MODIS
SCIENCE DATA SUPPORT TEAM
PRESENTATION

August 28, 1992

AGENDA

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ACTION ITEMS:

04/24/92 [Lloyd Carpenter & Team] Develop a staffing plan for the accomplishment of the tasks shown on the schedule. (A draft version of the staffing plan has been developed and delivered.) STATUS: Open. Due Date: 06/12/92

06/12/92 [Tom Goff] Develop separate detailed schedules using Microsoft Project for Level-1A and -1B software design and development. (Updated results were included in the handout and presented at the meeting on July 24, 1992.) STATUS: Open. Due Date: 07/10/92

07/31/92 [Ed Masuoka] Find out, or decide, who should interface with Code 930 on SLIP. (Ed says this may not be necessary, pending the outcome of current efforts.) STATUS: Open. Due Date: 08/28/92

07/31/92 [Tom Goff, Ed Masuoka, Al Fleig] Develop the purpose and requirements for a packet simulator. Get more information on the packet simulator being developed by SBRC. (A draft requirements specification was included in the handout. Ed or Al to check on the SBRC packet simulator. See if it will meet our needs, and if/when it will be available to the SDST.) STATUS: Open. Due Date: 09/04/92

08/21/92 [Paul Hubanks] Check to see what existing geolocation and pixel navigation software is available, and what EOSDIS plans to provide. (A report is included in the handout.) STATUS: Open. Due Date: 09/04/92

MODIS Airborne Simulator (MAS) Status

Liam E. Gumley
Progress up to 27 August 1992

(1) MAS data processing software development

In order to supplement the metadata available to MAS users it was decided to create subsampled quicklook images from the MAS netCDF flight line files. The program developed for this purpose has the same characteristics as the *summary* program in that it searches for all files existing for a specified date.

The program creates images of every 4th pixel on every 4th line for one visible and one infrared band of the MAS. These are written in Portable Gray Map (PGM) format. A set of tools from the PBMPlus suite is then used to

- quantize the 16 bit image data to 8 bits,
- contrast stretch the image,
- transform the image to portable Compuserve Graphics Interchange File (GIF) format.

GIF is a desirable format since many public domain programs are available to display GIF images on a variety of systems (e.g. MSDOS, Macintosh, Unix, Unix/Xwindows). GIF is also a compressed file format, thus saving space. This is important since these quicklook images are intended for online retrieval via FTP.

(2) MAS data processing

A complete output MAS dataset has been produced, copied to Exabyte tape, and will be passed to Mike King on 08/27. The distribution strategy currently planned is to give single copies of the input and output data tapes to Mike King, and to have quicklook images and flight line summary data online for anonymous FTP.

(3) User requests for MAS data

Si-Chee Tsay from Mike Kings group contacted me and asked for some assistance in getting ready to read MAS data. He is currently using the Cray to run an cloud optical depth algorithm. I was able to install the netCDF libraries on the Cray without problems, and compiled a test program (*MASDUMP*) for them to use as an example in code development. Si-Chee does have a problem in that he only has 20MB of disk quota on the Cray. This corresponds to a single small MAS flight line.

David Simas from Jim Coakleys group at Oregon State contacted me via email and asked for some direction on obtaining MAS data. I initially suggested that he download the netCDF software from UCAR and compile it on his system. I have yet to decide on a data distribution strategy.

(4) MAS image data filtering

I exchanged some email messages with Mike King during the week regarding the MAS image filtering demo that J.J. and myself put together a few weeks ago. Mike is "very happy" with the results, and as a consequence he asked if was possible that this filtering could become part of the opertaional processing. After some consultation with J.J. I told Mike that we did not think that this method would lend itself to automatic image filtering on all of the MAS data. The nature of the two algorithms involved is such that they both require continuous user interaction. It is also true that some users may wish to perform their own image filtering, to a greater or lesser degree of smoothing than we have done. J.J. and I recommended that the filtering source code be cleaned up and made portable, and a short set of documentation produced for distribution. This would enable data users to filter the data to their own satisfaction, if they wish to smooth it at all. Mike has agreed that this is the best approach.

