

## **MODIS Science Team Semi-Annual Report**

**July 1 – December 31 1999**

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### **a) Task Objectives**

This reporting period included the successful launch of the AM Platform and much of the run-up preparation for launch associated with evaluating synthetic output products from the MODAPS tests, making changes to the Version 2 code, refining the land product validation plans, planning the MODIS fire validation activity in southern Africa, coordinating the EOS Land Validation Program, developing the post launch fire burn scar algorithm and testing the QA flows.

We continued to build the collaboration required to conduct the work of developing community consensus algorithms on Fire, Surface Reflectance and Vegetation Indices. In this period in response to the IWG we developed plans for a separate PI-based 250m production system to allow full production of the 500m land products in MODIS. The project also 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 in the Discipline Leaders meetings and whenever possible the weekly Technical Team (TT) Meetings. Dr. Eric Vermote represented 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 the results of this MODIS supported 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.

In agreement with the MODIS Project Scientist, resources from this project continue to support the MODIS Surface Reflectance product. This includes providing shared support for personnel and computer resources with

Dr. E. Vermote and the Land Science Data Team at GSFC. A fuller account of this supporting activity performed is outlined in the companion report of Dr. E. Vermote.

## **b) Tasks Accomplished (Data analysis and interpretation)**

### **1. Version 2 Software (L. Giglio)**

During this period the MODIS Level 2 fire product was redesigned to include a separate table containing extensive information about each detected fire pixel. This new format matches that used with the heritage GIMMS AVHRR and TRMM fire products. An added benefit of this change is to make the fire product file size 75% smaller, even though it contains more information. Modifications to MODIS Level 2 fire product code were completed to generate this redesigned fire product.

Major revisions were made to the MODIS fire product Quality Assurance (QA) plan, which was submitted to the Land Data Operational Product Evaluation group for review.

Louis Giglio assisted Jim Ray in debugging the MODIS Level 3 fire product code. A bug was located and corrected relating to the internal cloud mask used by the MODIS surface reflectance and fire codes.

Louis Giglio met with various MODIS personnel (Roy, Linda, Ray) to clarify several ECS metadata fields that must be included in all MODIS products. Due to inconsistent and poorly-formulated ECS requirements, these discussions were unfortunately drawn out over more than a week. Eventually a consensus was reached.

An initial version of a MODIS Level 2 fire product QA software tool was completed that identifies contiguous regions of fire pixels in product granules and applies simple heuristic rules to these regions. To date this tool has been tested and refined with approximately six months of archived AVHRR fire products and four months of a near real-time TRMM VIRS fire product.

Louis Giglio attended Global Observation of Forest Cover (GOFC) fire meeting in Ispra, Italy in early November where he presented a talk describing current MODIS fire product status and distribution plans.

Louis Giglio completely rewrote the prototype MODIS consolidated fire product code (climate product) written by P. Fisher in 1997. The original code did not correctly perform the fire pixel consolidation procedure as intended by Y. Kaufman (GSFC Code 913). The consolidated fire product code, accommodated the new Level 2 fire product format described above.

The packaged code was handed over to Y. Kaufman and C. Ichoku (SSAI) for post-launch analysis and code maintenance.

Louis Giglio met with David Roy (UMD) on several occasions to discuss concepts for the AVHRR/MODIS burn scar algorithm and assisted Roy with processing of Pathfinder II data sets supplied by El Saleous, and with software implementation of the preliminary burn scar algorithm. Giglio and Roy investigated possible improvements to the MODIS burned-area algorithm by filtering Fourier components of a 1989 AVHRR time series data of Southern Africa.

Louis Giglio began routine use of LDOPE Quality Assurance Data Base to monitor the quality of the fire products generated within the MODAPS. Several problems were identified with the data-base which were corrected promptly.

Giglio also attended the weekly SCF meetings concerning code status, testing plans, and development of quality assurance (QA) tools for the MODIS surface reflectance and fire products. He also met with Kaufman, Ichoku, and J. Plummer (University of Montana) to discuss potential MODIS fire algorithm modifications based on work on Alaskan fires performed by Plummer.

## **2. EOS Validation (Chris Justice, Bob Swap, Stefania Korontzi)**

### **a) SAFARI Coordination (Bob Swap)**

Much of this reporting period has involved preparation for MODIS validation activities in Southern Africa. SAFARI2K will be the primary opportunity for fire validation. Bob Swap has taken the lead for the fire group in helping in the management of SAFARI 2000, leveraging off of the Southern African Validation of EOS (SAVE) project, and bringing together the validation efforts associated with MOPITT, ASTER, MISR and CERES. Swap has been interfacing with Suttles, King, Starr and Privette to plan SAFARI 2000 and secure the necessary international agreements to allow for the progress of SAFARI 2000.

