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TASK OBJECTIVES

During the second half of 2000, we concentrated our efforts product evaluation and adjustments; QA, and field validation activities. Much effort was also placed on validation activities at the Brazil-LBA validation core sites at Brasilia and Tapajos. We finished the MODIS Vegetation Index Users Guide for the EDC DAAC and are preparing peer review articles for MODIS special issue journals.

- ❖ New code submissions of MOD13A1, MOD13A2 and MOD13A3 vegetation index products.
- ❖ Completion of 250 m code delivery and its preliminary analysis.
- ❖ New submission of a revised aggregation code.
- ❖ Continued development of QA tools and data management plan.
- ❖ Brazil-LBA validation activities at Brasilia and Tapajos sites
- ❖ AVHRR comparisons with MODIS composited data
- ❖ Vegetation Index User's Manual for the EDC-DAAC
- ❖ Investigation of artifacts and anomalies in the VI image products.

WORK ACCOMPLISHED

1. MODIS Algorithm development and maintenance

Kamel Didan has focussed on the development and maintenance of the MODIS VI algorithm suite, which include:

- ❖ 16 day 1km NDVI/EVI
- ❖ 16 day 500m NDVI/EVI
- ❖ 16 day 250m NDVI/EVI
- ❖ Monthly 1km NDVI/EVI
- ❖ 16 day CMG NDVI/EVI
- ❖ Monthly CMG NDVI/EVI
- ❖ Daily MODIS aggregated surface reflectance product

This suite of algorithms went through four major revisions, mostly to deal with changes in upstream products (MOD09 surface reflectance). The current versions allow for production under three different scenarios; (1) combined 250m and 500m production; (2) separate 250m and 500m production; and (3) only 500m production. The current versions are optimized to produce data under all conditions, in order to avoid gaps in the final products.

Right before launch, the MODLAND team decided that a global 250m NDVI was unachievable due to disk space requirements and we were instructed to develop a 500m version as a replacement for the 250m algorithm. Later on, and through special arrangements, the 250m MODIS VI algorithm was being considered at reduced production (5-10 %) and we suggested that a 250m EVI could be added to the standard 250m NDVI product by using the 500m blue channel. The suggestion was accepted and a new MODIS 250m VI product was developed and named MOD13Q1 (Q stands for quarter km) to separate it from the 500m MOD13A1. Currently two separate versions are being maintained, one running on the standard MODAPS production system (SGI), and the other especially developed for the 250m DEC production system. The current versions are:

- ❖ 16 day 1km NDVI/EVI: Version 2.2.2
- ❖ 16 day 500m NDVI/EVI: Version 2.2.3
- ❖ 16 day 250m NDVI/EVI: Version 2.2.3
- ❖ Monthly 1km NDVI/EVI: Version 2.0.1
- ❖ 16 day CMG NDVI/EVI: Version 1.0.0
- ❖ Monthly CMG NDVI/EVI: Version 1.0.0
- ❖ Daily MODIS aggregated surface reflectance product: Version 2.2.11

1.1 Algorithm science enhancement and revisions

This effort is centered on maintaining the algorithms in response to various MODLAND requirement changes, in-house product evaluation and findings, and production enhancement. When the early MODIS images/data were made available, our in house tests (part of the QA/QC early checks) indicated that the strict “No-Cloud” production was extreme and led to very patchy data sets (all cloudy and non perfect pixels were eliminated). Given the global aspect of the MODIS VI product and the persistence of clouds over the globe we realized that an algorithm fix was necessary. This effort was coordinated with the MODLAND team (through telecom, e-mail exchanges, and during the MODIS science team meeting) and we agreed that cloudy pixels are not to be dropped from the production any more, but rather will be used and flagged properly using the MODIS QA bits. So far, this decision turned out to be very beneficial and successful as depicted by our global MODIS VI maps.

<http://gaea.fcr.arizona.edu/projects/modis/data/pictures/vipics/pictures.html>

In order to achieve the above, the algorithms were modified to process three different data stacks:

- ❖ Ideal data sets (from the sixteen days), no clouds, good atmospheric correction, low view angle ($< 45^\circ$)
- ❖ Ideal_45 data sets as above but view angle $> 45^\circ$
- ❖ Cloudy data sets, where the MODIS cloud mask algorithm indicates cloud presence.

The above stacks are processed separately and in decreasing order, i.e., if no “Ideal” data exist we process “Ideal_45” and so on. Initial research indicates that the above decision greatly enhanced the performance of the compositing algorithm by eliminating excessive viewing angle

and helped in filling the gaps in the data sets. We also made a decision to suspend the BRDF (currently Walthall) model until further in house evaluation. Plans are being made to adopt another BRDF model with the sun-angle as one of the parameters. The above enhancements resulted in a 100% success rate of our algorithms on the MODAPS production system, and 100% global coverage as opposed to high rates of failure and patchy data sets (results can be checked on our internal server and on the “mtvs” server).