DRAFT

MODIS Level-2 Processing Shell Design and Development

J. J. Pan
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(301) 982-3700

Date: August 24- August 28, 1992

1. Algorithm Dependency Diagram

Lloyd Carpenter and I prepared a brief description of the algorithm dependency diagram for MODIS Level-2 processing. This description will be provided to Team Members for the understanding of the legend used in the diagram.

Based on the selected data product list provided by Ghassem Asrar, EOS Program Scientist, inconsistencies with the dependency diagram were identified. The following procedure is used to check the relationship between the selected data products and the interdependence of MODIS Level-2 algorithms:

(1). MODIS selected data products are highlighted, except the Level-1B products 2338, 2339, 2340, and 2392 which are all selected.

(2). Algorithms which generate selected data product(s) are circled in green.

(3). Algorithms which must be run before selected products can be generated are circled in blue.

(4). For selected products, required input data (which were not selected) from non-MODIS instruments are circled in red.

(5). Algorithms which depend on non-selected data are crossed out in red.

(6). Changes will be made to the diagram to reflect any changes in the list of selected products.

I am also preparing a list which will indicate the dependence of MODIS Level-2 algorithms on non-MODIS instruments.

Algorithm Dependency Diagram for MODIS Level-2 Processing

A draft diagram of the interdependence of MODIS Level-2 algorithms is attached for your information and verification. The algorithm dependency diagram was constructed for use in the design and development of the higher-level processing shell. In addition to the need to identify limitations on the algorithm processing sequence, we wanted to explore cases where several algorithms require the same input data, providing opportunities for improved efficiency in handling the input operation.

The information used to generate the dependency diagram was provided by the Science Processing Support Office (SPSO) based on their Science Processing DataBase (SPDB). The following lists, which were provided by the SPSO, are also attached:

MODIS Products Sorted on Product Number,

MODIS Input Requirements (from sources other than MODIS),

MODIS Algorithms sorted on Investigator Name,

MODIS Algorithms sorted on Algorithm ID Number.

The required input data and the output data products for each algorithm were extracted from algorithm information sheets provided by the SPSO. Since the SPDB is being updated frequently, their may be some changes which were made after the dependency diagrams were generated. We will continue to update the diagrams as new information is received from the SPSO.

Before Launch (BL) and correlative data requirements have not been included in the diagrams, since these should not impact the production processing of MODIS data. A more complete study of input requirements from other instruments and other sources must be considered at a later stage.

For convenience, the diagram has been divided into four parts. The line across the top of the diagram indicates the MODIS Level-1 input product numbers and input products from other sources at the top level. Only those products which are used by more than one algorithm are shown.

The processing by each algorithm is shown in the following format:

Input Data ID Numbers
Algorithm Name (Algorithm ID) Investigator
Output Product ID Numbers

The bold numbers indicate data products which are used by more than one algorithm

The connecting lines and arrows indicate the flow of products from one algorithm to the next. The greatest complexity shows up in Parts 3A and 3B. (These are joined by connecting the lines A, B and C.)

