

MODIS Science Team Semi-Annual Report

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Contract #: NAS5-31365a) Task Objectives

This reporting period covers the period post-launch, as the instrument characteristics are becoming known and the products are starting to be made widely available. Emphasis has been on evaluation of the fire product, determining product quality and accuracy and outreach to users. Considerable attention has been given to coordinating the land product validation activities and outreach. The slow development of an operational data flow led the PI to put considerable effort into developing a rapid response fire monitoring system, in time for the northern hemisphere fire season.

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 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. This was done through the international program Global Observation of Forest Cover (GOFC), which is part of the Global Terrestrial Observing System (GTOS). Chris Justice participated in the Discipline Leaders meetings and whenever possible the weekly PI Processing Meetings, the Land Science Data Development Team Meetings and the Technical Team (TT) Meetings.

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, the 250m Production System developed in partnership with the NASA Earth System Information Partnerships (ESIPS) and the Fire Rapid Response System. This includes providing shared support for personnel and computer resources with Dr. E. Vermote, Dr Jacques Descloitres 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 and Version 3 Software (L. Giglio)

An on-going evaluation of the MODIS data was undertaken and extensive quality assurance was routinely performed on the MODIS fire product. Patches were made to the fire product code to account for problems with the cloud mask, refine several of the fire detection thresholds, and improve sun-glint rejection. Algorithm-related problems such as excessive desert false alarms and cloud mask errors were identified and corrected in a code delivery.

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.

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.

A meeting with E. Vermote and F. Petitcolin was held 19 June regarding the potential use of the short-wave infrared MODIS channels for improved fire detection and characterization. Development and evaluation of these methods, which are currently experimental, will continue over the next several reporting periods.

Due to the increasing complexity of the Surface Reflectance Code (PGE 11), the entire fire code was rewritten early in this reporting period and submitted as a stand-alone PGE (PGE 30). This Version 3 Code is currently running in the Fire Rapid Response System and was submitted for integration to MODAPS in early May.

2. NPOESS VIIRS (L. Giglio)

During this period Giglio was involved in providing input to the VIIRS instrument contractor and NPP management, concerning the detection capability of the instrument and the proposed algorithm. Concerns were raised by the MODIS Fire Team concerning the intended saturation level of the VIIRS 11 micron band, which will render the VIIRS instrument inadequate for fire detection. Giglio used MODIS data to derive temperature and area statistics for 11,000 active fires; these statistics were subsequently used to demonstrate that 50% of all active fires detectable by MODIS could not be characterized with the current VIIRS instrument design. The contractor is currently considering an algorithmic solution.

3. EOS Validation (Chris Justice, Bob Swap, Stefania Korontzi, Samuel Alleaume)

a) SAFARI 2K Coordination (Bob Swap)

SAFARI 2000 has been a primary opportunity for fire validation and demonstrating the scientific benefits of MODIS. During this reporting period Bob Swap has maintained his lead role 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 the SAFARI 2000 meeting in Siavonga, Zambia. Close collaboration has been maintained with the S2K collaborators in South Africa, in particular at the University of Witwatersrand.

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

During this reporting period the regional MODIS fire validation activity associated with SAFARI 2K was continued. The Miombo fire network submitted their interpretations of the Landsat scenes provided by David Roy and Jeff Morisette (MODIS Land Validation coordinator). Dr. Kolethi Gumbo visited Goddard and the University of Maryland to complete the validation interpretations of Guto, Zimbabwe. Dr Roy continued to develop the MODIS experimental burned area product.

c) MODIS/ASTER Active Fire Validation (S. Alleaume)

Samuel Alleaume of the University of Virginia was tasked with comparing ASTER data with MODIS data to estimate errors of omission and commission. A small meeting was held at the University of Maryland to determine the best approach for this inter-comparison. As part of an initial study, 7 ASTER scenes were obtained from Central Africa for the period after November 2000 and co-registered to MODIS data using a method developed by F. Petitecolin (UMd), initial errors of omission and commission were established. A set of tools were developed to enable the intercomparison. An accuracy assessment curve was applied to study the impact of fire size on detectability, with the help of Jeff Morisette (SSAI). A larger sample of ASTER images are being obtained to extend the study to other fire regimes.

d) CEOS Calibration and Validation Working Group – Land Product Validation Sub-group (C. Justice, J. Morisette)

International outreach of MODIS was undertaken by active participation and leadership in the Working Group meetings of the Committee on Earth Observation Satellites (CEOS). During this period plans were made for the organization and MODIS representation at the GOFCC/CEOS Cal Val Workshop on Fire Product Validation (Lisbon, July '01).

