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MODIS Science Team Semi-Annual Report

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a) Task Objectives

During this reporting periods emphasis was given to: completing, refining and following the code through the V2 Code delivery sequence; refining the land product phase-in plan; refining the product validation plans; planning the MODIS validation activity in southern Africa; coordinating the EOS Land Validation Program; reviewing the fire burn scar algorithm, refining the MODLAND production reduction plan, developing new schedules around the impending launch slip and developing a PI processing approach for MODLAND data.

We continued to build the collaboration required to conduct the work of developing community consensus algorithms on Fire, Surface Reflectance and Vegetation Indices. The project has developed a number of collaborative activities that are intended to expand the scope of the team members' activities and involve a larger community in MODIS research. Chris Justice participated the Discipline Leaders meetings and whenever possible the weekly Technical Team (TT) Meetings. Dr. Vermote represents the land group at the TT Meetings in Dr. Justice's absence.

In addition, the goals of the MODIS project, the status of the instrument and preliminary results of the research were presented at scientific meetings. Results of the studies undertaken as part of the project are in the process of being written up and submitted for publication. Considerable time was spent in coordinating and soliciting contributions to the MODLAND IEEE omnibus paper and the JGR MODIS Fire Product review paper. Publications are listed below.

The PI worked on developing the rationale for the Land Component to the MODIS AM follow-on, currently known as the AGI. The PI also coordinated a regional meeting on land cover with the IGBP LUCC project. This meeting included discussion on MODIS GLI collaboration with members of the NASDA GLI team.

The PI provided input on potential MODIS contributions to the CEOS GOFC Pilot activity.

In agreement with the MODIS Project Scientist, resources from this project continue to support the surface reflectance product. This includes providing shared support for personnel and computer resources with Dr. E. Vermote. A fuller account of this supporting activity is outlined in the companion report of Dr. Vermote.

b) Tasks Accomplished (Data analysis and interpretation)

Version 2 Software (L.Giglio and P. Fisher)

Emphasis in reporting period was given to supporting the Vegetation Index code developed at University of Arizona and refining the surface reflectance and fire codes.

Two bugs were fixed in the MODIS 250m L3 VI algorithm code and new code was delivered to MODIS SDST. The first bug involved the correct reading of the HDF-EOS metadata, as the code read the metadata incorrectly. The second bug did not allow the algorithm to process properly when run on 16 days of data. A bug in the HDF-EOS metadata was fixed in the MODIS L3 gridded fire detection algorithm code. A patch was delivered to MODIS SDST. A major patch was developed for the MODIS L2 surface reflectance algorithm code and delivered to the MODIS Science Data Support Team (SDST). The V 2.1 delivery of the MODIS L3 gridded surface reflectance product was delivered to SDST. The MODIS V2.0 1Km L3 vegetation index algorithm was delivered to SDST.

The MODIS Level 2 surface reflectance code was chaperoned at the DAAC processing system. P. Fisher worked with Robert Wolfe (RSTX/Code 922) to specify which MODIS tiles will be utilized for land global processing and began working on integrating the at-launch land cover product into the MODIS L2 surface reflectance algorithm. Some problems were noted with the product format, which was passed on to the individual developers at UMd. P. Fisher worked with MODIS SDST to change the ECS system design for the MODIS 1km L3 vegetation index algorithm. The earlier system design was left over from V1 code and was inefficient for running the V2 algorithm. The ODL production rules were developed for the MODIS L2 surface reflectance algorithm at the request of SDST. In doing this work, major deficiencies in the ECS specified production rules were noted which must be rectified in order to correctly run the code. These deficiencies were passed on to SDST and GDAAC.

Fisher began development of the 2.3 version of the MOD09 L2 surface reflectance algorithm. Currently, this version of the algorithm: can provide a Lambertian surface reflectance correction in ~6
minutes for a 5 minute input data granule; can correct the surface reflectance product from BRDF effects using the "Montana" LUT methodology; can ingest the MODIS L3 land cover product

P. Fisher worked with Paul Shehadi (MODIS SDST/GSC/Code 922) on developing methods that may improve the code delivery process to the MODIS Science Data Support Team and, ultimately, to the DAACs. P. Fisher aided the Boston SCF in developing code to produce HDF-EOS output. Runtime system problem were traced down a on our SGIs (w/ Louis Giglio SSAI/Code 923). Worked with the MODIS TLCF support staff to have the appropriate OS patches installed on the system.

Error message/operator action lists were created for the MODIS L2 surface reflectance product and the MOD14 L3 gridded fire detection product. Collaboration was developed with Kamel Didan, the new programmer hired by the University of Arizona MODIS Science Computing Facility. Kamel as at Goddard for approximately 6 weeks, during which time P. Fisher

instructed/trained him in how the MODIS Vegetation Index code has been structured. This will enable him to take on all future code maintenance and development for the MODIS Vegetation Index algorithms working from the University of Arizona.

During this reporting period Fisher spent a considerable amount of time reviewing the MODIS Emergency Back Up System.

MODIS Fire Detection (w. L. Giglio, P. Fisher, Y. Kaufman and J. Kendall)

Louis Giglio assisted P. Fisher (SSAI) during numerous debugging sessions of the MODIS surface reflectance and fire product code. Thirty validation sites were selected for evaluation of MODIS fire algorithm and products. Sites were selected on the basis of: 1) regions in which major fire activity is expected, 2) areas in which the detection algorithm is likely to experience problems, particularly false detections (based on our simulation results and experience with AVHRR), and 3) excluding areas within those MODIS production tiles (i.e. 75% of all tiles) that will not be produced the first year after launch.

