MODIS Science Team Semi-Annual Report

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a) Task Objectives

This reporting period covers the immediate post-launch activities. Emphasis has been on preliminary evaluation of the fire product, understanding the instrument calibration and product quality, making changes to the fire algorithm and ensuring that the land data sets are prepared for public release and coordinating the land product validation activities.

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 implemented plans for a separate PI-based 250m production system to allow full global production of the 500m land products in MODIS and keeping within the Option A cap of .5X of the 96 MODIS baseline. 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 and product validation. 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, C. Justice)

An evaluation of first MODIS data acquired in late February was initiated and extensive quality assurance was routinely performed on the MODIS fire product. Patches were submitted to the fire product code in February to handle last-minute changes made to Level 1B input data. A bugs was located in the Level 2 MODIS fire code related to the scaling of surface reflectances used in a sun glint test and patches were submitted patch to correct this problem in May. Algorithm-related problems such as excessive desert false alarms were identified and corrected in a code delivery in mid-June.

Meetings were attended with B. Guenther (MCST), J. Xiong (MCST), concerning dead and noisy detectors in several of the MODIS bands used in the fire algorithm.

Problems were identified within Level 1B MODIS data, particularly in the mid-infrared channels. Calibration problems and dead detectors within channels 21 and 22, the principal fire bands, have significantly degraded the quality of the MODIS fire product. Although a manual correction has been performed to improve the channel 21 calibration, ongoing problems in the 1B input data add artificial, non-trivial inhomogeneities into the spatial statistics computed as part of the fire detection algorithm, making it difficult for the algorithm to detect small fires. These problems also impact the retrieval of fire characteristics following detection. Uncertainties in these characteristics are already large so the overall impact is much less significant than for the small fire detection. We are currently awaiting improvements in the channels 21 and 22 1B data, slated for mid-August.

Extensive interactive quality assurance(QA) of the MODIS fire product was undertaken. The Science Quality flags for this product were set using the Land Data Operational Product Evaluation (LDOPE) QA database, but

software problems were encountered each time this was undertaken. Requests were sent to the LDOPE to correct this problem and a fix is in progress.

Attended MCST calibration workshop on 6 June.

Attended MODIS Science Team Meeting 7-9 June. Prepared presentation with C. Justice regarding current status of MODIS fire product for this meeting.

Met with E. Vermote and F. Petitcolins on 19 June regarding MODIS dead/noisy detectors. Drafted a statement to MCST with list of detectors land team would like flagged as non-functional.

A research paper was developed to examine Dozier method for fire temperature retrieval. The capability of active-fire characterization was examined for several current moderate-resolution instruments, including MODIS.

Several of the quality assurance (QA) software tools were revised to handle format changes made to fields in the LDOPE QA database. In the process, several minor problems with the database were discovered and reported to the LDOPE.

Giglio attended 20 MODIS Land SDDT meetings concerning code status, testing plans, and development of quality assurance (QA) tools for the MODIS surface reflectance and fire products.

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

a) SAFARI 2K Coordination (Bob Swap)

Much of this reporting period has involved preparation for MODIS validation activities in Southern Africa. SAFARI 2000 will be the primary opportunity for fire validation and demonstrating the scientific benefits of MODIS. Bob Swap has taken the lead for MODIS 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 has been closely involved in the planning and organizing of the SAFARI 2000 Intensive Flying Campaign planned for August and September 2000. The intensive, which is scheduled to last six weeks -- employs aircraft supplied by NASA, the University of Washington, the South African Weather Bureau and the United Kingdom's Meteorological Office.

b) Fire and Burn Scar Validation in SAFARI 2K(Chris Justice)

During this reporting period the regional MODIS fire validation activity associated with SAFARI 2K was initiated. The Miombo fire network was engaged in a preparatory validation protocol meeting in Western Zambia in late June 2000. This will be followed by a distributed validation activity during the SAFARI 2K intensive campaign. Representatives from the Miombo Fire network developed a standard protocol for validation of Landsat 7 burn scar identification which will be used as a basis for the validation of the MODIS fire and experimental burn-scar product. The MODIS active fire product will in addition 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 in the Working Group meetings of the Committee on Earth Observation Satellites (CEOS). Justice attended and orchestrated the CEOS Cal-Val Working Group Land Product Subgroup meeting in May in Ispra. Justice co-chaired a breakout group session on fire validation, which included MODIS validation plans. During this period plans were also made for MODIS representation in the GOFC Fire activity. A MODIS fire focus is being given to the development of a web mapping demonstration as part of the CEOS WGISS Test Facility. The MODIS demonstration will be given as part of the WGISS meeting in Bangkok in September.

3. Science Computing Facilities

a) 250m Computing Facility (Bruno Margerin/John Owens)

The 250m Production System is currently being developed and maintained by the MODland group with support from SDST. Funds from this contract are used to support the system development. The production system computers (Compaq ES-40s) were installed and maintained. A series of

hardware, firmware and system failures were encountered on the Compaq ES-40s and were remedied, leading to an acceptable level of stability. A Compaq HSG 80 Fibre Channel RAID was installed and configured onto the production system. A SAN Compaq Fibre Channel environment interconnecting all the fibre channel disks of the distribution and production system was evaluated. Two 500 GB SCSI RAID for the Compaq ES-40 were ordered, installed and configured. An additional 1000 GB SCSI RAID system was also ordered. An AIT2 tape drive was installed, configured and tested on the Compaq. A Gigabit Ethernet switch was configured and the 250 computing facility was moved onto EBNET, providing gigabit connectivity with the MODAPS system (mtvs1-g1.nascom.nasa.gov). Support was provided for the installation of the MODAPS software onto 250m production system. The script based data production system was improved through addition of new functionalities, debug and improvement of existing features. System configuration and tuning was undertaken, for example to increasing the TCP windows sizes for the gigabit Ethernet, tuning ftp performance and the Legato Networker.

b) MODIS Land Surface reflectance and Fire SCF:

The new System Administrator was trained for the MODIS Land Surface Reflectance and Fire SCF. Hardware and software installation was undertaken. User support was provided on HP-UX, Digital Unix, Linux, Windows 9x, NTx and Macintosh computers.

c) The MODIS Fire Product and 250 m WWW Site (John Owens, Stefania Korontzi)

The MODIS Fire Product web site was enhanced with a new bibliography During this period a new WWW site was developed to distribute the 250m data. John Owens developed the Graphical User Interface for the system which is designed to distribute 10% of the MODIS 250m coverage http://modis-250m.nascom.nasa.gov/index.asp.

4. Early Products (C. Justice, Jack Decloitre)

During the first few months of MODIS production, Justice took the lead in coordinating the availability of the first images. Working with Jack Decloitre several public relations images were generated and made available on the WWW, http://modland.nascom.nasa.gov/gallery/

5. New Publications

Giglio L and Kendall J. (submitted). Application of the Dozier Retrieval to Wildfire Characterization: A Sensitivity Analysis" submitted to Remote Sensing of Environment.

Cohen W. and Justice C.O.[2] (Editors), 1999. **MODIS Land Product Validation: linking in-situ and satellite measurements.** Special Edition of **Remote Sensing of the Environment**, 70, No 1.

Justice C.O.[1] and Korontzi S.A., **(submitted)** A review of satellite fire monitoring and the requirements for global environmental change research. **Remote Sensing of the Environment**

Ahern F. J., Belward A., Elvidge C., Goldammer J., Grégoire J.-M., Justice C.O.[4], Pereira J., Prins E. M., Stocks B., **(submitted)** The fire component of Global Observation of Forest Cover: a plan of action. **Remote Sensing of the Environment.**

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