Semi-annual Report, July to Dec. 2001
University of Arizona/ NAS5-31364

1. TASK OBJECTIVES

During the second half of 2001 we concentrated our efforts in the following areas:

1) MODIS VI algorithm development, maintenance, and enhancements,
2) MODIS Aggregation algorithm development;
3) MODIS VI product press release and public outreach,
4) MODIS VI compositing research,
5) Coordinate MODIS VI work with MODLAND and land products,
6) Evaluation of reprocessed MODIS VI products,
7) Assessment of the MODIS VI product for long-term studies in the Colorado Delta,
8) MODIS VI product validation within LBA and U.S. sites,
9) MODIS VI QA development and documentation,
10) SCF (in-house) production system, maintenance and upgrades,
11) TBRS-SCF web server reconfiguration and maintenances,
12) Spatial/temporal extensions of MODIS VI long-term stability monitoring charts.,
13) In-house production system, code development, maintenances/upgrades.
14) Investigation of artifacts and anomalies in MOD13Q1, MOD13A1, and MOD13A2,

2. WORK ACCOMPLISHED

Based on the above objectives work was divided into 4 categories

- Algorithm development,
- SCF maintenance and in-house code development
- MODIS VI press release and brochure
- Colorado delta MODIS VI time series analysis and assessment for research
- Science research

2.1 Algorithm and Code development, maintenance, and enhancements

The MODIS VI algorithm required several changes to address problems related to upstream product changes. These changes were made to accommodate new science ideas, and to optimize the production system. In doing so, both the L2 (MOD09) surface reflectance product and L2G gridded product changed sufficiently to require adjustments to all downstream products including the MODIS VI algorithm and MODIS Aggregation algorithm. Both the filtering and compositing schemes were modified in the MODIS VI algorithms.

The MODIS Surface Reflectance aggregation algorithm went through some changes due to the upstream product changes mentioned above. An agreement with all MODAGG product users to reduce the product size to less than 50% of the current size was also accomplished after

testing. The current algorithm generates a product that varies in size from one layer to four layers, depending on the L2G input and latitude of the area. Two new versions of our MODIS VI Algorithms were delivered:

September 2001 delivery:

a. MOD13A1, and MOD13A2 Version 2.2.8
b. MODAGG Version 2.2.8
c. MOD13Q1 Version 2.2.8

November 2001, delivery:

a. MOD13A1, and MOD13A2 Version 2.2.9
b. MODAGG Version 2.2.9
c. MOD13Q1 Version 2.2.9

Additional code developments included:

- We modified the Mosaicking algorithm to handle all MODIS VI products and resolutions (1km, 500m, and 250m). This code was further modified to correct product anomalies,
- Projection code was modified to work with the ISUNUS projection .
- The press release for our MODIS VI product required a new reprocessing code to correct spatial and temporal anomalies and to produce special mosaics that were used to generate the global VI maps.
- The Colorado delta time series (one year) was animated to produce a vegetation dynamics map of the area.

The MODIS VI algorithm had some anomalies that were attributed to its downstream interpretation of the land aerosol QA flags. The problem is summarized in the following graph (Fig. 1):

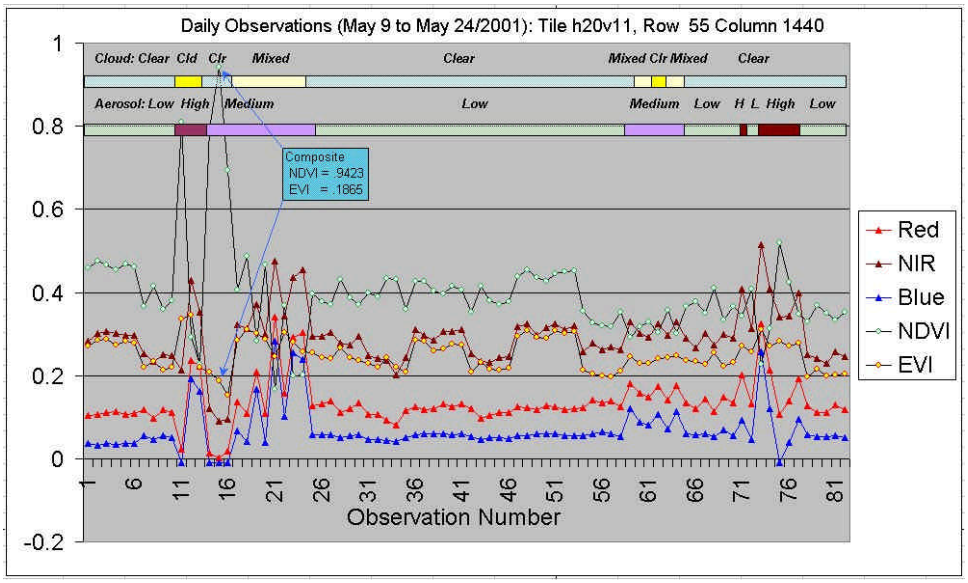


Figure 1. VI compositing performance under high aerosol condition

In the above graph it is obvious that the compositing algorithm is producing very high NDVI values under high aerosol conditions. This error was due to the misinterpretation of the aerosol QA flag. This was later attributed to a filtering bug, which allowed high aerosol pixels to be used during compositing. The actual procedure should have filtered all high aerosol contaminated pixel. The algorithm required substantial changes to the filtering process to avoid this sort of problem. The following graphs illustrate the difference between the algorithm results before and after correction (Fig. 2):

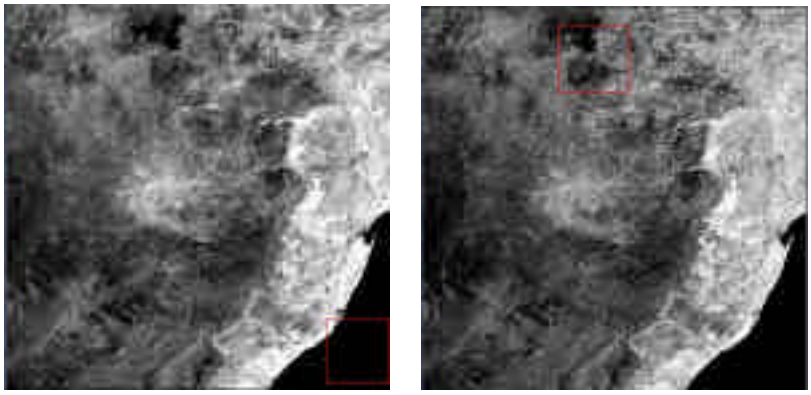


Figure 2a. MODIS NDVI after and before correction of the high aerosol anomaly

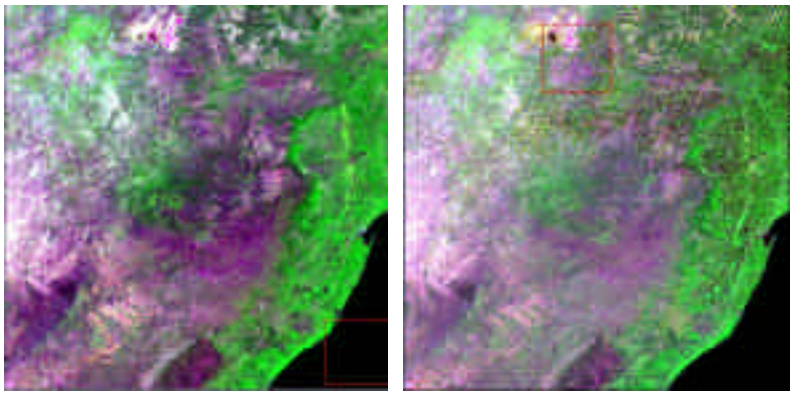


Figure 2b. MODIS False Color Red/NIR/Blue after and before correction of the high aerosol anomaly

Other issues with the algorithm that were addressed were:

- Accommodations for the new QA flags changes in L2/L2G
- Changes to both the MCF files for all algorithms and File specifications
- Use of the observation coverage to weigh observations before compositing. This change is expected to make the MODIS VI 500m and 250m more spatially consistent.

2.2 Quality Analysis/ Quality Control (QA/QC)

We also conducted extensive QA and QC evaluations of the MODIS VI products to both assess version 3 products and to evaluate the changes made to the algorithm in addressing the changes. A few problems were noticed and these were subsequently fixed. Notably, the MOD09 aerosol correction was passed as quality flags in the L2G product and was misinterpreted in the VI algorithm, leading to unreasonably very high VI values and a spatially incoherent product over certain areas of the globe. This problem was addressed by making extensive changes to the filtering process prior to actual compositing.

The LDOPE group reported inconsistent NDVI versus EVI values over the Okavango Delta, Botswana. They found that NDVI and EVI values were significantly uncorrelated and also showed a strong land cover dependency of this effect. We investigated the same issue found in MOD13A2 V3 product for a compositing period of 2001 (129-144). Over the Caspian sea and Volga river, the NDVI and EVI showed completely opposite values with the NDVI being very high and the EVI being very low. The NDVI values were found to be very high because these targets had very low red reflectance values and slightly larger NIR reflectance values. Thus, the red-NIR spectral signatures of the targets were similar to those of green vegetation over extremely dark canopy background or shadow. This may result from an over-correction of atmospheric effects. These issues with associated imagery were presented at:

(http://landdb1.nascom.nasa.gov/cgibin/QA_WWW/displayCase.cgi?esdt=MOD13&caseNum=DR_MOD13_01274&caseLocation=/web/QA_WWW/MOD13/cases_data/DR_MOD13_01274)
.