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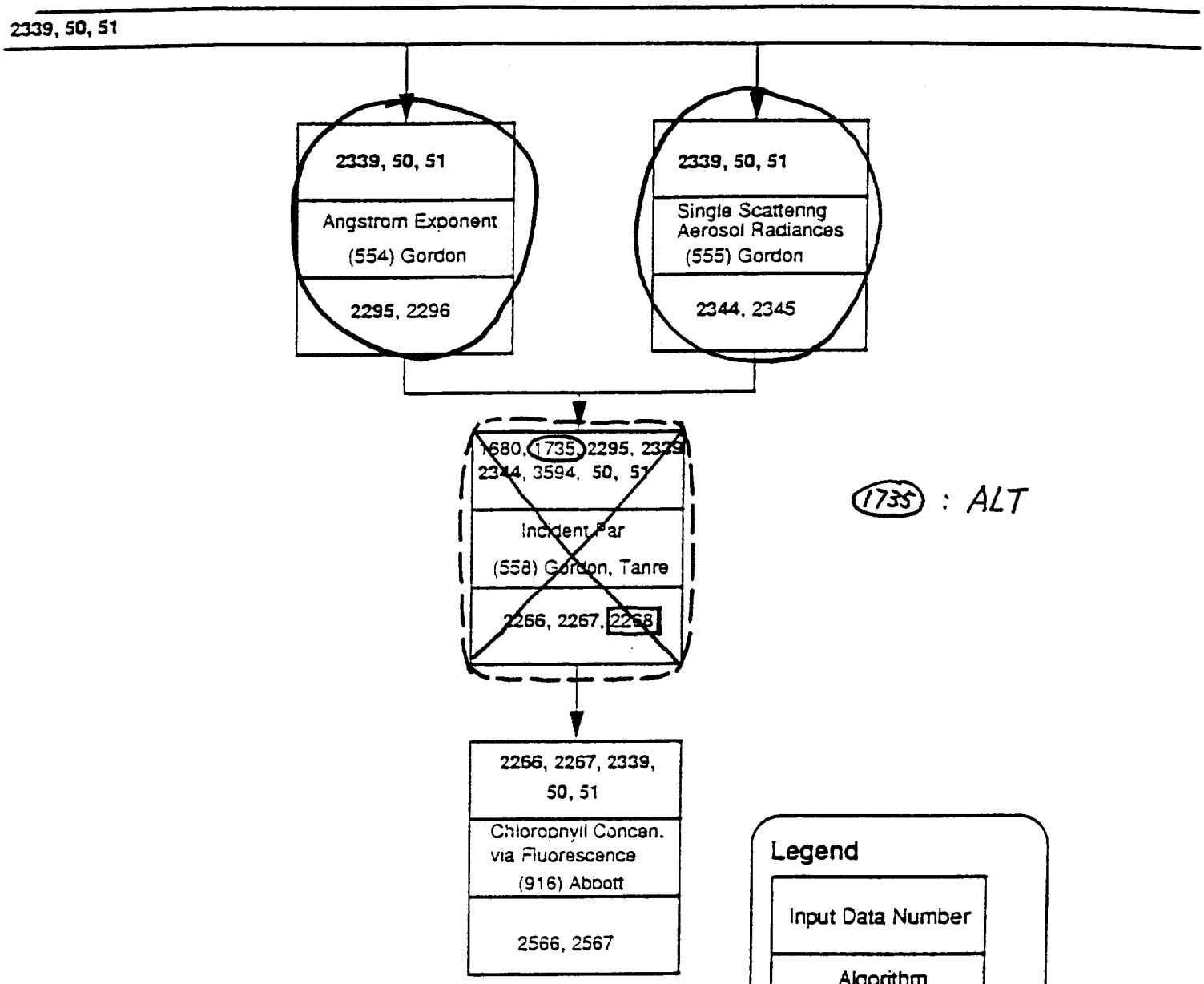
Algorithm Dependency in MODIS Level-2 Processing
(Part 1)



2268	Selected MODIS data products. (Level-1B data 2338, 2339, 2340, and 2392 are selected data, but not highlighted here).
1735	Data from non-MODIS instruments which is not selected.
◯	Algorithm which includes selected product(s).
X	Algorithm that cannot be made.
○	Algorithm which is needed.

