



## EOSDIS Earth Observing System Data and Information System

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### Laying the Groundwork [1]

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From forest to desert, as seen from space, details of various land cover types give scientists the groundwork with which to ultimately assess possible CO<sub>2</sub>-induced global change. Models to predict climate change rest on land cover-related information, such as surface roughness, albedo, and sensible and latent heat flux. In addition to climate change, land cover has multiple consequences for biodiversity, trace gas fluxes present in the atmosphere, and other types of global change.

Scientists get the picture on global land cover from satellite data.

Until now, efforts to assemble a global-scale land cover data set based on satellite data had been few. "There have been many attempts using more high-resolution data, but in terms of global coverage, it's just a whole lot of data. The logistics and difficulties are many," said Ruth DeFries, University of Maryland Department of Geology associate research scientist involved in a NASA-funded project that uses data from the nearly complete Goddard Space Flight Center DAAC Pathfinder AVHRR 8 km Land (PAL) data set.

DeFries and Dr. John Townshend, principal investigators of the study, have relied on AVHRR (Advanced Very High Resolution Radiometer) data garnered from meteorological satellites, as ground-based land cover data are limited in their usefulness. "Prior to the use of satellite data, existing geographically referenced data on the global distribution of land cover types were known to be inaccurate," said DeFries.

The DeFries-Townsend study involves the use of different kinds of remotely sensed data, including Landsat, to identify areas with high confidence. These images are then superimposed over coarser AVHRR data, to create reliable, geographically referenced land cover data sets.

Various algorithms are employed in the study to classify different cover types, as well as "multitemporal data and all of the spectral information available in AVHRR data," said DeFries. Parameters used to produce global land cover products from the PAL data set include measures of how the Normalized Difference Vegetation Index (NDVI) and land surface temperatures vary throughout the seasonal cycle. (NDVI indicates the amount of photosynthetic activity, or vegetation, present in the area of study.)

"An NDVI profile throughout an annual cycle helps to determine whether the land cover at a particular location is broadleaf evergreen forest or broadleaf deciduous forest or grassland, or some other kind of biome," said DeFries. "Then that information goes into the model, and from that, the model estimates the surface roughness and other parameters."

The team's future work will focus on the use of finer-resolution data and full length of satellite record to characterize interannual changes in land cover. Spatial resolution of the global AVHRR area coverage data has already been increased from 8 km to 1 km over the last year, said DeFries, yielding sharper images and, hence, improved attempts at global land cover classification. And, the use of EOS instrumentation, namely the Moderate-resolution Imaging Spectroradiometer (MODIS), is expected to provide the team with even more detailed data, said DeFries. MODIS, a multidisciplinary satellite instrument that facilitates understanding of the interactions between global land, ocean, and atmospheric processes, will allow for a spatial resolution as fine as 250 meters.

### AVHRR Data

AVHRR data afford:

- a daily view of land surface, so that a consistent global land cover data set may be obtained;

- vegetation characteristics and an indication of the total annual photosynthetic activity of vegetation, (calculated with the use of NDVI); and
- frequent collection of data through time, enabling detection of seasonal dynamics.

The Goddard Space Flight Center DAAC PAL data set consists of globally measured AVHRR data that have been atmospherically corrected, and in particular, provide length of record -- "There's a 12-year record that we can use to characterize interannual changes in the vegetation," said DeFries. "The Pathfinder AVHRR Land data are the only globally consistent information that's available for that length of the record."

## Reference(s)

See also the Global Land Cover Project at The Laboratory for Global Remote Sensing Studies, and:

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