BRDF Compositing Method

Some of the latest MOD13A2 products have been generated by the BRDF compositing algorithm (module) although they were supposed to be composited by the CV-MVC technique. An action was taken to switch back to the CV-MVC compositing algorithm.

Compositing Period	MOD13A1	MOD13A2
2000-337	CV-MVC	BRDF
2000-353	CV-MVC	BRDF
2001-097	CV-MVC	CV-MVC
2001-113	CV-MVC	CV-MVC
2001-129	CV-MVC	CV-MVC
2001-145	-	CV-MVC
2001-257	CV-MVC	CV-MVC
2001-273	CV-MVC	-
2001-289	CV-MVC	BRDF
2001-305	CV-MVC	BRDF
2001-321	CV-MVC	BRDF
2001-337	CV-MVC	BRDF

MODIS VI Long Term Stability Monitoring (LTSM)

During this period, we spatially extended our long-term stability monitoring (LTSM) sites by including 4 additional sites in the Atacama desert, Chile and one additional site in the Saharan desert, Tunisia. The additional sites in the Atacama desert were selected so as to cover a range of brightness (the average NIR reflectance values range from 0.2 to 0.55). The new site in the Saharan desert was selected from a slightly brighter, more homogeneous area than the original site (Figs. 3, 4).

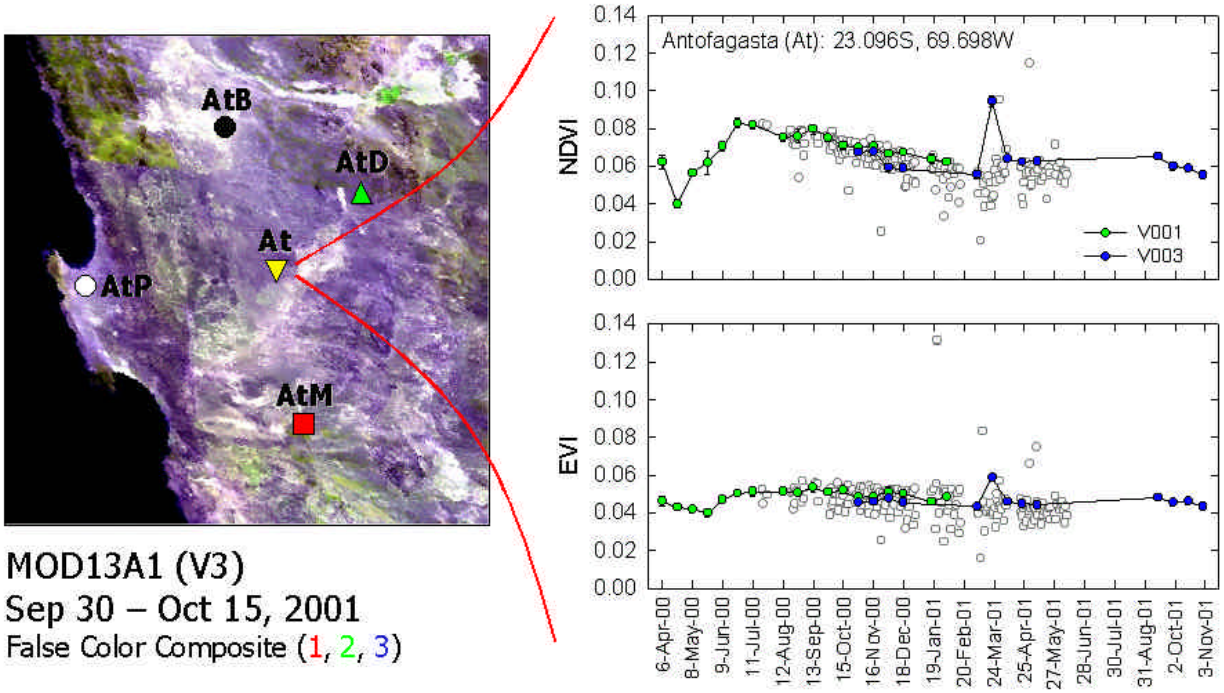


Figure 3. MODIS VI LTSM sites in the Atacama desert.

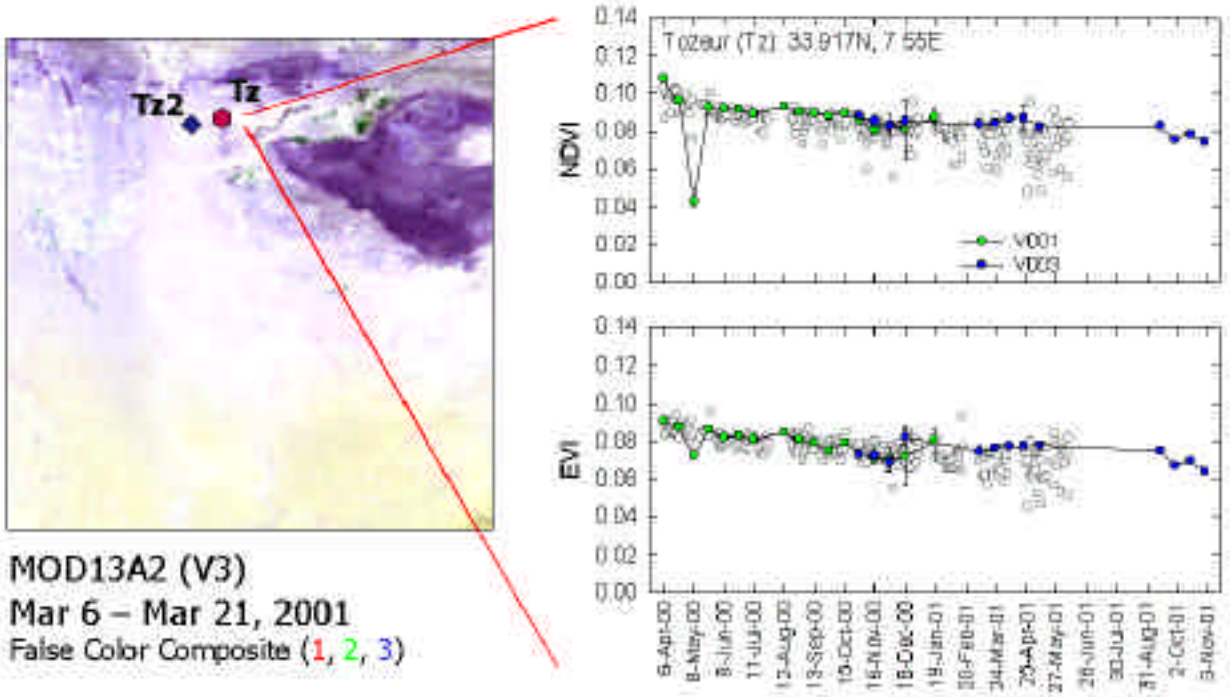


Figure 4. MODIS VI LTSM sites in the Saharan desert.

In addition to a continuous temporal extension of the LTSM charts, as new data sets are being produced, we initiated pair-wise, time-lag comparisons of the extracted data sets (Fig. 5). If there are consistent changes in VI values (e.g., due to a sensor degradation), will not scatter aaway from the 1:1 line. At this point, 1 month to 1 year time lags with similar geometries were used to investigate the relationships, which showed the consistent decrease in the VI values. We will continue this analysis as it will require, at least, a two year data set to have reliable results.