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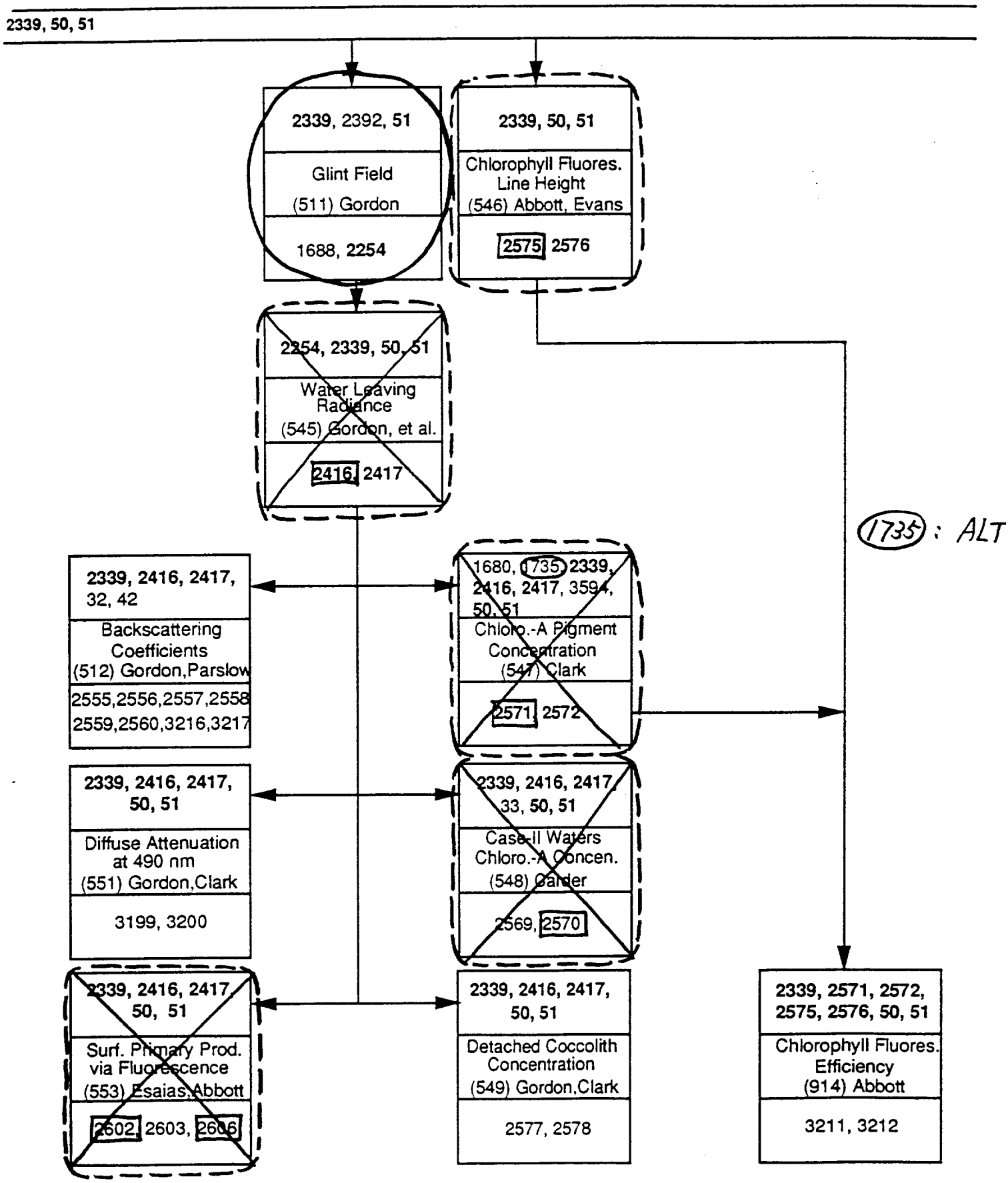
Algorithm Dependency in MODIS Level-2 Processing
(Part 2)