3. Science Computing Facilities

250m and RapidFire Computing Facility (John Owens)

During this period the production part of the 250m System developed within the MODLand group was moved to SDST. Jack Descloitres remains responsible for the Land 250m system. The 250m distribution hardware system was maintained by John Owens. The production hardware was re-used to develop a Fire Rapid Response System. Jack Descloitres is the RapidFire project manager. John Owens was responsible for setting up the Fire Rapid Response System and developing the Web Site (www.rapdfire.sci.gsfc.nasa.gov). Jack Descloitres and Louis Giglio were responsible for developing the production system. An active collaboration was set up with Rob Sohlberg of UMD (John Townshend, PI) and the USFS to deliver active fire data in support of fire management. Presentations were made to the USFS, Martha Maiden (NASA HQ Data) and Steve Wharton

(NASA NEWDISS Lead).

4. IDS Collaboration (S. Korontzi/C. Justice/ D. Roy)

The Shugart NASA IDS initiated a collaboration with the MODIS Fire team. Plans were made for using the MODIS fire product to drive an emissions model for Southern Africa and to support scientific synthesis from SAFARI 2000. Stefania Korontzi was responsible for the MODIS Fire emissions research component, collaborating with Darold Ward (former USFS). David Roy (SDST-LDOPE) is responsible for developing the MODIS experimental burned area product. Justice is responsible for overall IDS / MODIS coordination.

5. GOF-C-Fire (Justice/Owens)

During this performance period Justice took on the task of leading the Fire implementation team of the Global Observation of Forest Cover Project. Through this activity he has added MODIS fire data to the international coordination activities to improve availability and access to satellite fire data. Tasks include a) combination of MODIS data with other data sources to provide a multi-source fire product, b) outreach to the fire management communities in Thailand, Russia, Brazil, and Australia c) development of active fire and burned area product validation protocols and standards.

6. New Publications

In this period Justice took on the role of organizing a MODLAND Special Edition of Remote Sensing of the Environment.

Giglio L and Kendall J. (2001). Application of the Dozier Retrieval to Wildfire Characterization: A Sensitivity Analysis" Remote Sensing of Environment, 77:34-49

Justice C.O.¹ and Korontzi S.A., 2001 A review of the status of satellite fire monitoring and the requirements for global environmental change research. Global and Regional Vegetation Fire Monitoring from Space: planning a coordinated international effort. Eds. J. Goldammer, F. Ahern and C. Justice, SPB Academic Publishing bv, The Hague, Netherlands, 1-18.

Ahern F. J., Belward A., Elvidge C., Goldammer J., Grégoire J.-M., Justice C.O. , Pereira J., Prins E. M., Stocks B., (submitted) The fire component of

Global Observation of Forest Cover: a plan of action. Global and Regional Vegetation Fire Monitoring from Space: planning a coordinated international effort. Eds. J. Goldammer, F. Ahern and C. Justice, SPB Academic Publishing bv, The Hague, Netherlands, 267-289.

Kaufman, Y., Ichoku C., Korontzi S., Giglio L., Justice C. Monitoring Fires and Smoke using MODIS data (IJRS in press).

Justice C. Giglio L., Korontzi S. Alleaume S., Roy D. (in preparation) MODIS Fire Product: preliminary evaluation. Remote Sensing of the Environment.

7. Presentations

MODIS Fire Monitoring – Justice et al. EARSEL Special Interest Group on Fire – Paris

MODIS Fire Monitoring – Justice, Owens – GOFRC Regional Fire Workshop, Tokyo

MODIS Overview Presentation – IWG, Florida

MODIS Rapid Fire Detection – USFS/UMD

MODIS Overview – USDA, GSFC

8. New Staff

Samuel Alleaume UVa

Regina Oglesby UMD