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A Remote Sensing Based Vegetation Classification Logic for Global Land Cover Analysis [1]

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This article proposes a simple new logic for classifying vegetation using the Global Land 1 km Advanced Very High Resolution Radiometer (AVHRR) data set, currently archived and distributed by the EROS Data Center DAAC. This classification scheme, and its basis on easily acquired, global, remotely sensed data, is a crucial step towards characterizing the Earth's biosphere for incorporation into global circulation models (GCMs).

An efficient means of representing the variety of the world's land vegetation types has been a stumbling block in the ongoing efforts to model the Earth's biosphere and its interaction with climate. To date, such representations have either been too coarse (desert, rainforest, etc.) or too specific (such as "hickory-oak-ash deciduous forest"). Coarse representations do not allow a sophisticated model to portray accurately the effects of climate change on the system; too-specific representations are difficult to construct for the entire globe. Further, such representations do not allow variable seasonal responses to be taken into account, and do not easily follow climatically induced changes in the extent of the ecosystems.

The new classification is based on fundamental, morphological aspects of the vegetation, such as leaf shape (needle or broad) and leaf longevity (annual or perennial). This simplicity represents a new step in the characterizations of vegetation and ecosystems. It is designed to be easily assessed from spaceborne sensor platforms, and is therefore easily gathered across the entire globe. Changes in the extent of various ecosystems represented by the classification are also easily monitored, since the satellite gathers data on a daily basis and the data are available for a span of several years. Further, it is a classification that lends itself more easily to conversion into true biomass measurements, such as leaf area index and total biomass. More detailed breakdowns of ecosystems or vegetation types, if necessary, may be built upon this basic classification. As it stands, however, the classification shows promise for being simple enough for inclusion in next-generation global circulation models, yet accurate and flexible enough to well-represent the majority of the Earth's vegetative diversity.

In this case, the data source is the AVHRR currently flown on several NOAA platforms. An 18-month database was used for this initial test assessment of the classification scheme over the United States (see Loveland et al. 1991). The classification is based on looking at time-series of bi-weekly composite images of Normalized Difference Vegetation Index (NDVI), a data product derived from band 1 (0.55 mm to 0.90 mm) and band 2 (0.73 mm to 1.10 mm) of the AVHRR sensor. The 18-month span of the data set allowed assessment of leaf longevity over a full annual cycle. 1 km resolution of this sensor yields a derived data set that suffers much less from mixed-pixel problems, i.e., mixtures of more than one vegetation class, or mixtures of soil and vegetative cover, within a single pixel sample.

Monitoring the extent of these vegetation types, and the ecosystems and biomass they represent, will be a fundamental use of upcoming data sets derived from Moderate Resolution Imaging Spectrometer (MODIS) in the EOS era.

Reference(s)

Running, S. W., T. R. Loveland, L. L. Pierce, R. R. Nemani, and E. R. Hunt, Jr. 1995. *Remote Sensing of Environment*. 51(1):39-48.

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