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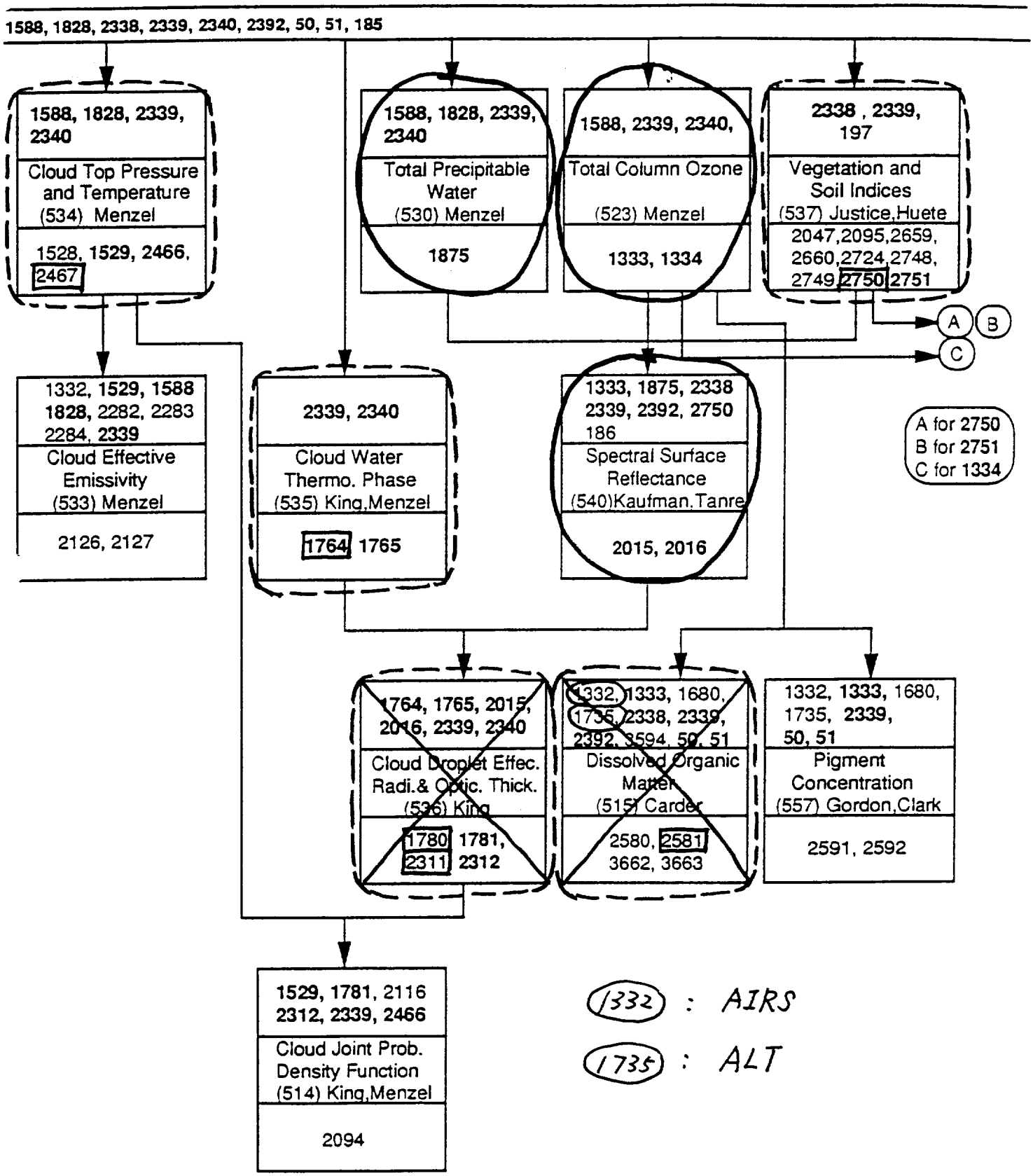
Algorithm Dependency in MODIS Level-2 Processing (Part 3A)