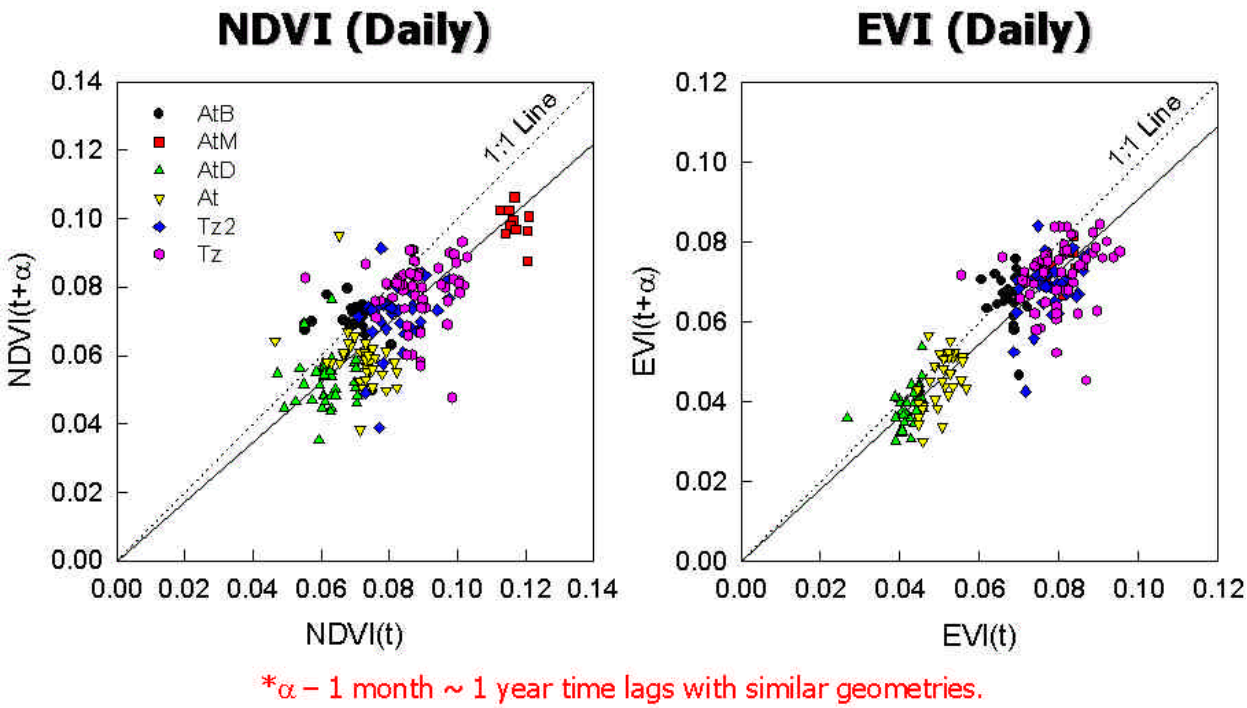


Figure 5. Pair-wise, time-lag comparisons of VI values for the LTSM sites.

2.3 SCF Maintenance

As the collection 3 (V3) data sets started being produced, we upgraded our in-house processing system to be capable of handling both the collections 1 and 3 data sets. In addition, the system was upgraded to accommodate a new set of in-house (TBRS) core sites that includes the additional LTSM (long-term stability monitoring) sites.

The in-house MODIS archive system was built on the SQL database. It populates information of each tile processed through the in-house production system. The system serves for a quick access to the in-house processing history/logs for the operational QA purposes, and quick retrievals of in-house archived data. The information stored in the database include metadata, quick look images, and backup media types and serial numbers. The web-based front end to access the database was also made in the Java language. They were originally built for Windows 2000 system. As our operating system was upgraded to Linux 7.1, a whole code/scripts were migrated to the Linux system. The main page of the web-based, in-house data archive search engine and example search results are diagrammed in Figs. 6, 7.

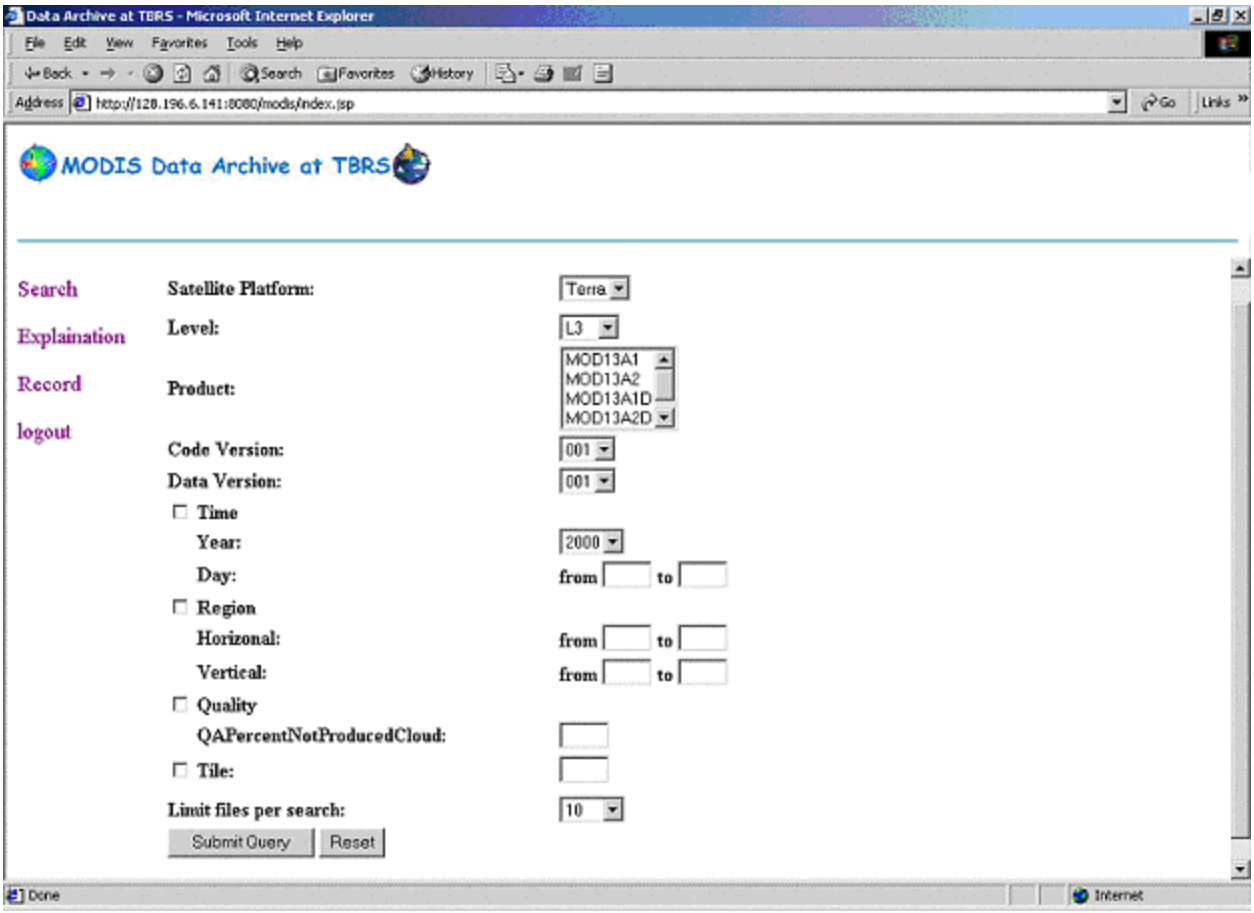


Figure 6. Main page of the web-based, in-house data archive search engine.

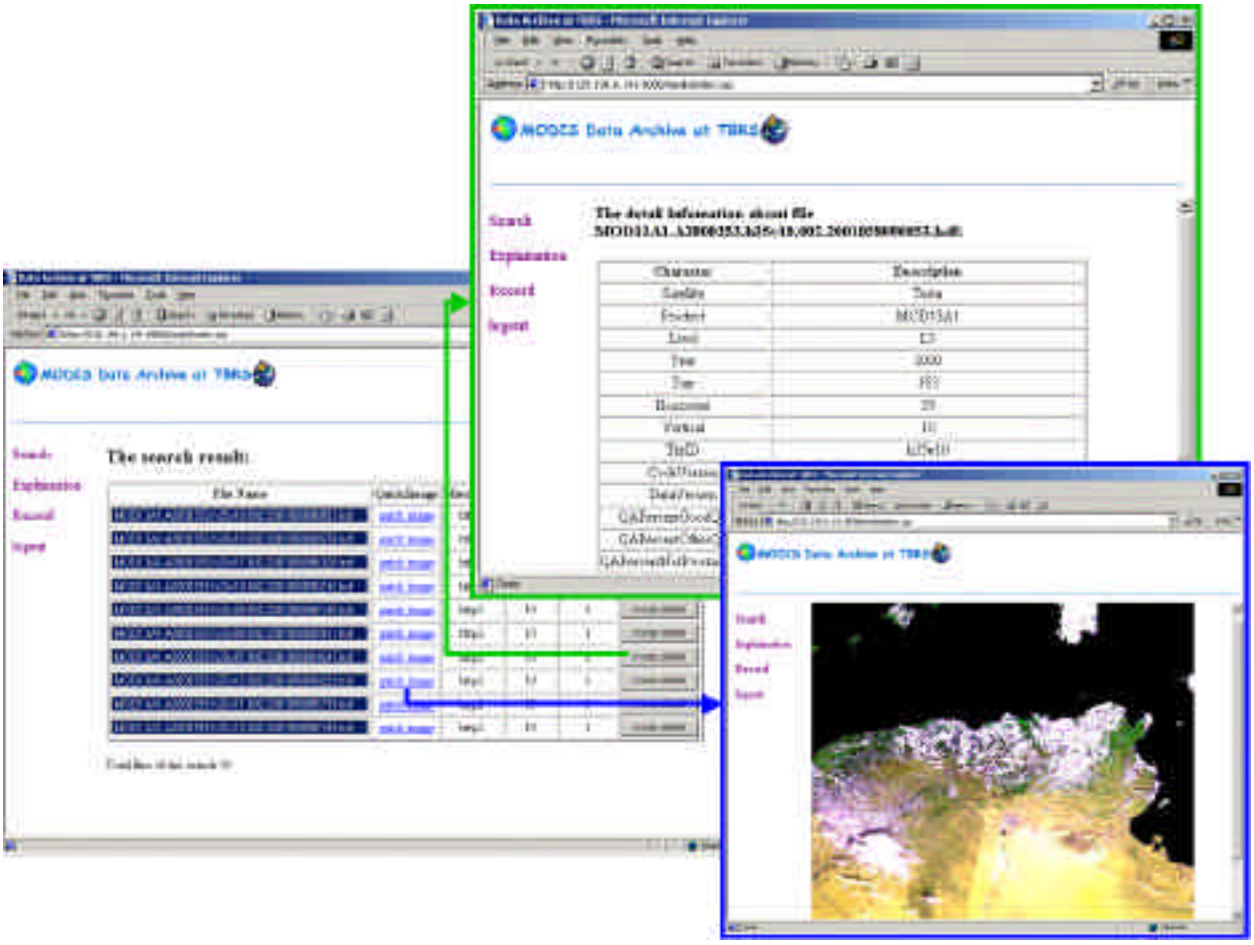


Figure 7. Example search results. By clicking the appropriate links, the metadata and quick looks can dynamically be retrieved.

