Notes from a meeting Between LTER and NASA/MODIS Scientists

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Background:
These notes are from a meeting between representatives of LTER and NASA, in particular, of the NASA/MODIS (MODLAND) team. It was an initial follow-up to the November LTER/NASA workshop at the Sevilleta LTER site. The purpose of this meeting was to start in motion specific initiatives which were considered important and attainable during the previous workshop. These activities were seen as first steps to continued interaction between LTER and NASA scientists. In final discussion it was noted that at the program level, these initiatives represent interaction between the LTER and EOS programs of NSF and NASA, respectively. A number of action items resulted during this meeting and are not all included specifically in the notes. This list, compiled by Chris Justice is included at the end of the report.

Please note that this text was gleaned from various discussions during and after the meeting. I have not attempted to list all the acronyms etc., and no member of the meeting has reviewed these notes, thus I take responsibility for any omissions or misinterpretations. Please feel free to contact me (jvc@lternet.edu) for clarifications or copies of this text. This text and the previously mentioned LTER/NASA report are available by anonymous ftp or gopher on the "LTERnet.edu" file server.

Meeting Proceedings:
Chris Justice of NASA/GSFC started the meeting with background and updates since the November LTER/NASA meeting at SEV. Handouts of MODLAND background, the instrument, its purpose etc. were given and discussed. Chris noted that a MODIS overhead set is available, although handouts of many of the overheads were distributed to meeting participants.

Steve Running noted that it would be best to focus on products

that MODLAND needs to provide for EOS. These products are key items for LTER/EOS interaction since MODLAND is expected to produce specific items which included verification by ground reference data and scientific evaluation.

Pathfinder data sets as described by Chris Justice consist of AVHRR data - from Tucker's multi-year dataset and also from Landsat Thematic Mapper. Three Pathfinder projects are identified to date: 1-Tropical Forest Inventory, 2-North America Landscape Characterization, and 3-Land Cover Test Sites. LTER projects fit well with the second and third items.

Linked with the Pathfinder data sets are new acquisitions of Landsat-TM data, known as the Landsat "data grant". Bob Murphy gave an update on the 1992 acquisitions, with provisions for each LTER site. Bob now calls these data the "Global Change Landsat Data Collection". A previous note from this meeting erroneously stated that NASA had provided 1991 Landsat-TM data for LTER,

however these data were acquired by a funded proposal from NSF to the LTER Network Office. This is described in the November, 1992 LTER/NASA workshop report. The successful 1992 NASA acquisitions for LTER sites are listed below:

Global Change Landsat Data Collection - There were 13 acquisitions for LTER sites in 1992.

GCLDC/LTER Data Set.

Site	P/R	Mo	Day	Yr	Notes
Harvard Forest: MA	13 30	06	16	1992	
Hubbard Brook Forest	13 29	07	02	1992	
Harvard Forest	13 30	07	02	1992	
Virginia Coast	14 34	08	10	1992	
North Inlet	16 37	07	07	1992	
Konza Prairie	28 33	08	26	1991	
Sevilleta	33 36	04	09	1992	
Sevilleta	33 36	07	06	1992	Multitemporal
Sevilleta	33 36	07	14	1992	Multitemporal
Sevilleta	33 36	08	15	1992	Multitemporal
Jornada	33 37	07	06	1992	Incl White Sands
Central Plains	33 32	8	15	1992	
H J Andrews	46 29	08	10	1992	

The 1992 now exist at EDC. Data sharing restrictions will need to be defined. These data should be sent to the sites and archived at NET. Bob Murphy has schedule 26 acquisitions to cover all LTER sites with acquisitions as described in the 1992 LTER/NASA workshop report. Better coordination will be needed with NASA regarding these acquisitions, perhaps with the EDC DAAC as the interface.

Jim Gosz gave a short presentation on future plans for interagency linkages such as interactions between NASA and NSF programs, as well as with the USGS (including the EROS Data Center). As part of this, with potential reorganizations of

biological science programs within agencies, there is a potential for new or close interactions with other government programs, with potentials for new funding sources.

Brent Holbern and Yoram Kaufman gave information on specific needs for corrections to satellite data. Yoram described these errors, primarily from aerosols and water vapor in reference to NDVI data and alternative corrections (like normalizing with wavelengths such as TM band 1). The need to correct for such errors was the basis for discussions to acquire sun photometers for LTER sites to be used for correcting data from not only Landsat-TM, but also the daily overpasses of AVHRR, and in the future of MODIS and other sensors.

