM-1 satellite (launch: 1998) will carry two complementary scanners useful for monitoring forest change: ASTER, which will acquire images in a 60-km-wide swath at a spatial resolution of  $\leq 30\text{m}$ , and MODIS, which will acquire images with a resolution of 500 m but over larger areas. Calibration and correction for viewing and illumination geometry is essential in multi-temporal image comparison. Multi-temporal classification is hierarchical and based on (1) maximum-likelihood analysis of endmember fractions and textural patterns, (2) seasonal changes, and (3) non-seasonal transitions from one class to another (e. g., old-growth to bare soil). There are four main areas in which the high-resolution ASTER data are especially useful: characterization of small units; identification of endmembers for spectral analysis; distinction between topographic and canopy shade; and classification based on image texture. ASTER is also useful as an aid in interpreting the smaller-scale MODIS images.

We have analyzed a time series of simulated ASTER VNIR summer images taken yearly between 1972 and 1994 of a rugged forested watershed in northern California. We also analysed images acquired monthly (1987- 1988) to assess the need for classification step #2. Major community types and seral stages can be distinguished. With high-resolution images acute local changes (clearing) can be distinguished from 10 W-1CVC1 chronic changes (water stress, insect damage). We conclude that quantitative maps of forest changes can be made from ASTER and other high-resolution images.

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8. Invoice \$60.00 to attached PO #000538652 at Jet Propulsion Laboratory, Accounts Payable, MS 511-305, Pasadena, CA, 91109
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