A fire product test plan was drafted addressing algorithm (science) testing, code implementation testing, and code exception and error handling. A preliminary fire product quality assurance (QA) plan was developed, including a list of potential product-specific QA tools (software) and useful ancillary databases.

The MODIS FIRE ATBD was updated based on recent developments with the algorithm.

EOS Validation (Chris Justice and Bob Swap)

Much of this reporting period has involved preparation for MODIS validation activities in Southern Africa.

An initial planning meeting was held at the University of Virginia in February. Materials on MODIS validation were also prepared for the Kalahari Network meeting in Gaberone.

A southern African coordination meeting of funded NASA EOS validation activities was held at the University of Maryland (June 29-30, 1998). Collaboration continues between the PI and the SAVE EOS validation activity.

A major regional workshop was also held in Blydepoort South Africa associated with the SAFARI 2000 Campaign. MODIS Fire validation will be an integral part of SAFARI 2000. SAFARI 2000 will be one of the early science initiatives for EOS. This project will contribute to the development of a science plan for the SAFARI 2000 project.

Science Computing Facility (Bruno Margerin)

Networking ATM Switch

In cooperation with Sanjay Taneja,code 540, configuration of ATM interface cards and switches were installed to ensure internal and external ATM OC3 communication. An ATM connection was established and configured in Bldg. 28 allowing proper communication between all the SCF components.

By adding to an the existing Ethernet 10BaseT, an ATM OC3 network interconnecting all the processing systems, the SCF is now provided with a strong, fast and reliable network. It is fundamental especially since the SCF is based on a distributed processing strategy. The existing

10BaseT network will continue to be used for communication with Xterminals and as a backup in case of an ATM Failure.

NFS tuning resulted in speed improvement up to 2000% when HP NFS servers perform NFS writes over ATM. The HP servers now perform asynchronous NFS writes. This means that an unreported data loss may occur, but only on a write, and only if the NFS server experiences a failure after the write reply has been sent to the client. Specifically, blocks that have been queued for the server's disk, but have not yet been written to the disk may be lost.
Poor performances remain on the DEC AlphaServer 2100 performing NFS server writes over ATM.

Digital AlphaServer

The operating system was upgraded along with its dependencies from version 3.2 to 4.0D. ATM OC3 networking capabilities were installed and configured.

Auspex NetServer

Full configuration of the NFS serverincluding its ATM interface was completed. In cooperation, with Keenan Bayol with Auspex, system updates were made adding Very Large Files (>2 Gbytes) support. The formal 4 Gb system disk is preserved as a backup system disk.

Storage

The Hierarchical System Management software Omnistorage 2.20 was configured. Reliability, performance, and functionality tests were undertaken. Utilities improving omnistorage manageability were developed. Basic maintenance and system administration including kernel tunes, system patches and updates were provided.

Processing

As part of the MODIS prototyping, processing of SeaWifs Monthly Level 3 composites was undertaken for September (from the 19th), October, November, December 1997 and January 1998. The process was developed using the PVM 3.4 (Parallel Virtual Machine) message passing daemon and library, creating a program to control and dynamically balance the SeaWifs data processing workload across designated computers and CPUs.

Tests of this program were undertaken on the processing of daily Level 3 SeaWifs composites for the months of October, November, December 1997 and January 1998.

Prototyping the MODIS Fire Web Site

As a response to OSTP, NASA requested the PI to assist in the development of a Global Fire Monitoring Web Site. The Fire Web Site was developed around existing satellite fire data sets and was used as a prototype for the upcoming MODIS fire products. Sections of the Fire ATBD and the IGBP Fire Algorithm Working group reports were used for this Web site. The Fire Web Site is seen as a precursor to the MODIS contribution to the Earth Observatory for the EOS AM platform.

Liaison

Justice represented the MODIS Land program at the Landsat 7 Science Team Meeting to coordinate Landsat Acquisition for MODIS Validation and atmospheric correction of Landsat 7 using MODIS data.

Justice met with the ORNL DAAC to develop plans for supporting the Land validation program.

Justice presented the MODIS Fire Product plans at the IGBP DIS Fire Algorithm Working group meeting in Toulouse, including material from Luke Flynn on the MODIS volcano and fire alert system.

Justice presented the MODIS Land products at the NASA LCLUC Science Team meeting in March.

Justice contributed to the RFI response on the MODIS AM Follow-On Mission known as the advanced global imager (AGI).

Publications

Kaufman, Y.J., C.O. Justice, L.P. Flynn, J.Kendall, E. Prins, D.E. Ward, A. Setzer, Monitoring Global Fires from EOS-MODIS, IEEE EOS AM Special Edition - submitted

Giglio, L., J. Kendall and C.O. Justice, Evaluation of Global Fire Detection Algorithms Using Simulated AVHRR Data, IJRS Submitted.

Roy D.P., Giglio L., Kendall J. and Justice C.O., 1998. Multitemporal active-fire based burn scar detection algorithm. International Journal of Remote Sensing Letters (submitted).

Justice C., E. Vermote, J.R.G Townshend, R. DeFries, D.R. Roy, D.K. Hall, V.V. Salomonson, J.L. Privette, G. Riggs, A. Strahler, W. Lucht, R. Myneni, Y Knyazikhin, S. W. Running, R. R. Nemani, Z. Wan, A. Huete, W. van Leeuwen, R. E. Wolfe, L. Giglio, J-P. Muller, P. Lewis, M.J. Barnsley, 1998. The Moderate Resolution Imaging Spectroradiometer (MODIS): land remote sensing for global change research. Trans. IEEE Geoscience and Remote Sensing 36, 4, 1228-1249.