It should be noted that these instruments are primarily for generating correction parameters, not for obtaining continuous multispectral light measurements, although they provide measurements of 9 specific wavelengths (controlled by filters in

the photometer. The specific measurements that are made by the instruments are controlled by an automated robot linked to a pre-programmed microprocessor. This is needed primarily since the number of measurements, and specific measurement angles needed are sufficiently tedious that they would never be done on a regular basis. Although the data generated by the instruments can be downloaded to automated data loggers, the data can be sent directly via GOES satellite to Goddard for processing, generation of specific correction factors, and redistribution via computer networks links.

Brent gave a demonstration on the tracking ability and basic data acquisition of a photometer on the morning of "day 2" of this meeting. A network of 6 instruments were field tested in the Amazon to a limited degree. However, because of unknown problems from use at sites as varied as LTER and because of their cost (about $20,000), it did not seem practical to implement these instruments for all LTER sites all at once. NASA scientists agreed to provide at least 1 photometer to be used in conjunction with MODIS simulator and AVIRUS overflights of VCR/LTER (the instrument will be flown from an ER-2 based at Wallops Island, just north of VCR). Other instruments may be available by May for Landsat-TM acquisitions of the SEV and JRN LTER sites - for a total of 3 "floating" NASA instruments during 1992. It was suggested that the Network Office develop a proposal for 4 instruments to be used at LTER sites. This was done with information from Brent Holbern to better document the operational use of the instruments.

It was noted that Doug Stow and Allen Hope of the JRN/LTER have been working on atmospheric corrections from ongoing NASA and other projects. It was suggested that the
Toolik lake and JRN collaboration information from Doug Stowe for atmospheric correction should be coordinated with people at NASA such as Yoram Kaufman
.

As a specific action item, information and data for future work was considered important, and the LTER sites should be asked to see what was already available. These were to see what comparable datasets might be available across the LTER Network:
1-Landcover assesment/classification - what it includes if available, and what classification scheme was used.
2-DEM coverage for the sites - what the sites have, and what resolution.
3-NPP Measurements (what type and how often).

There was discussion regarding DAAC meetings at EDC. This would be important as an information source, and future data management effort, perhaps task the LTER datamanagers to work with EDC DAAC in the future, perhaps Rudolf Nottrott as contact point. There is a meeting scheduled for May.

Warren Cohen agreed to coordinate a current landcover assesment from new (i.e. 1991 or 1992) Landsat TM data.

Priority of efforts for remote sensing activities need to include:
-Land Cover Map
-LAI Map
-Primary Production Estimates.

Discussions involving the LTER ALL SCIENTISTS Meeting suggested that this could be a focus for the next major LTER/EOS interaction. Items as listed in the 1992 LTER/NASA workshop report should be included. A sun photometer demonstration/training session, a full afternoon workshop (cover photometers, data acquisitions, planning for a 1995 MAC at interested sites, but specifically to cover: LTER/EOS Overview, EOS Program, MODIS/LTER Program, Sun Photometer-Atmospheric corrections, Land Cover, Vegetation Indices R+D, NPP/Rs, Spatial Patterns/fragmentation-regionalization. A breakout session is also planned for generation of a proposal on analysis of landscape fragmentation and another on cross-site NPP/Carbon measurements. Remote sensing activities at LTER sites as well as NASA should be included in the posters sessions during the meeting, preferably organized as a group.

NASA Aircraft data for LTER sites:
Diane Wickland said that plans are being made to get overflights of AIRSAR (BNZ, SEV, JRN) or AVIRUS (VCR, HFR, HBR, AND) data for some LTER sites during 1993. NASA will need flightline information from the sites. Also needed from the sites that NASA can schedule would be a letter stating their plans/ability to process data acquired.

Diane also emphasized the need to plan now (at least as an LTER All Scientist Meeting activity) for a 1995 MAC if sites are interested, as well as a general need for the science programs to define the longer term relationships.

Short description of SCAR 93 from Yoram Kaufman

<kaufman@climate.gsfc.nasa.gov>
(This is background information for planned remote sensing activity which will involve primarily the Virginia Coast Reserve LTER site.