Specific SCF maintenance/upgrade items included:

- Web server OS upgrade from Windows 2000 to Linux 7.1
- Recompilation of Linux kernel to support a SGI-XFS file system protocol
- Installations and re-configurations of Appache web server, SQL, and Java
- Replacements of two monitors
- Installation of S-plus version 6
- Replacements of two DLT tape drives
- Our SGI system is now running IRIX 6.5.11f
- Installation of the new ENVI version 3.5, which handles better MODIS products.

The operating system of the TBRS web server was upgraded from Windows 2000 to Linux 7.1 to have a better integrity with the TBRS SGI system and to have better security. The kernel was recompiled to support SGI XFS file system protocol and its data hard drive has been mounted to the SGI system for easy data sharing.

We are also planning for the new RAID system (~730 GB) which was purchased earlier but needs for more hardware. This RAID system will be operational in a month pending NASA approval of the additional capital items.

2.4 Public Outreach

Our MODIS VI products were highlighted in a Press release in December 2001. The release focused on the new global EVI and required a large effort on our part to produce a consistent year of VI data. This release highlights the products, its structure, accomplishments, uses, and strengths. We focused on three themes for the Press release:

- Global seasonal EVI and NDVI change
- Continental vegetation dynamics in North and South America
- Regional vegetation dynamics in arid regions, using the U.S. Southwest and in particular the Colorado Delta wetlands vegetation change due to upstream water release in contrast to seasonal changes. Daily EVI images of the Southwest tile (h08v05) at 250m, 500m, and 1km for a period of 2000-129 thru 2001-160 were generated. These images have been animated and are posted on the TBRS-SCF website for public outreach.

The current release could be found on the following URL:

http://earthobservatory.nasa.gov/Newsroom/EVI_LAI_FPAR/
and
http://earthobservatory.nasa.gov/Newsroom/NasaNews/2001/200110175254.html

Example images used for the press release are displayed below (Fig. 8):

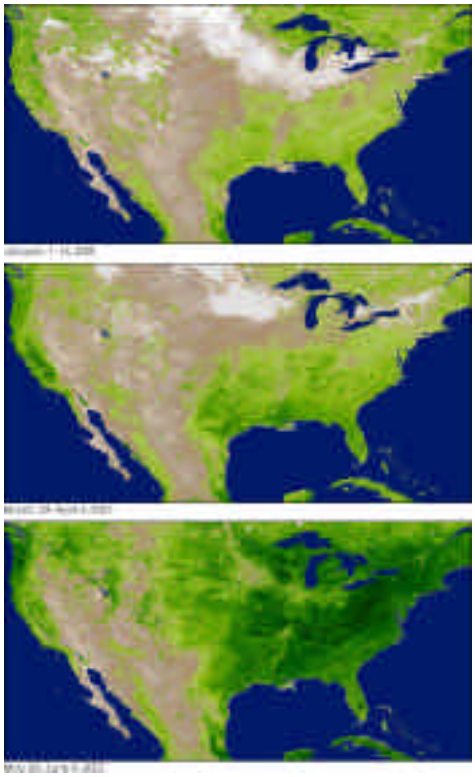


Figure 8. Seasonal vegetation change in North America (MODIS EVI, 2000-2001)

MODIS Data product Brochure

Currently our MODIS VI product is being showcased on many web pages, with instructions on how to acquire the MODIS VI data. In the same spirit of reaching to the science community and the public at large, we were also tasked with generating global NDVI and EVI images to be used in the MODIS product brochure. The following images were submitted (Figs. 9-11):

Figure 9: MODIS EVI (top) and NDVI (bottom) for October 2000

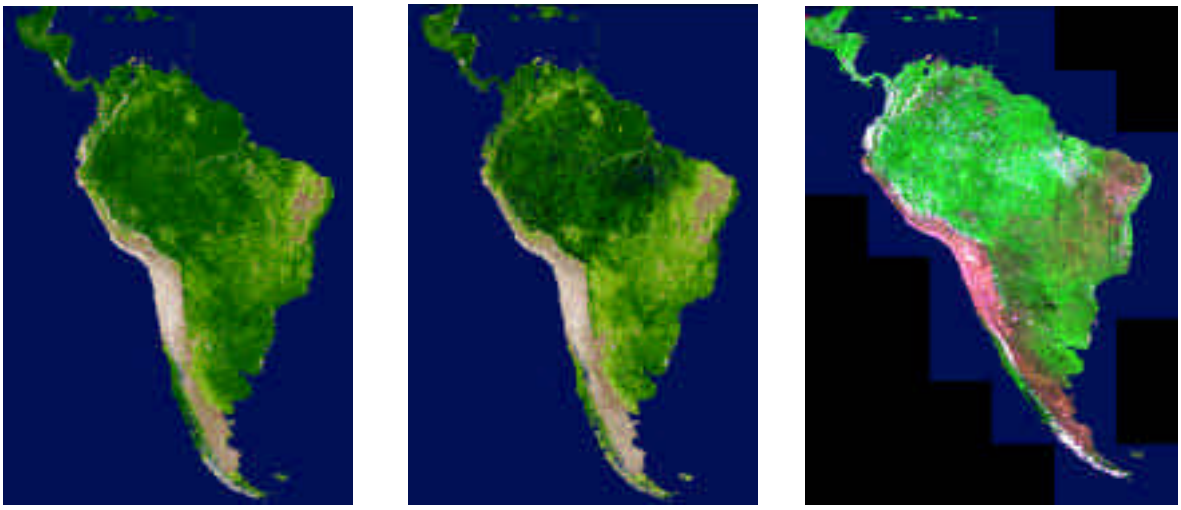
Figure 10 shows the projected MODIS global mosaics at 1 km resolution. Figure 11 shows the projected continental mosaics for South America at 500 m resolution.

NDVI MOD13A2 DOY 273, 2000 1km

EVI MOD13A2 DOY 273, 2000 1km

RNB MOD13A2 DOY 273, 2000 1km

Figure 10. MODIS global mosaic 1km resolution, Mollweide projection



NDVI MOD13A1 DOY 289 Mollweide projection | EVI MOD13A1 DOY 289 Mollweide projection | RNB MOD13A1 DOY 289 - ISIN projection

Figure 11. MODIS South America continental mosaic 500m resolution

To promote public outreach we also submitted a manuscript to "GeoWorld" on using MODIS imagery for environmental work. The article emphasized how to search for and order MODIS imagery through the EOS Data Gateway. The manuscript was submitted in October and appeared in the December, 2001 issue.

2.5 MODIS VI Applications

As part of showcasing the capabilities of MODIS VI we conducted a time series analysis of the Colorado Delta using 1km/500m and 250m VIs. This work was later presented by Dr. Ed Glenn and Dr. Pamela Nagler to a conference on the Colorado Delta. The goal was to assess the spatial and temporal capabilities of MODIS data to such research. We attempted to evaluate how useful MODIS VIs (NDVI and EVI) would be for studies of the Colorado Delta vegetation dynamics and change. The work required analyzing and producing a one-year time series for the Colorado Delta with the hope of illustrating how valuable MODIS could be for such research.

Although the MODIS resolution is coarse (250m/ 500m), its' temporal resolution makes up for this shortcoming (Fig. 12). We managed to produce vegetation maps for the region at 16-day and daily intervals. An animation of the vegetation change was produced and indicated that vegetation in the wetland region is changing mostly due to water releases upstream and not in response to the growing season. This research is still ongoing through a cooperation agreement with the Environmental Research Lab of the University of Arizona (ERL).