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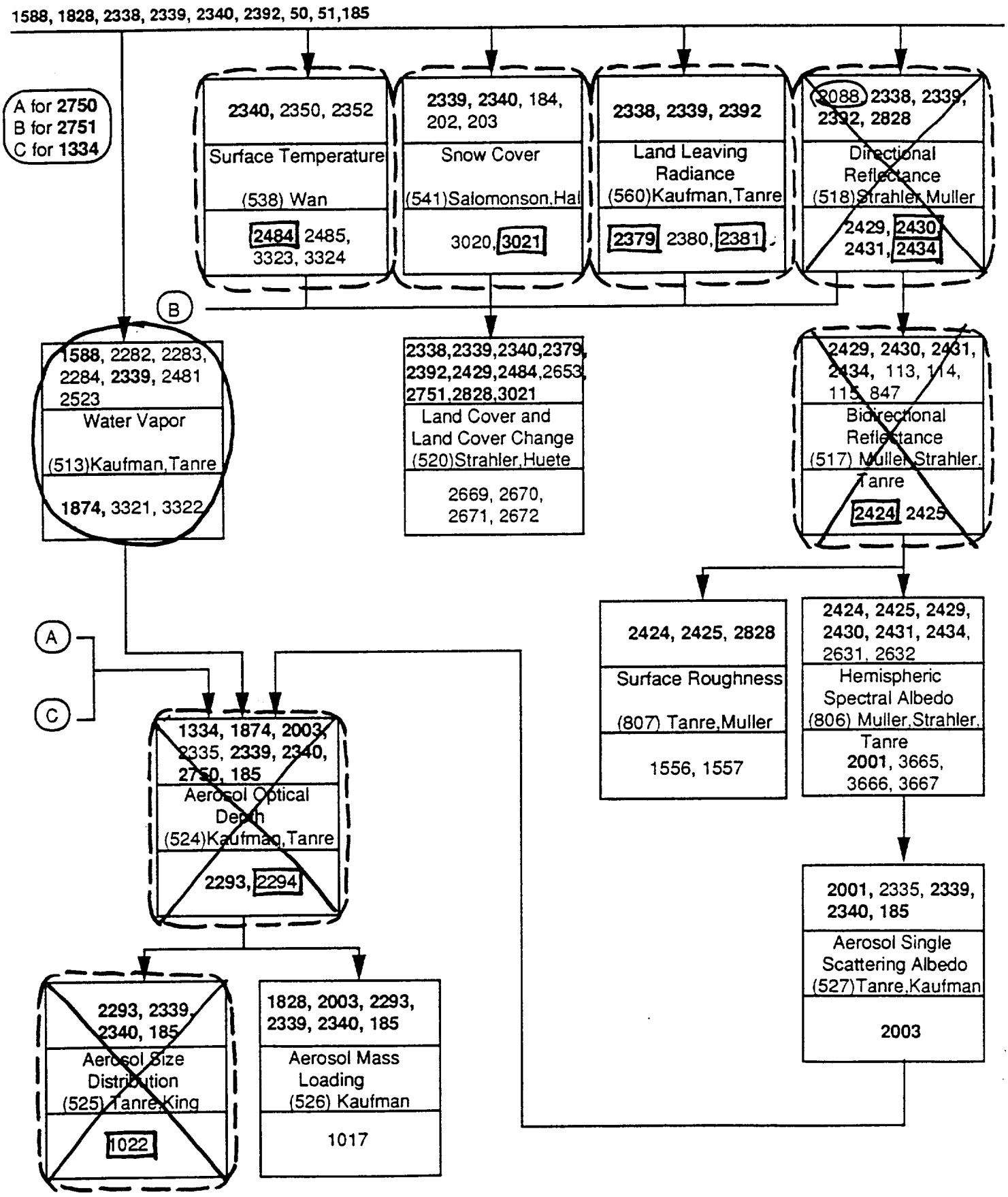
Algorithm Dependency in MODIS Level-2 Processing (Part 3B)