1.2 Production when EVI fails (clouds, snow, and ice)

Although scientifically not very significant due to the geographic location where this problem is noted, the EVI was shown to be anomalous over snow, ice and heavy cloud. This EVI problem emerged in two fashions:

- ❖ Greenness of snow, ice and cloud pixels
- ❖ Excessive FILL_Value, leading to patchy EVI data sets.

This problem was tracked and related to two reasons:
Blue channel excessively high and higher than red and NIR
EVI equation was optimized using vegetation data and no allowance for the above land covers was made.

- ❖ This problem is temporarily fixed through an algorithm modifications as follows:
- ❖ If EVI cannot be computed, replace by SAVI
- ❖ If no valid blue channel is present in any stack replace by SAVI

The above changes, although simple, required large changes to the algorithm code, and resulted and major enhancement to the VI product, see the following page:

http://tbrs.arizona.edu/~kamel/EVI_QA/EVI_QA.html

1.3 In-house VI-mosaicking

Because L3 MODIS land product are produced on a tile basis (1200km by 1200 km), we developed a special code to stitch these tiles into larger areas (up to the whole globe). This code was very useful in assisting our research, when large scale VI analysis is required (Check with Kamel about location and use). This code is also available for the three different MODIS VI product (250m, 500m and 1km).

1.4 MODIS VI User Guide:

The first version of the MODIS VI user guide is currently available:

http://gaea.fcr.arizona.edu/projects/modis/documents/UserGuide_doc.htm

This document serves the user community identify the MODIS VI product specifications, and shed light on its inner working and data format.

2. QA/QC (Miura)

QA/QC activities focused on implementing routine QA procedures and conducting science QA analyses for the algorithm performance evaluations.

- *Global mosaics (routine QA procedure)*: Global mosaics (browse images) of the MOD13A1 and MOD13A2 products were generated in order to visually examine product quality on a global scale. The Robinson projection was used at 5 km and 20 km spatial resolutions. A shell script and an IDL code were developed to re-project and stitch the MODIS tiles and these stitched products were color-coded (Figure 1). All these global mosaics have been posted and are accessible at:

<http://gaea.fcr.arizona.edu/projects/modis/data/pictures/vipics/index.htm>.

Several visits to LDOPE were made to conduct cooperative QA/QC analysis on our VI product and on MODAGG (surface reflectance aggregation). Kamel Didan works as liaison between our lab and the LDOPE in sorting issues pertinent to the status of our MODIS VI product. This effort requires the continuous monitoring of the specially designed home page for known issues and cautions about our VI product :

http://modland.nascom.nasa.gov/QA_WWW/MOD13/MOD13v2.cgi).

So far this effort lead to the complete elimination of all serious issues regarding our product and algorithms. It was also decided that our TBRs group will supervise this page and provide links to the status of the MODIS VI product (see section on EVI problem).

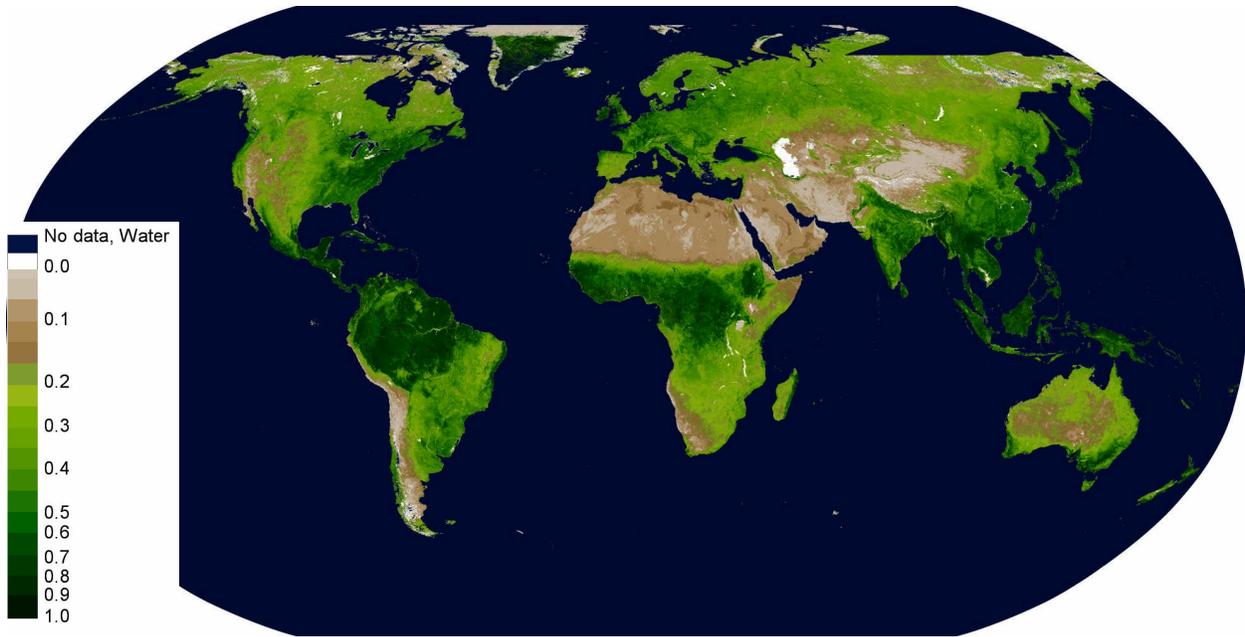


Figure 1. Global mosaic image of the MOD13A2 EVI for the compositing period of DOY 273-288, 2000.