Swap was actively involved in organizing the SAFARI 2000 Regional Implementation Workshop, Botswana National Productivity Centre, Gaborone, Botswana, July 26-30, 1999. Which had approximately 140 participants. The report from this meeting is on the SAFARI Web Site (<http://safari.gecp.virginia.edu>). Swap has also been closely involved in the planning and organizing of the SAFARI 2000 Intensive Flying Campaign Workshop that will be held in Pietersburg RSA from April 3-6, 2000 and will present the fire validation activity plans at this meeting. The intent is to provide overflights of Darold Wards EOS-funded prescribed burns during the

August intensive campaign, providing some initial temperature calibration for MODIS band 21.

The following presentations related to SAFARI 2000, MODIS and the Southern African Validation of EOS were presented.

R.J. Swap, S.A. Macko, R.W. Talbot and S.J. Piketh, "Sources of Carbonaceous and Nitrogenous Aerosols over Southern Africa," Fall Meeting of the American Geophysical Union Proceedings, San Francisco, CA., December, 1999.

SAFARI 2000 Briefing of the MODLAND Readiness Workshop on November 17, 1999

SAFARI 2000 Briefing of NSF program managers on November 22, 1999

b) Fire and Burn Scar Validation in SAFARI (Chris Justice)

During this reporting period plans were made for a regional MODIS fire validation activity associated with SAFARI 2K. Planning has involved the Miombo fire network and will consist of a validation protocol meeting in Western Zambia in July 2000, followed by distributed validation activity during the SAFARI 2K intensive campaign. Representatives from the Miombo Fire network will develop a standard protocol for validation of Landsat 7 burn scar identification which will then be used as a basis for the validation of the MODIS experimental burn-scar product. The MODIS active fire product will be validated through the use of airborne data collected by the MAS instrument during the intensive campaign.

c) CEOS Calibration and Validation Working Group

International outreach of MODIS was undertaken by active participation and leadership of the group in Working Group meetings of the Committee on Earth Observation Satellites (CEOS). Justice attended the CEOS Cal-Val working group meeting in London and presented the MODIS validation activities. Justice took the lead with Alan Belward (CEOS Cal Val WG Chair) in planning the development of a Land Product Validation Sub Working group with a preliminary meeting of interested parties in May in Ispra. During this period plans were made for MODIS representation in the GOFC Fire activity.

#### **4. Science Computing Facilities**

a) **The Justice/ Vermote Joint SCF at GSFC (Bruno Margerin)**

This reporting period saw the redesign and reconfiguration of the SCF into an operational production system capable of processing in near real time MODIS/LAND Surface reflectance 1 km resolution products (40000 Mbytes/day) from MODIS Level 1B 1 km resolution (51590 Mbytes/day) data. This included system network tuning and enhancement, RAID disk storage performances and configuration improvement. Also, to meet this goal, 612 Gbytes of RAID disks and an ATL P3000 11.4 Tbyte DLT library have been ordered, upgrading RAID disk storage from 660 Gbytes to 1.27 Tbytes and near line storage from 2 Tbytes to 13.4 Tbytes. For reliability and performances reasons a Legato Networker 5.5 Network Edition was chosen to replace the H.P Omnistorage 2.2 as the software managing near line archiving.

#### **b) The MODIS Fire Product WWW Site**

John Owens and Stefania Korontzi developed the basis for the MODIS Fire Product WWW site. This provides the user with an understanding of the algorithm and after launch will provide fire product users with a guide to using the data product.

#### **New Publications**

Roy D.P., Giglio L., Kendall J. and Justice C.O. 1999. Multitemporal active-fire based burn scar detection algorithm. *International Journal of Remote Sensing*, 20:1031-1038.

Giglio L., Kendall J. D., Justice C. O. 1999. Evaluation of Global Fire Detection Algorithms Using Simulated AVHRR Infrared Data. *International Journal of Remote Sensing*, 20:1947-1985.

Justice C. 1999. Satellite Fire Monitoring: a status report. IGACTivities, Newsletter, 15, 7-9.

Swap R., Annegarn, H. Scholes, M. and Justice C.O. 1999. SAFARI-2000: A southern African Regional Science Initiative. IGACTivities, Newsletter, 15, 16-18.

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.

Kaufman Y. J., Justice C.O., Flynn L., Kendall J., Prins E., Ward D.E., Menzel P. and Setzer A. 1998. Potential Global Fire Monitoring from EOS-MODIS. *Journal of Geophysical Research*, 103, D24, 32,215-32,238.

R. J. Swap and H. J. Annegarn (eds.), 1999 “*Southern African Regional Science Initiative: SAFARI 2000 – Science Plan*,” available at <http://safari.gecp.virginia.edu>, 41pp.

B. Swap, T. Suttles, M. King, H. Annegarn, B. Cook, J. Drummond, B. Emanuel, J. Gille, P. Hobbs, C. Justice, L. Otter, S. Piketh, S. Platnick, J. Privette, L. Remer, G. Shelton and H. Shugart. 1999. “*Summary of NASA EOS SAFARI 2000 Workshop*.” **The Earth Observer**, Vol. 11, No. 3, pp. 31-35.

### **New Staff**

None