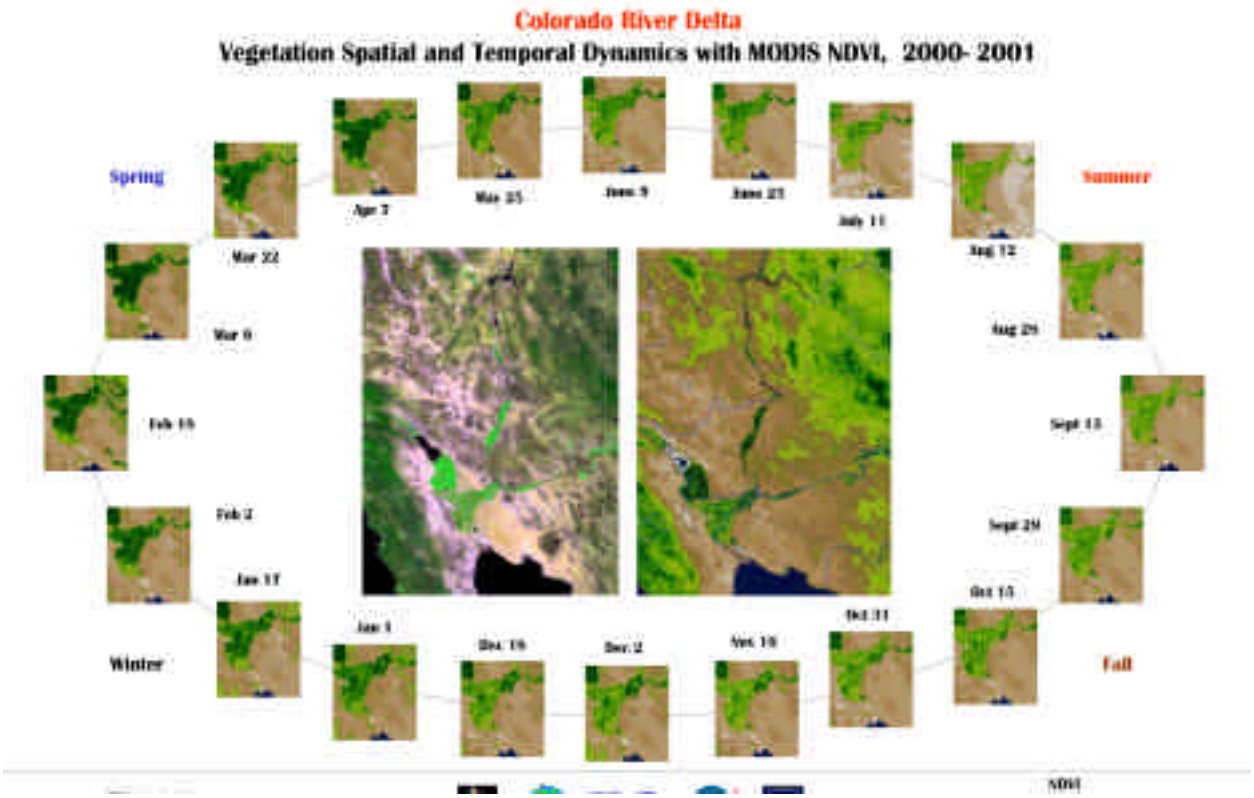


Figure 12. Colorado Delta vegetation dynamic

Currently we're attempting to develop some metrics for vegetation dynamics using the MODIS VI. These new metrics are being computed on a global and regional basis, and include:

- Accumulated VI maps over a year.
- Maximum and Minimum VI change maps
- VI change derivatives to assess vegetation response to natural and human induced phenomena.
- Start and end of the growing season and length of the growing season.

This work is still ongoing, however, some results are presented for the initial test on a 20km resolution global data set. The metrics being used now are very simple, and more work is expected on this type of research (Fig. 13).

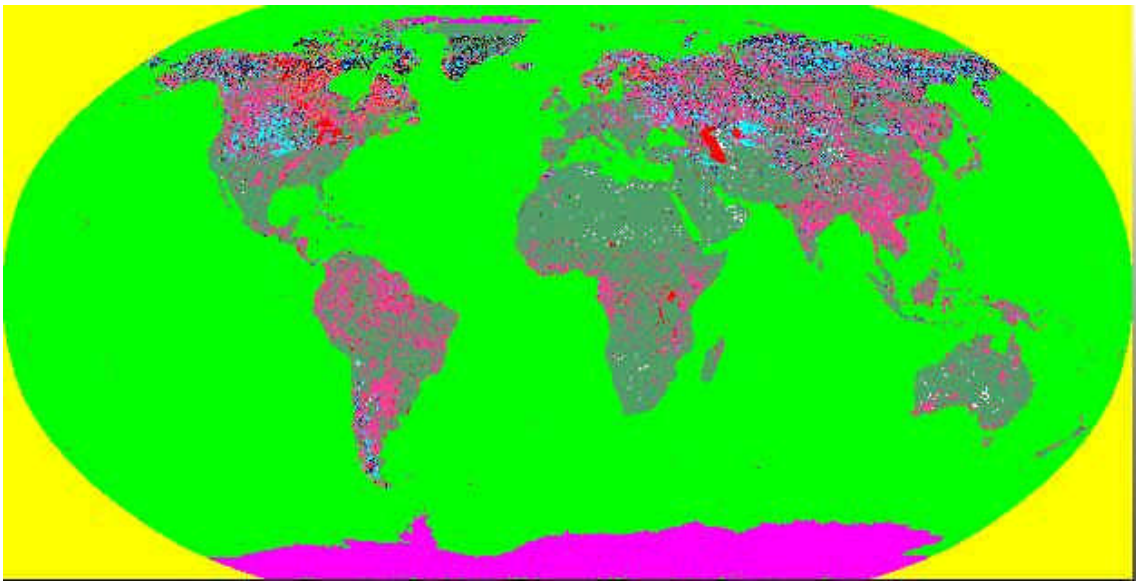


Figure 13a. Maximum NDVI Change (Maximum vegetation changes) Red and Magenta highest, green low

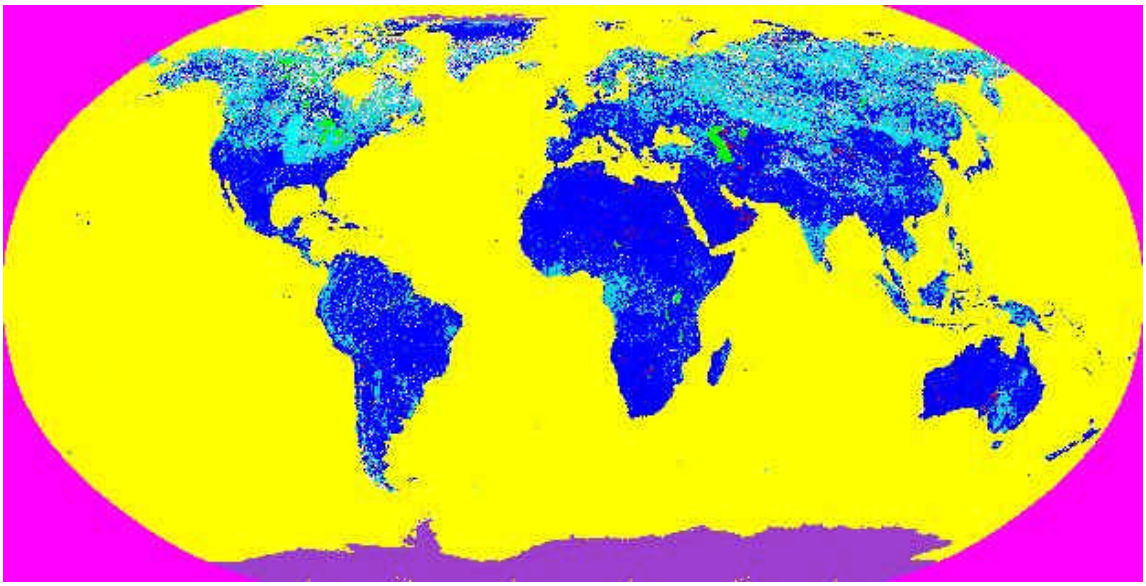


Figure 13b. Minimum NDVI Change (lowest vegetation activities). Cyan higher than blue.

2.6 Validation

LBA sites

As part of our "Large Scale Biosphere-Atmosphere Experiment in Amazonia" (LBA) initiative we conducted a field campaign from July 9th to August 2nd in Brasilia - DF (Brasilia

National Park), Palmas - TO (Araguaia National Park), and Santarem – PA (Tapajos National Forest) (Figs. 14, 15) . For MODIS validation activities within LBA, we flew MQUALS over two sites, the Brasilia National Park (BNP) and surrounding areas, and the Araguaia National Park (ANP) and surrounding areas in July – August, 2001. The MQUALS package consisted of an ASD FieldSpec Pro FR (400 – 2500 nm), Olympus Digital Camera (natural color with 1600x1200 resolutions), and Garmin III+ GPS, for this specific MQUALS flight campaign. Simultaneous ground data of selected radiometric and biophysical parameters (i.e., %cover, fAPAR, and LAI) were also acquired at several sites. We used MQUALS ASD data as a reference and used an ETM+ image to scale-up the reference data to MODIS spatial resolutions. Airborne ASD-FR data sets were collected over the BNP and ANP on July 21 and July 26, 2001, respectively (Fig. 16) . Part of the ASD data over the intensive ground measurement sites (250m-by-250m) were extracted and convolved to MODIS and ETM+ bandpasses to be compared with the ETM+ and MODIS images.