- *Long term stability monitoring (routine QA procedure):* We have applied the concept of a quality control chart to the long term stability monitoring procedure of our product. Stability monitoring charts were generated for a hyper-arid area in Tunisia (Figure 2). In order to semi-automate this procedure, S-Plus software is being purchased. We will be performing the same procedure over another hyper-arid area (Atacama desert, Chile) and also attempt to use this procedure over dense evergreen forests.

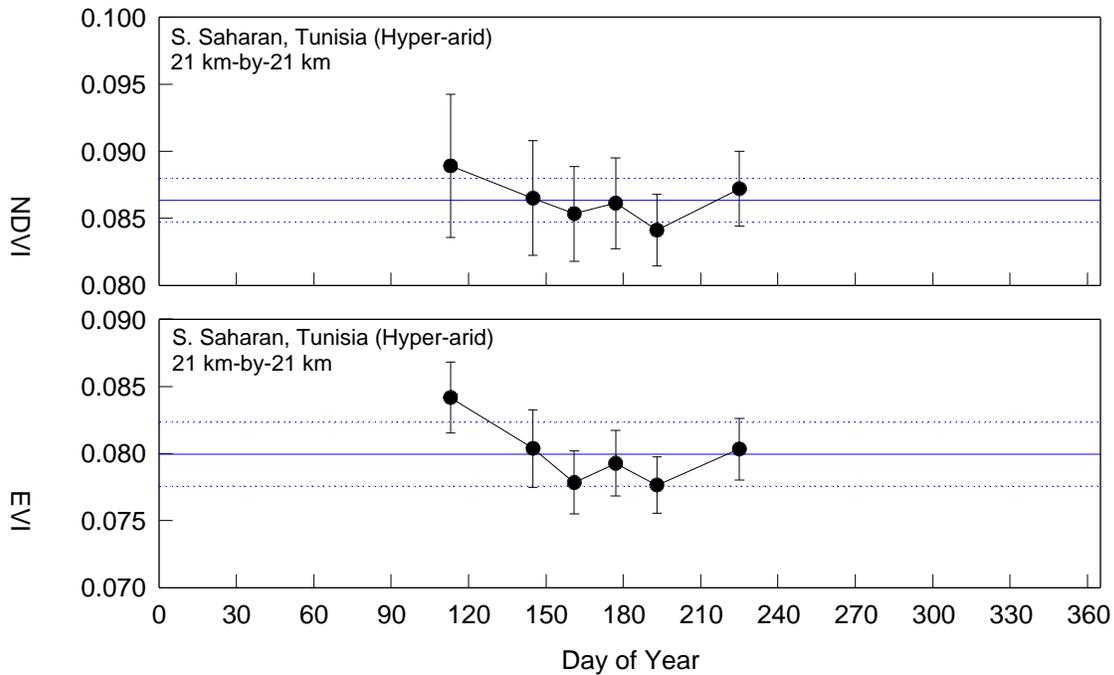


Figure 2. Stability monitoring charts for the MOD13A2 NDVI and EVI over the hyper-arid, South Saharan site in Tunisia. The solid blue lines are the reference VI values (mean) while the dotted blue lines indicate the upper and lower confidence limits (± 1).

- *Combinatorial analysis (science QA analysis)*: As aerosol corrections have been implemented for the MOD09 products starting on day 273, we have updated a color lookup table for the QA map generation (Figure 3). We also investigated and attempted to rank the quality of the MODIS VI products based on the information documented on QA and sun/view angle SDSs of the products (Figure 4). The preliminary results of these analyses were presented at the AGU 2000 Fall Meeting. After a thorough analysis is completed, we plan to incorporate the results (quality ranking) into the VI usefulness index bit fields within the VI quality SDSs.
- *Web*: The goals and overview of the QA/QC activities were summarized in a homepage (<http://gaea.fcr.arizona.edu/projects/modis/documents/qa/qa.html>). These pages will be updated as progress is made.

3. Data Management

During this period, we revisited and adjusted the SCF data management plan. We first determined what types of data would be needed for QA, evaluation of VI, and validation of the VI algorithms/products and then purchased additional hard disks to meet the new requirement. The data sets being accumulated include:

- MOD13A1 and MOD13A2 global coverage every 16 days,
- Their daily input products over the 30 VI validation "core" sites for nadir-view days,
- Their daily input products over the "golden" tiles.

The new plan is being implemented and several shell scripts, perl scripts, and c-codes were developed to automate files and directory organizations (Figure 5).

