Characterizing Land Cover Heterogeneity and Land Cover Change from Multisensor Satellite Data

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Background

The research conducted under this project addresses the need to develop improved regional and global land cover products that incorporate spatial and temporal heterogeneity of vegetation based on satellite data. The research focuses on both conventional land cover classification products and alternative approaches to depict land cover heterogeneity and land cover changes over large areas. The applications of these products are primarily regional and global biosphere-atmosphere models. To date, the effort has focused on deriving

1) a global land cover classification based on 8 km AVHRR data
2) global land cover classification from 1 km AVHRR data to enhance the IGBP effort
3) alternative approaches to describing spatial heterogeneity to estimate proportional cover of vegetation types.

Global land cover classification from 8 km AVHRR data

A global land cover classification based on the 1984 NASA/NOAA Pathfinder Land data at 8 km resolution has been finalized (see list of publications). The classification product was derived using a decision tree classifier in an effort to develop methodologies for global land cover classifications that are objective, reproducible, and feasible to implement as new satellite data become available in the future. A global network of traiining data were derived from analysis of 156 Landsat scenes to identify over 9,000 pixels in the PAL data where we have high confidence that the labeled cover type occurs. Metrics that describe the temporal dynamics of vegetation over an annual cycle were used as input variables to the decision tree classifier. The resulting classification has an overall accuracy between 81.4 and 90.3 percent.Digital versions of the land cover data set and detailed documentation can be found at:
http://www.geog.umd.edu/landcover/8km-map.html

Global land cover classification from 1 km AVHRR data

Applying the same methodology and training data as for the 8 km product described above, we are currently finalizing the publication of a global land cover classification based on the 1km AVHRR data for 1992-93. We intend that this product will complement the global land cover classification produced under the auspices of the

IGBP. We plan to make this product, as well as the training data, available through the WWW.

Continuous fields of vegetation characteristics

As an alternative approach to the traditional classification schemes with discrete numbers of vegetation types, we have proposed "continuous fields" of vegetation properties that can more realistically describe gradients and heterogeneity in the vegetated land surface. A linear mixture model is applied to estimate proportional cover for three important vegetation characteristics: life form (percent woody vegetation, herbaceous vegetation, and bare ground), leaf type (percent needleleaf and broadleaf), and leaf duration (percent evergreen and deciduous). In this reporting period, we have applied this approach to the AVHRR 1 km data (see list of publications) and the AVHRR PAL data for the full time series (1982-1994). Efforts are currently underway to evaluate these products and to assess the potential for using this approach to detect interannual variability in land cover due to climate variability and anthropogenic land cover change.

Future plans

Over the next period of this project, we plan to:

- finalize the global land cover classification based on 1 km AVHRR data and make the data set available to the community through the WWW.

- evaluate the "continuous fields" products and assess the feasibility of this approach for detecting interannual variability in land cover

- work with the biosphere-atmosphere modeling community to assess the significance of land cover heterogeneity for global and regional biosphere-atmosphere models. Specifically, we plan to apply the land cover products in BATS, SiB-2, and CASA.

Publications from this reporting period

DeFries, R., Hansen, M., Townshend, J., and Sohlberg, R., in press, Global land cover classifications at 8 km spatial resolution: The use of training data derived from Landsat imagery in decision tree classifiers.

DeFries, R., Townshend, J., and M. Hansen, submitted, Continuous fields of vegetation characteristics at the global scale. Journal of Geophysical Research.

Hansen, M., DeFries, R., and Townshend, J., in preparation, 1 km global land cover classification using a supervised decision tree classifier, to be included in special issue of International Journal of Remote Sensing.

DeFries, R., Hansen, M., and Townshend, J., in preparation, Continuous fields of vegetation properties from multiyear, 8 km AVHRR data, to be included in special issue of International Journal of Remote Sensing.