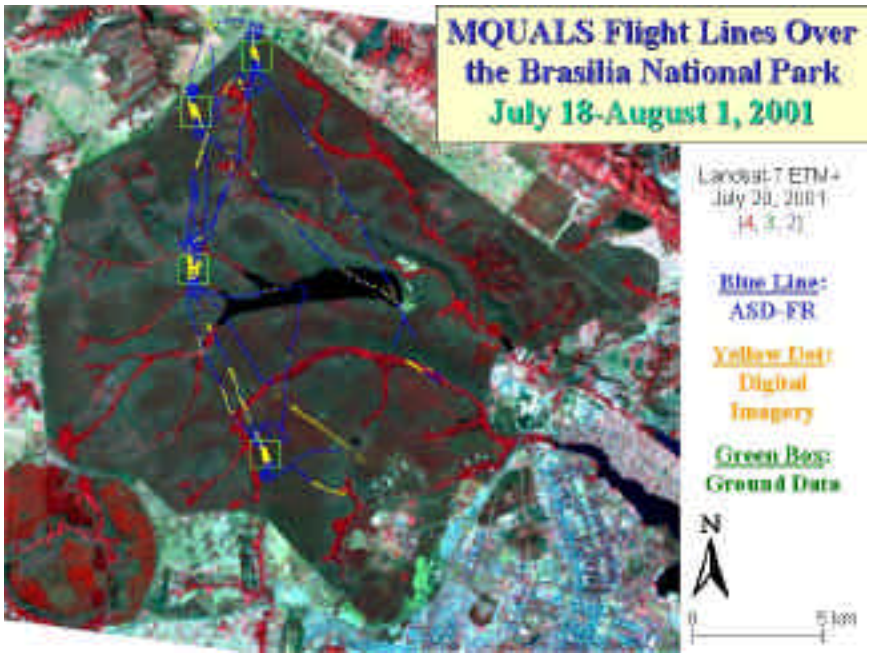


Figure 14. MQUALS flight lines over the Brasilia National Park, Brazil.

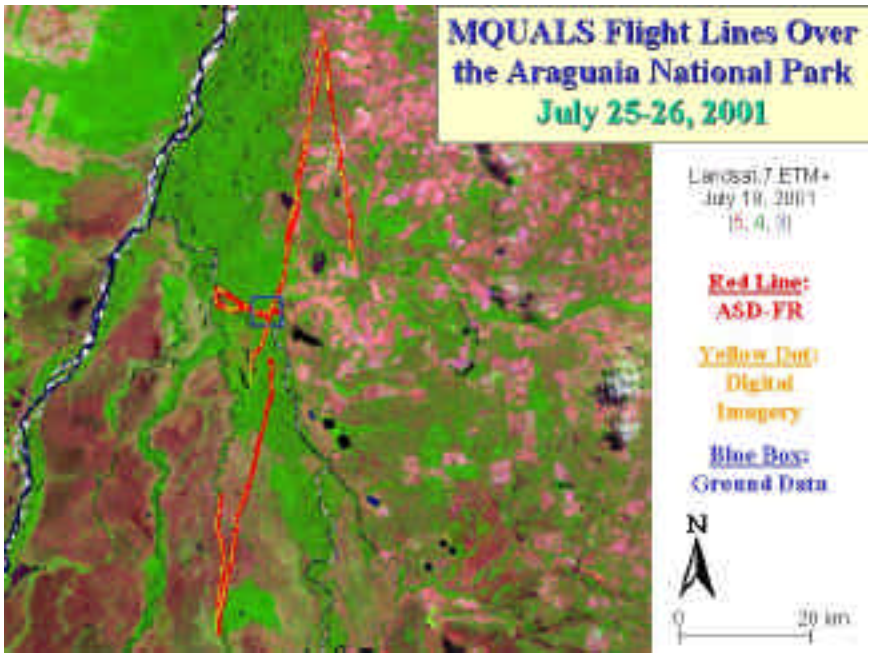


Figure 15. MQUALS flight lines over the Araguaia National Park, Brazil.

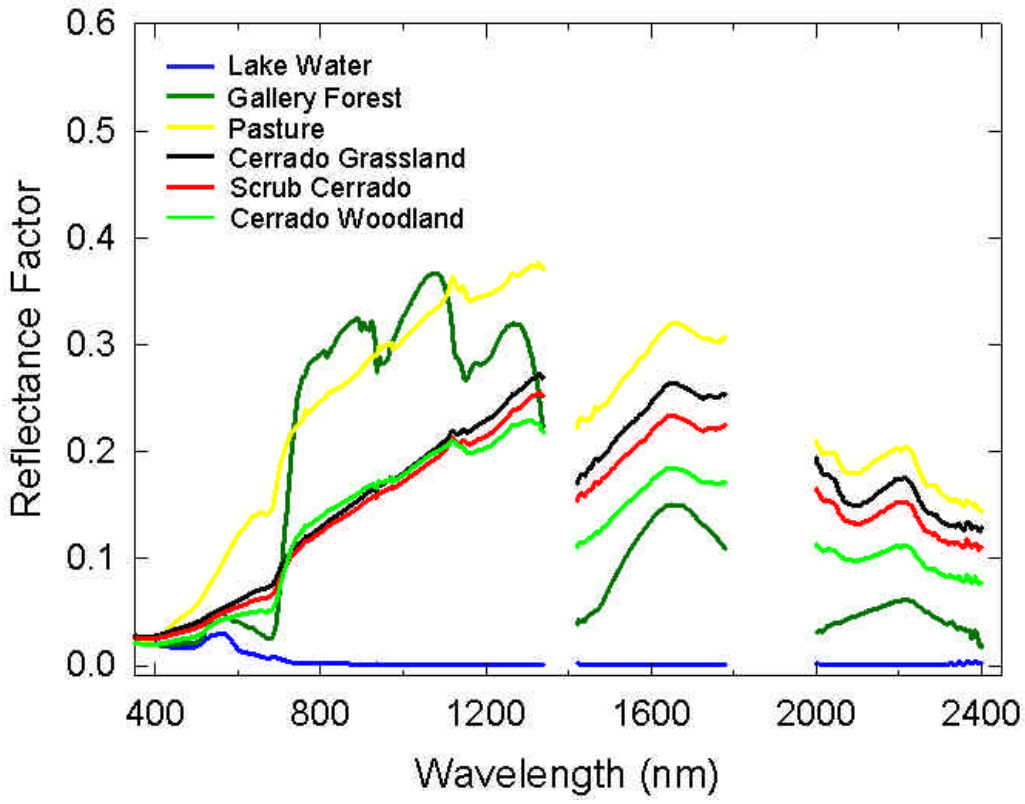


Figure 16. Example of Airborne ASD spectra over various land cover classes.

Harvard Forest

In August we flew MQUALS at Harvard Forest, Massachusetts in collaboration with the Bigfoot group and Boston University. This involved selection of a flying service, mission planning, equipment preparation, coordination with ground crews, and several days of fieldwork. Following the mission we discovered a problem with the ASD data. Working with Tomoaki Miura and Ho-Jin Kim we were able to salvage the data with post-processing. Refinements were made to the geolocation of the digital imagery to reduce the spatial error from 450m to about 50m. Data for the mission were given directly to the Bigfoot team and made available through the TBRS Website. An ArcIMS site was built to show the results (Fig. 17).

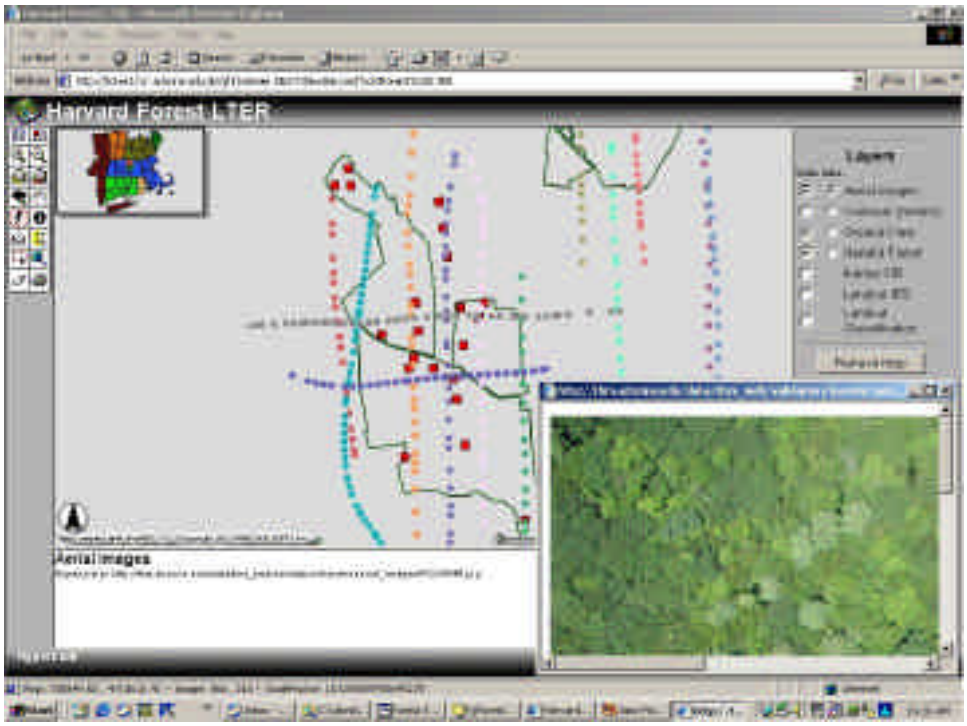


Figure 17. ArcIMS site giving public access to Harvard Forest MQUALS data. Every dot corresponds to an aerial image.