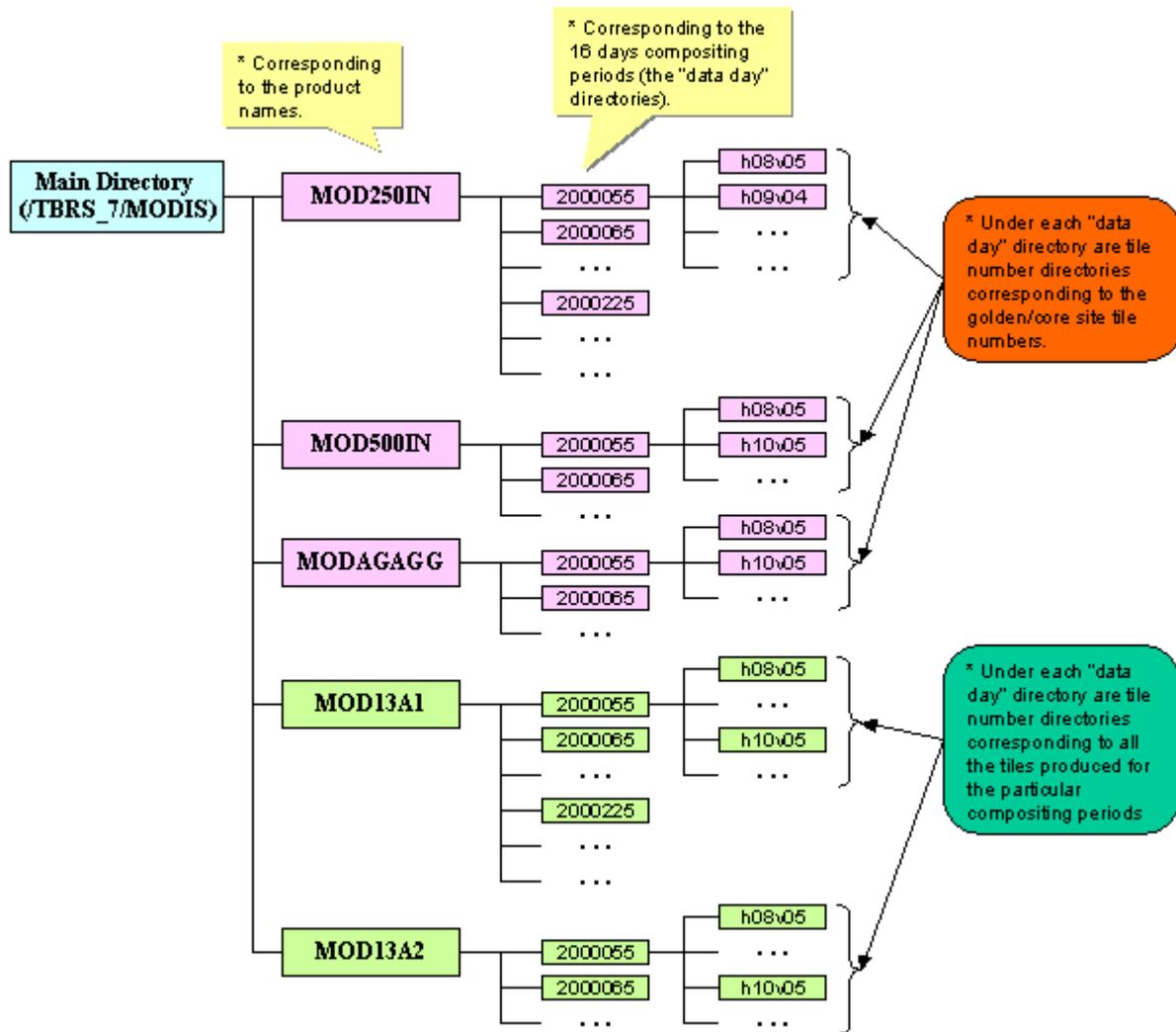


Figure 5. TBR5-SCF data directory structures for storing/archiving MODIS data for QA, VI evaluation, and validation of the VI algorithms/products.

We also developed a html-based database system to document/inventory in-house data availability and a perl script search engine (Figure 6).

