QUARTERLY REPORT
NASA CONTRACT NAS5-31368
FOR MODIS TEAM MEMBER STEVEN W. RUNNING
ASSOC. TEAM MEMBER RAMAKRISHNA R. NEMANI
SOFTWARE ENGINEER JOSEPH GLASSY
15 OCTOBER 1995

Activities of Team Member S.W.Running

Meetings Attended:

EOS SEC meeting, Chicago Airport, Sept. 8, 1995.
Global land cover algorithms from satellite data, Polson, MT.  Sept 5-8.
Ecological Society of America Meeting, Snowbird, Utah. Jul 30-Aug 4, 1995;
    Running, S.W. - A vegetation classification logic based on remote sensing
for use in global biogeochemical models.
    Nemani, R. and S.W. Running - Global vegetation changes from satellite
data.
    Hunt, E.R., Jr., S.C. Piper, R.Nemani, S.W. Running, and C.D. Keeling -
Global net primary production and heterotrophic resporation for 1987.
    Rollins, M.G. and E.R. Hunt, Jr. - Comparing simulated and measured H2O and
CO2 fluxes spatially over the 15-km by 15km FIFE site.
IGBP- Global Analysis and Interpretation Models, Garmisch, Germany.  Sept 28-30,
1995; Churkina, G. and S.W. Running - Testing the assumption of water balance
limits controlling global NPP from the Potsdam-95 model inter-comparison.

Publications:
    Hunt, E.R., Jr., S.C. Piper, R. Nemani, C.D. Keeling, R.D. Otto, and S.W.
Running. 1995. Global Net Carbon Exchange and Intra-Annual Atmospheric $CO_2$
Concentrations Predicted by an Ecosystem Process Model and Three-Dimensional
Atmospheric Transport Model.  (submitted)

Activities of Associate Team Member R.R. Nemani

Publications:
    Nemani, R.R., and S.W. Running. 1995a. Satellite monitoring of global land
cover change and their impact on climate. Climatic change (in press).
    Nemani, R.R., and S.W. Running. 1995b. Implementation of a hierarchical
global biome classification in biospheric models. Journal of vegetation science
(in press).
    Nemani, R.R., S.W. Running and R.A. Pielke. 1995c. Global vegetation cover
changes from coarse resolution satellite data. Journal of Geophysical Research
(in press).
    Nemani, R.R., and S.W. Running. 1995d. Land cover classification using
multi-temporal red, nir and thermal-ir AVHRR data. Ecological applications (in
press).

Meetings:
MODLAND meeting, Boston, July
Global land cover algorithms from satellite data, Polson, Montana, Sept 6-9.

Presentations:
    MODIS LAI/FPAR algorithm implementation details, MODLAND meeting, Boston,
July.

Land cover classification compatible with radiative transfer theory, Global land cover meeting, Polson, Montana, Sept 6-9.

MODIS Science:

-Revised and submitted MODIS PSN/NPP algorithm.

-An extensive analysis of the influence of canopy structural/optical properties on spectral reflectance was conducted using a 3-D radiative transfer model. This analysis helped us to identify six vegetation canopies that are significantly different from each other.  These are shrubs, grass/cereal crops, broadleaf crops, broadleaf forests, needle forests and savanna.

-A prototype of global land cover classification scheme is developed using red, nir and thermal-ir data to derive the above six classes.   The scheme is implemented using AVHRR Pathfinder, 8 km global data.

-A prototype version of our Look-Up-Table for LAI/FPAR was produced for global grasslands. The approach is being extended for other biomes.

- To ensure reliabel estimates from FPAR/LAI algorithm (in cases where LUT searches fail), backup algorithms are being developed based on VI produced from MODIS.

-Global Ecosystem Simulation System was used to compute and map net primary production and heterotrophic respiration at 0.5x0.5 resolution. The results from this analysis are being compared against results from other models and observations.

Activities for Engineer Joe Glassy

My principal objectives during this time period were to 1) develop a ECS Production Generation System (PGS) compliant software interface from out MODIS-Univ.Montana (MUM) API software to the System Message Facility (SMF) mandated for use by all Science Computer Facility (SCF) developers.  2) incorporate the new SMF integration into the MOD15 and MOD17 algorithm codes, and 3) continue primary software development on the MOD17 algorithm codes.  In addition to these major task areas, we continued to develop our local SCF compute facility, designing a large scale, automated archive subsystem for routine SCF wide data archive.

MODIS Work:

MODIS UM SCF Compute Ring Infrastructure

-A large scale, high performance automated data archive subsystem was designed during this period, and is currently on order.  This SCF hardware subsystem centers around an automated Exabyte-440 streaming tape archive with a 40 cartridge jukebox, with each cartridge capable of storing 14G.  The archive subsystem will be controlled using Legato archive software, running on a dedicated workstation serving as archive tender.

-During the July to October 1995 timeframe, the NASA ECS PGS Toolkit version 5.0 was retrieved, built, and tested at our SCF.  Work continues on the software interface between the NCSA and MAPI HDF software implementation and our product level algorithm codes.

FPAR/LAI Product

-Starting with the latest iteration of MOD15 codes reviewed by the SDST Software Transfer and Integration Team (STIG), the next generation of these codes was developed.

This new generation (v. 0.98) of MOD15 codes supports a fully integrated PGS SMF interface to the MUM API underlying all our algorithm software products.

Improvements at the science level to the MOD15 codes included implementation of a new two stage probe of the FPAR, LAI lookup table (LUT) procedure based on a root mean squared error (RMSE) threshold criteria.  The new scheme employs a fault tolerant fallback algorithm where FPAR and LAI pixel are computed using empircally derived polynomials.

PSN/NPP Product
    -Work on the MOD17 algorithm focused on development of a proxy daily surface climatology dataset for use in software development and test.  A full two year sequence of daily data resolved to 2.81 degrees geographic resolution has now been assembled.  Front end software to pre-process the raw 6 hour timestep climatology data stream into a daily timestep dataset is underway.  Work is also progressing rapidly on finalizing the values making up the biome properties lookup table (BPLUT) used within the core PSN, NPP algorithm.  Lastly, the Quality Assurance (Q/A) scoring methods used within the PSN, NPP algorithm have been reviewed and refined.

ON GOING ACTIVITIES:
    MODIS UM SCF Compute Ring Infrastructure

    -Further core additions to our SCF Compute Ring have been planned and are now awaiting resolution of the 1995 operating budget for our SCF.  Minor upgrades planned will include CPU upgrades to the Power PC 604 chip in our Power PC 601 class workstations, as well as a major expansion of the fixed disk capacity on the central IBM Model 589H Univ. of Montana compute server.  Upon arrival of the 1995 funding allotment, the network facility will be upgraded via installation of a Catalyst 5000 network manager.

MOD15 (FPAR, LAI ) and MOD17 Algorithms
    -The major short term goal continues to be refining the MOD15 and MOD17 algorithm codes in anticipation of a final beta delivery in the October-November 1995 timeframe.