2088 : CERA



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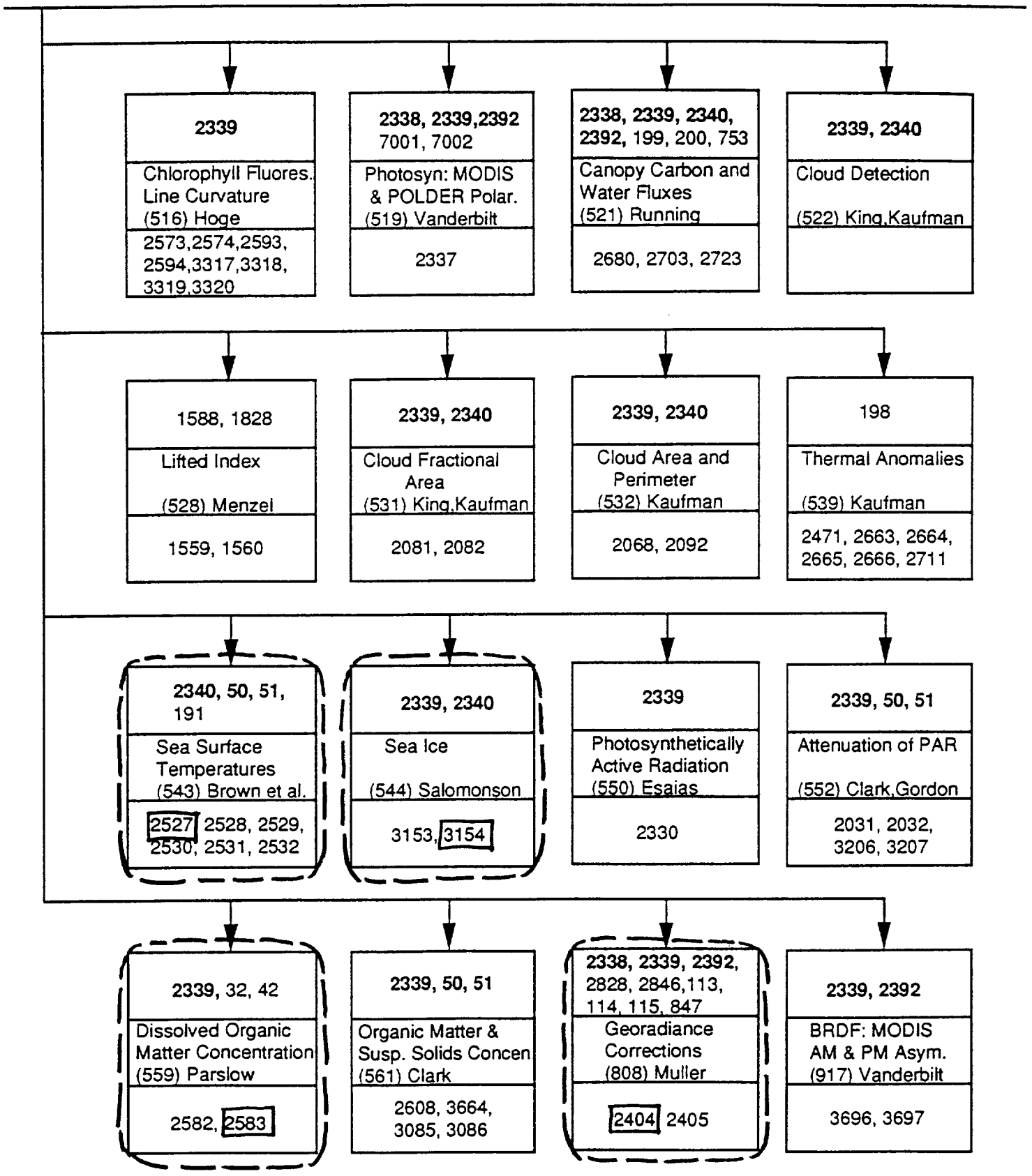
Algorithm Dependency in MODIS Level-2 Processing
(Part 4)



MODIS Level 1 Navigation and Input Data Simulation

Paul A. Hubanks
28 August 1992

Objective

Develop software to perform navigation of MODIS instrument data. Model the orbital track of the spacecraft to generate files of simulated spacecraft position and attitude, and instrument scan angles. Test the navigation software by generating pixel geolocation, and the spacecraft and solar azimuth and zenith angles with respect to the pixel for controlled cases.

Assigned Tasks

1. Locate and obtain a copy of existing geolocation software.
   Code may need to be modified to fit the specifications of EOS and MODIS.
2. Locate and obtain a copy of existing solar ephemeris software.
   This code is needed for simulation purposes only.
   In operational mode, solar ephemeris will be available from TOOLKIT.
3. Develop equations for modeling the spacecraft orbit.

Progress

I contacted the USGS EROS Data Center several times about obtaining earth location software. Two of the primary contacts I was given were on vacation. Several other people I spoke with there were not very helpful. I was finally able to reach Joy Hood, Senior Scientist in the Information Sciences Section, on Thursday (yesterday). She was going to call me back with the proper contact.