1. Phase 1 - 1993: Eastern US - SCAR-p

A preliminary experiment will be conducted during July 12-31, 1993 in the Eastern US. The experiment will include flights of the ER-2 from Wallops VA with the MODIS simulator (MAS), and the AVIRIS instrument. It will also include ground based measurements with sunphotometers of the total precipitable water vapor and of the aerosol concentration and characteristics. During this period the ER-2 is already scheduled to be located in Wallops at the end of June for vegetation chemistry studies and to fly from here to missions. So some data may be already collected before July 12.

The configuration of the MAS 12 channels is: (.55, .66, .86, .94, 2.14, 3.9, 8.6, 11., 12., 13.3, 13.9). It scans +45 from nadir.

AVIRIS has 200 channels from 0.4 to 2.5 micron. It scans +15 deg.

There is high possibility of C-131 from the U of Washington that is capable to use the CAR radiometer that can give the full 4*pi radiation with resolution of 1 deg at 13 channels from 0.47 to 2.1 micron. It is a slower plane and may not get as far as the ER-2.

Action Items from the MODIS/LTER Meeting (March 23-24 1993)

þ Locke Stuart (MODIS) will provide Jim Gosz with a set of MODIS color vugraphs within the next two or three weeks.

þ Brent Holben (GSFC) will contact John Porter (Va LTER) with respect to installing a sun photometer for the period of the Airborne MAS experiment (July - Aug 93).

þ Bob Murphy (NASA/HQ) to include a TM acquisition for the Va LTER during the SCAR campaign.

þ Yoram Kaufman (GSFC) to send information concerning the timing of the East Coast SCAR over-flights and the instrument configuration for the experiment to John Porter of the VA LTER.

þ John Vande Castle to contact Brent Holben (GSFC) concerning the possible and preferred distribution of the loaner sunphotometers at LTER's during summer of 93.

þ Jim Gosz to investigate and inform the group on mechanisms for research proposals to NSF to support the MODIS/LTER research agenda.

þ Brent Holben / John Vande Castle to coordinate an instrument proposal for April 1st.

þ Dorothy Hall to provide a one page description of plans for the MODIS snow cover product research agenda with the intent of identifying potential future collaboration with the relevant LTER's.

þ Aaron Moody to generate a one page description of the MODIS land cover research agenda with the intent of identifying potential future collaboration with the relevant LTER's.

þ Steve Ungar to provide information to John Vande Castle on the availability of the MCST software for MODIS simulation from TM data.

þ John Vande Castle to provide a statement of the existing land cover (vegetation maps) for the LTERs and the extent of mapping for the surrounding region. The statement should include scale, categories and format available (digital/hardcopy).

þ Warren Cohen to coordinate a vegetation mapping activity between the LTER's using the 1992 TM data acquired.

þ Justice to pursue linking 1km daily AVHRR data extraction to the Landsat pathfinder test site (LTER) activity.

þ John Vande Castle to provide a statement of the current

availability of DEM data for the LTERS.

þ Aaron Moody to send John Vande Castle a copy of the MODIS BRDF meeting (Columbia 1992) document for circulation.

þ Zhenming Wan (MODIS) to provide a one page description of the ideas for developing and validating surface temperature products for MODIS with the intent of identifying potential future collaboration with the relevant LTER's.

þ Alfredo Huete to send a preprint of the Modis Vegetation Index paper to John Vande Castle for distribution.

þ Chris Justice to send John Vande Castle a copy of the IGBP/GAIM remote sensing NPP workshop (UMd 1992) for circulation as it becomes available.

þ Bob Murphy to update the group on the current status of EOSAT TM acquisitions.

þ Bob Murphy will send John Vande Castle the necessary forms for the LTER's to obtain the 1992 TM data from EDC and will elaborate on the distribution restrictions.

þ John Vande Castle to report back on the suggestion for an NASA / LTER workshop at the Estes Park (All Science) Meeting in September. Detailed agenda to be worked out with Steve Running. Emphasis should be on joint presentations between MODIS/LTER scientists.

þ Steve Running to pursue the issue of poster sessions at the Estes Park Meeting.

þ Steve Running to contact Warren Cohen, Carol Wessman and Aaron Moody to develop plans for the Land Cover / LAI / NPP pre-proposal prior to the Estes Park meeting.

þ Brent Holben to consider presenting the sun-photometer initiative at the Estes Park Meeting.

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