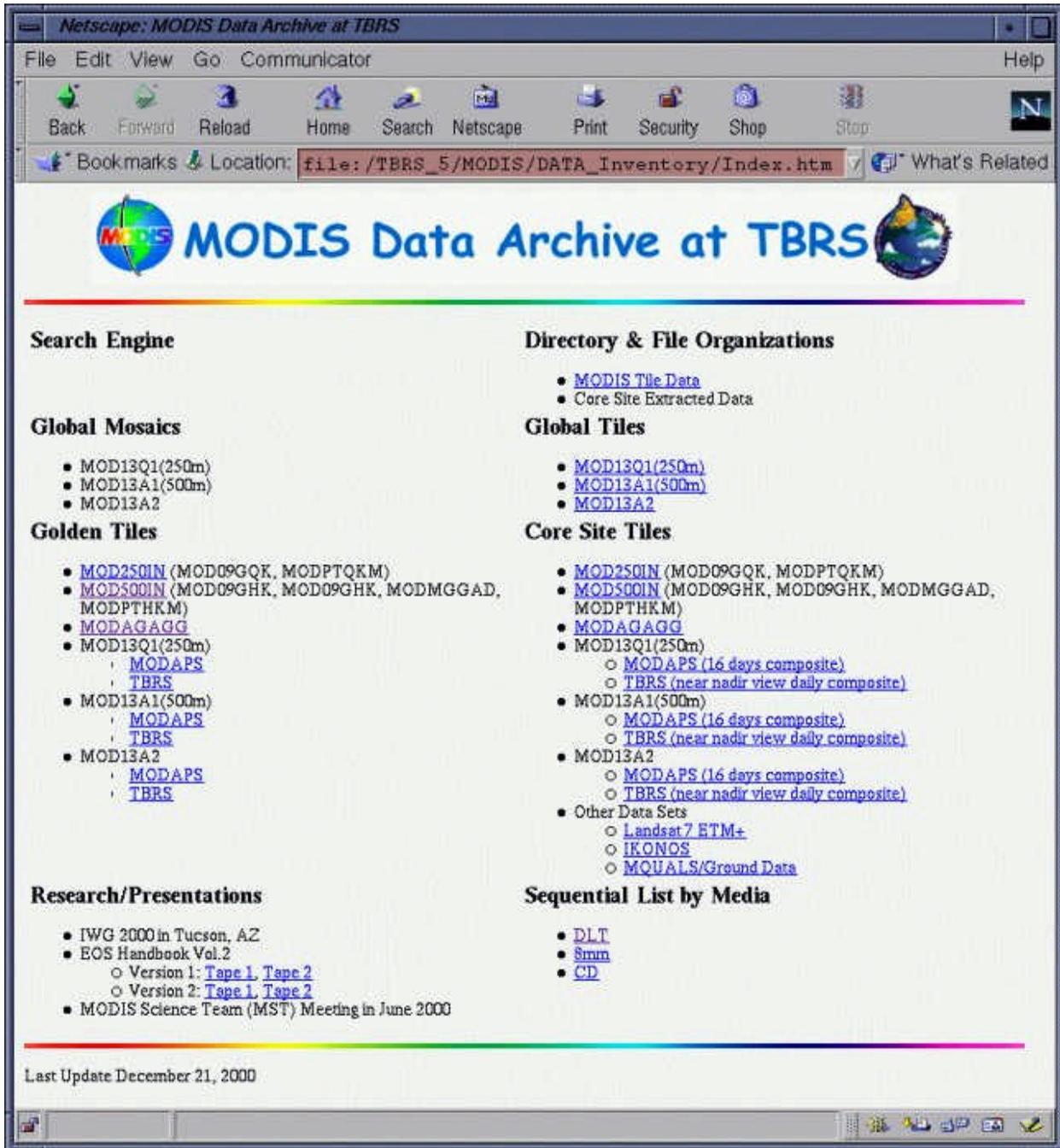


Figure 6. The front (index) page of the HTML-based MODIS data inventory system.

4. Validation

4.1 Reflectance calibration of the MQUALS multispectral digital camera:

In order to re-characterize after hardware upgrades/fixes and increase an operational shutter speed, the MQUALS DyCam multispectral digital camera was re-calibrated. The updated, new configurations allow for imaging with a 5 ms shutter speed, which results in pictures with less blurring appearances, especially for a low altitude flight (~150 m AGL). The developed calibration procedures and results were summarized in a paper submitted to the Journal of Arid Environments.

4.2 Jornada Experimental Ranch, New Mexico, September 27-13, 2000

In September, we went back to La Jornada (New Mexico) in order to collect ground and airplane data for the wet season. The survey flights took place September 27 - 30 at La Jornada and Sevilleta sites (short grassland). The MQUALS package was mounted onto the USDA-ARS plane out of Weslaco, Texas. The MQUALS package was mounted onto the USDA-ARS plane out of Weslaco, Texas. We collected both *in situ* (field) radiometric and biophysical data with 250m ~ 1km pixel sizes at various solar zenith angles over (1) grassland, (2) transitional, and (3) mesquite sites in the Jornada experimental range as part of the MODIS validation activities.

From Aug 29, 2000, we started a 16-day multitemporal validation activity in Jornada Experiment Range with the purpose of validating the compositing aspects of the MODIS VI algorithm as well as validating biophysical – VI relationships by providing the opportunity to monitor the sites for the entire growing season over a range of green LAI conditions. We accomplished 4 trips: Aug 29, Sep 14, Sep 30, and Oct 14, which coincided with the overpass of MODIS (nadir-looking at the site) and ETM+. We stopped at Oct 14 since the vegetation status was stable. During each trip, we have made as many runs of radiometric measurement as possible in the grassland site in order to characterize the effect of solar zenith angle on the vegetation indices. From the biophysical point of view, every revisit we used vertical line point intercept technique to estimate percent cover and LAI of the same transect, collected some biomass quadrat samplings along the transect, separated green part from yellow for each sampling, used LAI-3000 to quantify the green LAI, oven-dried and weighed the green and yellow biomass, etc. This end-to-end vegetation analyses helped us to better understand the vegetation indices as biophysical interpretation. The Jornada multitemporal validation effort, although incomplete for a thorough VI validation due to incomplete biophysical data which captured the dry down only of multitemporal profile, has provided a good start pointing and useful insights for the next year's validation activities. Based on the experiences and lessons we have learned, better validation data sets are expected to be collected in a more consistent manner in the future.