Walnut Gulch Experimental Watershed

We also attempted a flight at Walnut Gulch, but weather conditions forced us to abort the mission. As a result of our collaboration with Rachel Pinker, University of Maryland, we reanalyzed the MQUALS data from the 2001 missions at Walnut Gulch, Arizona. We determined that the albedo data were probably too noisy to be useful, but that the Exotech data were good. We compared the Exotech data from the airplane with ground Exotech data and with MODIS VI imagery (Fig. 18). We finished collecting leaf area index (LAI) data at Walnut

Gulch and completed analysis of the 2001 field data. The results showed a huge increase in LAI after the monsoons were underway.

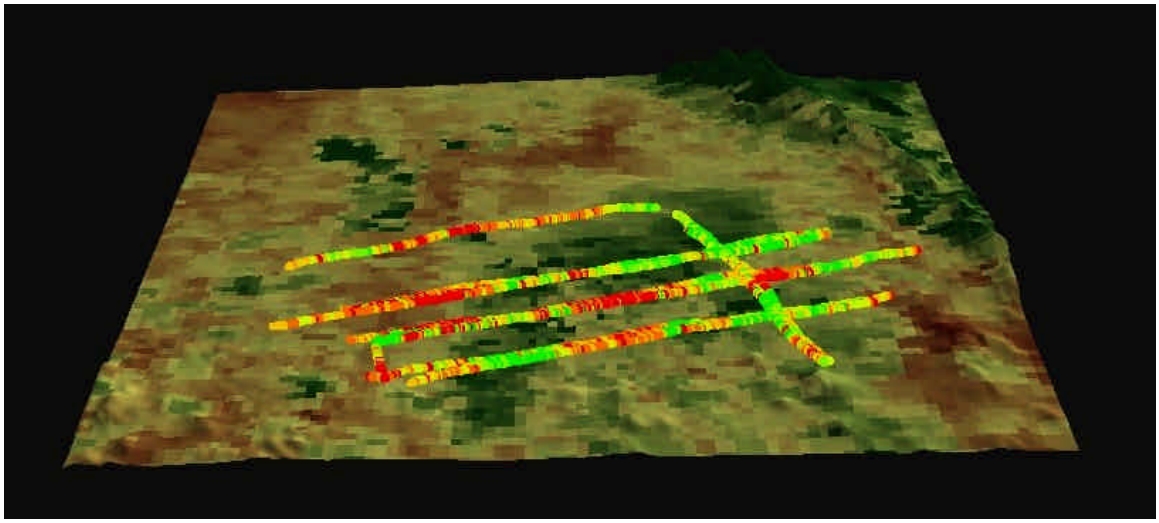


Figure. 18. Display of MQUALS EVI data superimposed over 250m MODIS EVI for Walnut Gulch. Rendered with ArcGIS 3-D Analyst (April 8, 2001 data).

2.7 AVHRR-MODIS continuity:

This project is an extension of the 2000-year comparison of MODIS NDVI and AVHRR NDVI data products in order to assess the improved sensitivity of MODIS, and evaluate the continuity of MODIS-NDVI for temporal monitoring of the Earth's global vegetation. MODIS and AVHRR data were extracted over numerous study sites in North America, covering the entire growing season over a range of biome types in the U.S.A. These data were plotted as seasonal profiles, including precipitation data when available (Fig. 19). NDVI histograms for North America were created for three different compositing periods, to see how each sensor depicts continental changes over North America (Fig. 20).

AVHRR-NDVI data, with water vapor correction was released starting with June 2000 data. AVHRR water vapor corrected data was plotted with available 2000 non-water vapor corrected AVHRR to complement the above study (Figs. 21, 22). AVHRR-NDVI data extracted for the year 2001 is all water vapor corrected. In general, the AVHRR-MODIS project is completed for year 2000 and approximately 90% completed for 2001. A large amount of effort has been focused on updating seasonal profiles and extracting AVHRR data over the TBRS validation core sites.

The AVHRR-MODIS project includes extraction of data of MODIS and AVHRR data products at 1 km resolution, with the purpose to maintain a continuity of a time series covered during 2000-2001 growing season of the North America TBRS sites. MODIS 16-days composited period and bi-weekly AVHRR composited images are extracted. For the year 2000

NOAA-14 AVHRR products were extracted, and due to the degradation of this satellite, the NOAA-16 AVHRR data is used for the year 2001.

Data extraction and statistical computations are done semi-automatically on a Unix environment, and data manipulation and plotting are done semi-automatically on a Windows environment. Data analyses is based on statistical data obtained for each site, and seasonal plots and cross plots derived from them. For regional analysis the North America histograms covering several periods over the growing season. In all cases MODIS has shown its improved sensitivity over AVHRR.

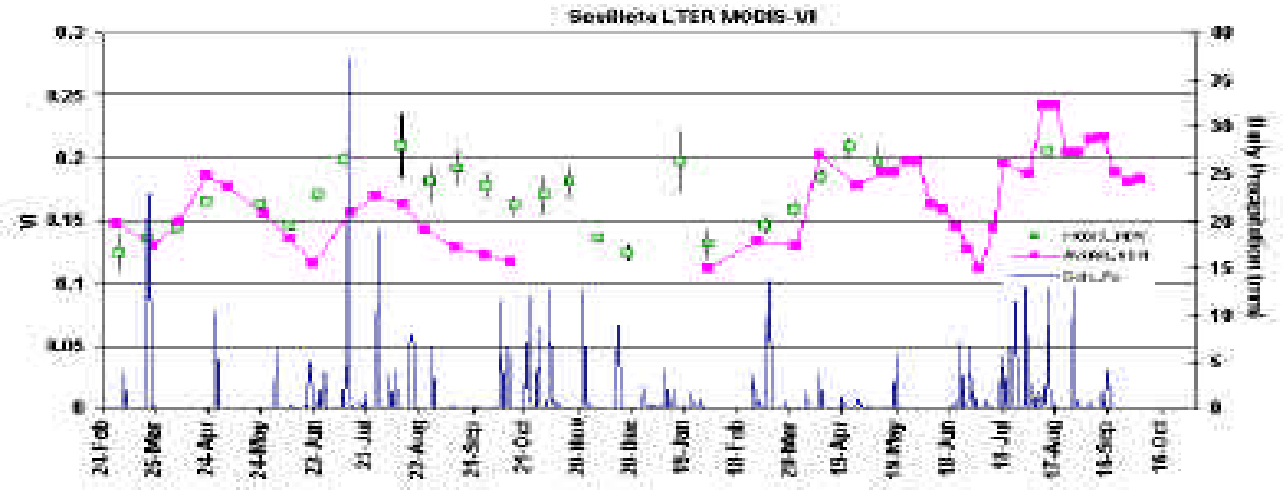


Figure 19. Example of MODIS MOD13A2 seasonal profiles over Sevilleta, and NDVI histogram of North America.

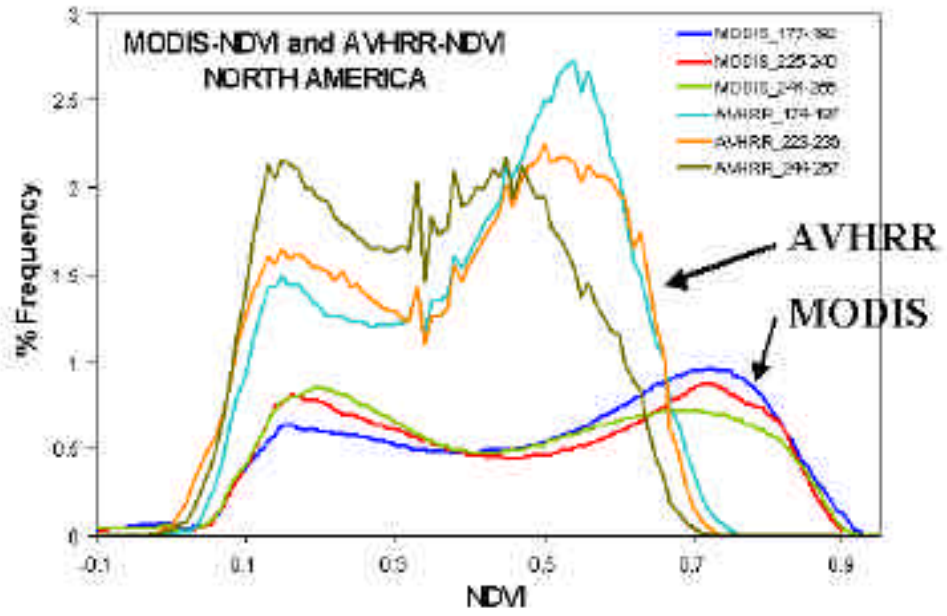


Figure 20. NDVI histogram of North America as depicted by MODIS and AVHRR sensor.