5. MODIS - LBA

In the last 6 months, two field investigations were carried over the 'Large Scale Biosphere-Atmosphere Experiment in Amazonia (LBA)' experiment, a joint effort by both the

Brazilian and the U.S. governments (NASA). We focussed on evaluating and validating the MODIS Vegetation Index (VI) products over two of the LBA core sites, the Brasilia National Park (Brasilia, DF) and the Tapajos National Forest (Santarem, PA). We also collected top-of-canopy surface reflectance data and LAI-fAPAR data which could be used in validation of other MODland products.

The first field campaign, from July 1st to July 16th, took place at the Tapajos National Forest, in the Amazon forest region (Santarem, PA). For this work, a true cooperative effort among the Terrestrial Biophysics and Remote Sensing lab (University of Arizona), The Brazilian Space Research Institute (INPE), and the Brazilian Agricultural Organization (Embrapa Cerrados), ground biophysical measurements, depicting the structure and conditions of the vegetation, and ground and airborne radiometric data were acquired over two different types of primary seasonal forest and their associated land use / land converted classes (cultivated pasture and eight different growth stages of secondary forest).

Our other field campaign, from July 17 to 20, was at the Brasilia National Park, the largest LBA core site in the Cerrado region (Brazilian savanna). This work, particularly focused on the airborne data acquisition and carried out during the mid-stages of the dry season, complemented a previous and longer campaign conducted from April 16th to May 5th (end of the wet season), so that the strong seasonal contrast of the Cerrado region could be evaluated from a remote sensing perspective.

Ground and airborne data were collected at the Brasilia National Park, which encompasses the major true savanna formations encountered in the Brazilian Cerrado biome, for both the wet and dry seasons (April 16 through May 5 and July 17 through 20, respectively), while at the Tapajos National Forest, dominated by the seasonal Amazon tropical forest, data collection was concentrated during the dry season (July 1 through 16, 2000).

The next two months after these field activities were spent on the data processing, organization, and report writing. In addition, through the LBA metadata editor (Beija Flor), a complete description on the nature and extension of the acquired datasets was submitted to the LBA Data Information System (DIS). Thus, our results have been made public and available, upon request, to the other investigators involved with the LBA project.

6. GLI - MODIS

Algorithm development and maintenance

We developed the new GLI VI compositing algorithm allowing for the processing of 18 channels, this included special allowance for their cryosphere algorithm. We also developed the interface for the GLI atmosphere algorithm (not the science part). We prototyped the GLI algorithms with SeaWiFS data and have begun doing this with MODIS data. We provided our Japanese counterparts some initial ideas on how to deal with MODIS L1B data.

I attended the GLI science team workshop, held in Kanazawa, Japan in November 2000 and gave a GLI-VI presentation and a Validation presentation. We currently maintain a the GLI project home-page on our server:

<http://gaea.fcr.arizona.edu/projects/gli/index.htm>

7. AVHRR-MODIS continuity:

One-year of 1-km composited AVHRR-NDVI data was acquired for the conterminous U.S. and compared with the equivalent 1km MODIS-NDVI product. The objectives were to (1) assess the performance of MODIS VI data; (2) investigate the issue of "continuity" with respect to long-term VI data sets; and look for improved sensitivities from the MODIS instrument. To accomplish this goal, MODIS and AVHRR data products were acquired through the 2000 growing season. MODIS and AVHRR subsets were extracted over selected EOS validation core sites, as well as over additional sites, in order to encompass a wide range of land cover types. A total of 14 compositing periods were used throughout the year. The MODIS data products were not corrected for aerosols during this period, making the comparisons more instrument related. One of the main difficulties was dealing with the differing projections and attempting to avoid reprojection such that data was resampled and distorted. We wrote several shell scripts were to semi-automate the data extraction procedure from each of the scenes. Since temporal data was analyzed, all steps were performed biweekly for the MODIS data (six tiles), and weekly for the AVHRR products (overlapping biweekly data). Data extracted were organized under a directory structure by sites. Optimal window size extracts were analyzed as well as the several cycles of MODIS recalibrations. We evaluated both the multitemporal profiles (seasonal dynamics), histograms, and crossplots of the two data sets.

Time series analysis and cross-plots results showed that the MODIS and AVHRR NDVI are correlated across the range of vegetation types, but with a reduced sensitivity of the AVHRR-NDVI values. MODIS-NDVI showed a 30% higher overall response over the AVHRR-NDVI products, but this varied with the seasons with minimal differences during the dry season. Both MODIS sensitivity and atmosphere (water vapor) influences within the AVHRR NIR band contributed to these differences. Although the AVHRR-NDVI was more vulnerable to the atmospheric influences, the analysis of the histogram structures for MODIS and AVHRR NDVI's at a regional scale, showed similar structures with the significantly reduced dynamic range for the AVHRR-NDVI values.