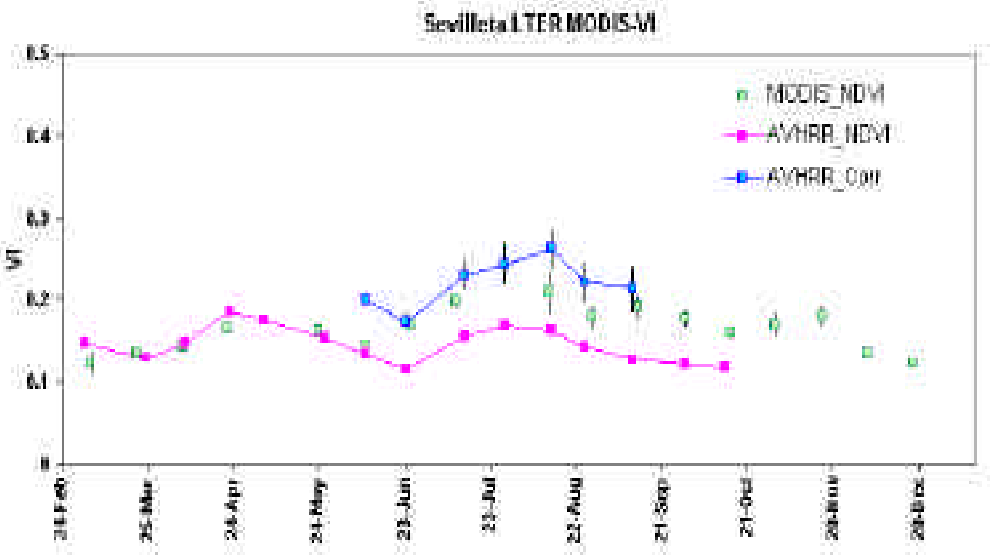


Figure 21. Sevilleta seasonal profile of MODIS-NDVI and AVHRR-NDVI during 2000 with available AVHRR water corrected data.

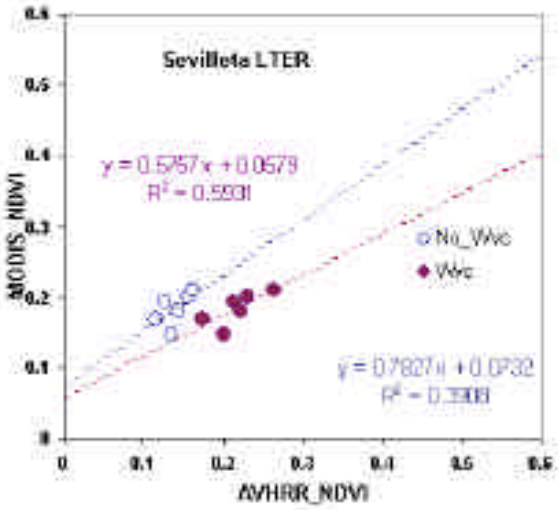


Figure 22. Sevilleta cross plot of MODIS-NDVI and AVHRR-NDVI during 2000 including only period with available water corrected data.

3. PUBLICATIONS AND MEETINGS

3.1 Peer-reviewed publications

Miura, T., Huete, A. R., Yoshioka, H., and Holben, B. N. (2002), An error and sensitivity analysis of atmospheric resistant vegetation indices derived from dark target-based atmospheric correction, *Remote Sens. Environ.* 78:284-298.

Huete, A., Didan, K., Miura, T., and Rodriguez, E., 2001, Overview of the Radiometric and Biophysical Performance of the MODIS Vegetation Indices. *Remote Sens. Environ. (special issue, in press)*.

Gao, X., Huete, A.R., Rodriguez, E.P., Didan, K., and Miura. T.(2001), Radiometric and biophysical validation of MODIS vegetation indices at La Jornada Experimental Range, Remote Sens. Environ. (in revision).

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Gao, X., Huete, A.R., Miura., T., and Didan, K., 2002, Validation of MODIS vegetation indices at parallel sites in Mendoza, Argentina and New Mexico, USA using multiple fine spatial resolution data, Journal of Geophysical Research (to be submitted)

3.2 Symposia and Conferences

Miura, T., Didan, K., Huete, A. R., and Rodriguez, E. P. (2001). A performance evaluation of the MODIS vegetation index compositing algorithm. *Proceedings of IGARSS 2001 Symposium, July 9-13, Sydney, Australia*

Huete A., Miura T., Didan K. and Rodriguez P., A Performance Evaluation of the MODIS Vegetation Index Compositing Algorithm. *Proceedings of IGARSS 2001 Symposium, July 9-13, Sydney, Australia*

Huete A. R., Didan K. et. al., Regional Amazon Basin Analyses with MODIS Vegetation Indices: Early Results and Comparisons. Brazil 2001.

Huete, A., K. Didan, et. al, 2001. Vegetation dynamics and Seasonal Responses of North and South America from EOS-MODIS Vegetation Indices, AGU 2001 Fall Meeting, San Fransisco, CA. Dec. 10-14, 2001

Huete, A. R., Didan, K., Miura, T., Rodriguez, E. P., Gao, X., and Ferrira, L. G. (2001), Vegetation dynamics and seasonal responses of north and south America from EOS-MODIS vegetation indices, *MODIS Science Team Meeting, Baltimore, MD, December 17-19*.

Huete et. a. MQUALS talk at MODIS MST

3.3 Reports

Two new reports on the MODIS VI status published on the web
MODIS VI press release published on the web.
MODIS VI for Colorado Delta vegetation dynamics power point presentation.

Schaub, D., and Huete, A. (2001). NASA's MODIS Sensor Aids Environmental Studies. GeoWorld 14(12), 46-48.

3.4 Future Meetings:

Miura, T., Huete, A., and Ferreira, L. (2002), Discriminating land cover types and conversions in the Brazilian cerrado using airborne hyperspectral remote sensing data, *29th International Symposium on Remote Sensing of Environment, Buenos Aires, Argentina, April 8-12*.

Huete, A., Gao, X., Miura, T., Ross Bryant, R., Moran, S., and Hotlifield, C. (2002), Multiple scale analyses of land degradation at the Nacuñan reserve, Argentina with Hyperspectral EO-1 and MODIS data, *29th International Symposium on Remote Sensing of Environment, Buenos Aires, Argentina, April 8-12*.

Rodriguez, E. P., Didan, K., Huete, A. R., and Miura, T. (2002), Application of MODIS vegetation indices to monitor the seasonal responses and water use impacts over the Colorado Delta Area, NW Mexico, *29th International Symposium on Remote Sensing of Environment, Buenos Aires, Argentina, April 8-12*.

Miura, T., Huete, A. R., Yoshioka, H., and Kim, H.-J. (2002), An application of airborne hyperspectral and EO-1 Hyperion data for inter-sensor calibration of vegetation indices for regional-scale monitoring, *IGARSS 2002 – 24th Canadian Symposium on Remote Sensing, Toronto, Canada, June 24-28*.

Huete, A., Didan, K., Rodriguez, E. P., Miura, T., Ferreira, L., and Ratana, P. (2002), Seasonal dynamics of the Brazilian cerrado, transition, and rainforest with MODIS vegetation index products, *IGARSS 2002 – 24th Canadian Symposium on Remote Sensing, Toronto, Canada, June 24-28.*

Rodriguez, E. P., Didan, K., Huete, A. R., and Miura, T. (2002), Vegetation monitoring of wetland and riparian areas along the Colorado River Delta, NW Mexico, with MODIS data, *IGARSS 2002 – 24th Canadian Symposium on Remote Sensing, Toronto, Canada, June 24-28.*

Huete, A., Didan, K., Rodriguez, E.P., Miura, T., Ferreira, L., Ratana, P., (2002), Seasonal dynamics of the Brazilian cerrado, transition, and rainforest with MODIS vegetation index products, *IGARSS 2002 – 24th Canadian Symposium on Remote Sensing, Toronto, Canada, June 24-28*.

Yoshioka, H., Miura, T., Yamamoto, H, and Huete, A. (2002), A technique of inter-sensor VI translations using EO-1 Hyperion data to minimize systematic differences in spectral band-

pass filters, *IGARSS 2002 – 24th Canadian Symposium on Remote Sensing, Toronto, Canada, June 24-28*.

4. Future Activities for the next 6 months (January – June 2002)

- MODIS VI algorithm enhancements for Collection 4 reprocessing
- Global Analysis of MODIS EVI and NDVI

QA/QC

- LTSM; Temporal extensions of daily VI values and continuation of temporal trend analyses

MODIS-LBA

- Continuation of Correlative Comparisons between MQUALS-ASD and MODIS

MODIS-AVHRR

- Analysis of MODIS-AVHRR VI product continuity by spectral bandpass simulations from MQUALS-ASD and EO-1 Hyperion image for regional-scale monitoring (Brazil)
- Download AVHRR data for the year 2001 with no water vapor correction
- Download historical AVHRR data

In-house Production and SCF

- Integration of the In-house Production System and Web-based In-house Database Search Engine

Validation Activities

- Two Brazil Field Campaign and MQUALS (May 15 – June 1 & July 15 – Aug 15, 2002)

Public Outreach

- Prepare MODIS short course for visiting students
- VI – outreach workshops