8. Publications and Meetings

8.1 Peer-reviewed publications

Miura, T., Huete, A. R., and Yoshioka, H. (2000), Evaluation of sensor calibration uncertainties on vegetation indices for MODIS, *IEEE Trans. Geosci. Remote Sensing* 38(3):1399-1409.

Yoshioka, H., Miura T., Huete, A. R., and Ganapol, B. D. (2000), Analysis of vegetation isolines in red-NIR reflectance space, *Remote Sens. Environ.* 74:313-326.

Yoshioka, H., Huete, A. R., and Miura, T. (2000), Derivation of vegetation isolines in red-NIR reflectance space, *IEEE Trans. Geosci. and Remote Sens.* 38(2):838-848.

Gao X., Huete, A.R., Ni W., and Miura T. (2000), Optical –biophysical relationships of vegetation spectra without background contamination. *Remote Sens. Environ* (in press).

Miura, T., Huete, A. R., Yoshioka, H., and Holben, B. N. (2000), An error and sensitivity analysis of atmospheric resistant vegetation indices derived from dark target-based atmospheric correction, *Remote Sens. Environ.* (submitted).

Miura, T., Huete, A. R., Keita, F., Batchily, A. K., Yoshioka, H., and Gao, X. (2001), Reflectance Calibration of the MQUALS Multispectral Digital Camera, *Journal of Arid Environment* (submitted).

Ferreira, L.G., and Huete, A.R., 2001, "Assessing the seasonal dynamics of the Brazilian Cerrado vegetation through the use of spectral vegetation indices", *Int. J. Remote Sens.* (submitted)

Didan K., Huete, A., Miura, T., Sadashiva D., Wolfe R., and Roy D., "Spatial aggregation of MODIS surface reflectance products for land remote sensing: an overview and evaluation of the algorithm", *Remote Sens. Environ. Special Edition* (in preparation).

Huete, A., Didan, K., Miura, T., and Rodriguez, E.P., "Overview of the radiometric and biophysical performance of the MODIS vegetation indices", *Remote Sens. Environ. Special Edition* (in preparation).

8.2 Reports

Miura, T. (2000), A science QA activity plan for the first MODIS data set, *TBRS Internal Report (January 18)*.

Miura, T. (2000), Quality (uncertainty) assessment of field observational (DyCam digital camera) surface reflectance factors, *TBRS Internal Report (March 7)*.

Miura, T. (2000), Field measurement protocol (quality control of field observational data), *TBRS Internal Report (March 22)*.

Didan, K., Miura, T., and Huete, A., "The .MODIS VI Users' Guide, Version 1" August 2000. http://gaea.fcr.arizona.edu/projects/modis/documents/UserGuide_doc.htm

8.3 IGARSS' 2000 Symposium

Huete, A.R., Didan, K., Shimabukuro, Y., and Ferreira, L.G., 2000, "Regional Amazon Basin and global analysis of MODIS vegetation indices: Early results and comparisons with AVHRR". *IGARSS 2000, July 24-28, Honolulu, HA*. (Oral presentation)

Miura, T., Huete, A. R., Didan, K., van Leeuwen, W. J. D., and Yoshioka, H., "An assessment of the MODIS vegetation index compositing algorithm using quality assurance flags and sun/view angles", *IGARSS 2000, July 24-28, Honolulu, HA*. (Poster)

Gao X. and Huete A.R. "Validation of MODIS Land Surface Reflectance and Vegetation Indices with Multi-scale High Spatial Resolution Data", *IGARSS 2000, July 24-28, Honolulu, HA*. (Poster)

Ferreira, L.G., Huete, A.R., Yoshioka, H., and Sano, E.E., 2000, "Preliminary analysis of MODIS vegetation indices over the LBA sites in the Cerrado Region, Brazil". *IGARSS 2000, July 24-28, Honolulu, HA*. (Poster)

8.4 AGU Fall Meeting

Ferreira, L.G., Yoshioka, H., Huete, A.R., and Sano, E.E., "The response of MODIS vegetation indices to the Brazilian Cerrado seasonal contrast: an analysis within the Large Scale Biosphere-Atmosphere Experiment in Amazonia", *AGU 2000 Fall Meeting, 15-19 December 2000, San Francisco, CA*. (Oral presentation)

Miura, T., Didan, K., Huete, A. R., and Rodriguez, E. P., "Quality ranking of MODIS vegetation index products based on quality assurance flags and sun/view angles", *AGU 2000 Fall Meeting, 15-19 December 2000, San Francisco, CA*. (Oral presentation)

Gao X, Huete, A.R., Rodriguez, E.P., Miura T., Didan K., Keita F., and Honda Y., "Biophysical and radiometric validation of MODIS Vegetation Indices at La Jornada Experiment Range", *AGU 2000 Fall Meeting, 15-19 December 2000, San Francisco, CA*. (Oral Presentation, **Invited**).

Didan, K., Huete, A.R., Miura, T., Rodriguez, E.P., "Impact of high resolution MODIS VI products on regional Amazon vegetation monitoring, *AGU 2000 Fall Meeting, 15-19 December 2000, San Francisco, CA*. (Poster)

Rodríguez -Guerra, E.P., Huete, A.R., Didan, K., Miura, T., and Yoshioka, H., "Comparison and evaluation of the MODIS-VI and AVHRR-NDVI products", *AGU 2000 Fall Meeting, 15-19 December 2000, San Francisco, CA*. (Poster)

Yoshioka, H., Ferreira, L.G., Huete, A.R., Sano, E.E., and Shimabukuro, Y., "A validation strategy of vegetation indices from satellite-based sensors over two LBA core sites", *AGU 2000 Fall Meeting, 15-19 December 2000, San Francisco, CA*. (Poster)

8.5 EOS- SPIE Symposium

Huete, A., Didan, K., Miura, T., Yoshioka, H., Ferreira, L., Gao, X., and Batchily, K., "Validation of the MODIS vegetation indices over a global set of test sites: preliminary results",

The EOS/SPIE Symposium on Remote Sensing, September 2000, Barcelona, Spain. (Oral presentation).

8.6 Future Meetings:

Ferreira, L.G., Huete, A.R., Yoshioka, H., and Sano, E.E., 2001, "On the Use of the EOS - MODIS Vegetation Indices for Monitoring the Cerrado Region, Brazil: Insights and Perspectives". *X Brazilian Remote Sensing Symposium*, April 21-26, 2001, Foz do Iguacu, Parana, Brazil.

Sano, E.E., Ferreira, L.G., and Huete, A.R., 2001, "A Comparative Analysis on the Use of Optical and SAR Data for Monitoring the Brazilian Cerrado". *X Brazilian Remote Sensing Symposium*, April 21-26, 2001, Foz do Iguacu, Parana, Brazil.

Shimabukuro, Y.E., Verona, J.D., LaCruz, S.P., Huete, A.R., Ferreira, L.G., Yoshioka, H., and Sano, E.E., 2001, "Evaluation of the MODIS data for vegetation cover assessments in the Tapajos National Forest, Para". *X Brazilian Remote Sensing Symposium*, April 21-26, 2001, Foz do Iguacu, Parana, Brazil.

Ferreira, L., Huete, A.R., Yoshioka, Y., Sano, E., "Monitoring the Brazilian Cerrado land cover types and associated ecological processes with AVHRR and MODIS spectral vegetation indices" To be presented at the LBA-Ecology Open Meeting, Atlanta, Georgia, USA, from February 12-14, 2001 (Oral presentation).

Huete, A., Ferreira, L., Yoshioka, Y., and Shimabokuro, Y., "Evaluation of MODIS Land Products over the Amazon with Field and Airborne Measurements over Tapajos", To be presented at the LBA-Ecology Open Meeting, Atlanta, Georgia, USA, from February 12-14, 2001 (Oral presentation).

Gao, X., Huete, A., and Rodriguez, E.P., "Biophysical and Radiometric Validation of MODIS Vegetation Indices at Parallel Sites in Argentina and New Mexico, U.S.A", To be presented at the IGARSS 2001 Symposium, Sydney, Australia, July, 2001.

Yoshioka, H., Ferreira, L., Huete, A., Ki, H., Miura, T., "A Translation Algorithm of NDVI to Minimize Biases Caused by Differences in Spectral Band Pass Filters", To be presented at the IGARSS 2001 Symposium, Sydney, Australia, July, 2001.

Didan, K., Miura, T., Rodriguez, E.P., Huete, A., "A practical approach on using MODIS product quality assurance data", To be presented at the IGARSS 2001 Symposium, Sydney, Australia, July, 2001.

Rodriguez, E.P., Huete, A.R., Miura, T., and Didan, K., "An Assessment of the Seasonal Response of MODIS Vegetation Indices over a Global Range of Land Cover Types", To be presented at the IGARSS 2001 Symposium, Sydney, Australia, July, 2001.

Miura, T., Didan, K., Huete, A.R., and Rodriguez, E.P., "A Performance Evaluation of the MODIS Vegetation Index Compositing Algorithm",

Huete, A., - "Multi-sensor analysis of vegetation and soils in semi-arid Argentina and Southwest USA", ", To be presented at the IGARSS 2001 Symposium, Sydney, Australia, July, 2001.

Justice, C., and MODIS Land Science Team Members, "Land Science and Applications Results Overview from the First 16 Months of EOS Terra MODIS Operations", To be presented at the IGARSS 2001 Symposium, Sydney, Australia, July, 2001.

Huete, A., Keita, F., Batchily, K., and Rodriguez, H., "MQUALS 2000 Data Sharing and Results", To be presented at the MODIS Land Team Validation Annual Review Meeting, Columbia, MD, January 22-23, 2001.

Running, S., Myneni, R., and Huete, A.R., "Land Science Presentation Session, Biophysical Parameters", to be presented at the MODIS Science Team Meeting, Columbia MD., January 24-26, 2001.