I spoke with Mr. John Bangert at the United States Naval Observatory about currently developed software to compute the solar and lunar ephemeris. To the best of his knowledge the current standard operational ephemeris software in the astronomical community is the Jet Propulsion Laboratory's DE200/LE200 program. To set up this program, JPL provides a large ASCII file which contains encoded Chebyshev series coefficients, implementation software, and ephemeris computational source code (written in Fortran). The implementation software reads in the ASCII file and creates a direct access file of Chebyshev coefficients in binary form. This direct access file is used to generate ephemeris data. Given a particular Julian date, coordinate origin, and target object, the computational code evaluates the appropriate short Chebyshev series (which approximates the specified target object ephemeris) and returns the rectangular coordinates of the target. This program generates valid ephemeris data for the years 1960 through 2025. There is also extraction software to create a temporal subset of the direct access file. The memory requirements for the binary direct access file are approximately 1 Megabyte for every 10 year period. I currently have a call into JPL's Dr. Skip Newhall to get information on obtaining the latest version of this software.

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MODIS

Software and Data Management Plan

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1 Introduction

1.1 Purpose

The purpose of this MODIS Software and Data Management Plan is to address the policy of the MODIS Science Team for management of the MODIS science data and the software which will be developed for the purpose of processing these data and generating data products on an operational basis. This software and data management policy will be coordinated with the Earth Observing System (EOS) Project to assure consistency with the requirements of the EOS Data and Information System (EOSDIS).

1.2 Scope

This MODIS Software and Data Management Plan defines the nature of the software to be developed for processing MODIS science data, and it outlines the procedures to be followed in software development, porting, integration, testing, validation, maintenance, modification, and documentation. Provision is made for a Configuration Management (CM) system to protect the MODIS operational software and data products.

The plan provides for the calibration, validation, earth location, processing, archival and distribution to the science users, within the EOSDIS data management structure. The end-to-end data flow from its origin at the MODIS instrument to the science product archival and distribution is described in the EOSDIS context.

The collection and management of input data, ancillary data and data from external sources is described as they relate to the processing and production of MODIS products. The manner in which reference data for ground control points, digital elevation and terrain models, atmospheric models, coastline definitions, etc. will be collected and integrated into the system is specified.

The Plan describes the output products to be produced, including standard, quicklook, browse, and special products. The descriptions include the volume, product level, and format of the output data. Formats will comply with Investigator Working Group (IWG) approved standards.

The software development and validation schedule is contained in Appendix B. The schedule is based upon three software deliveries prior to launch. Each delivery of software to the EOSDIS Core System (ECS) will include software, input test data and test results, user's guide, operations guide, and software version description. Conformance to the schedule is contingent upon timely provision of resources, support, and information from the EOS Project.

Consideration is given to processing and management of quick look data for field experiments, targets of opportunity and special investigations. A plan is provided for the generation and delivery of metadata and browse products.

2.4.2 Correlative Data

Correlative data which are required by a number of investigators are to be acquired and integrated into the EOSDIS by the EOS Project in a cooperative effort with the Science Team Members. This includes reference data such as ground control point data, digital elevation and terrain models, atmospheric models, coastline definitions, etc.

Each Team Member is responsible for establishing the initial agreement for providing all other non EOS data that are needed to validate MODIS Science Data products. If the data will be supplied on a continuing basis, the SDST will assist the EOS Project in implementing and administering the process. The EOS Project is responsible for reformatting the data as needed for the DADS. The SDST will work with the Project to get publicly available correlative data. The TM is responsible for submitting to the DADS any needed research data which are not generally available. Neither the SDST nor the TMs will reformat correlative data to IWG standards.

3 MODIS Science Software

The MODIS Science Team Leader and Team Members are responsible for the requirements analysis, design, implementation, test plan, test data, all levels of testing, and lifetime evolution, maintenance and updating of the MODIS Science Software. The source code and documentation for every version of every science algorithm will be provided to the Data Archive and Distribution System (DADS), but neither the Team Members nor the SDST will provide support to other users of the software.

The development, porting, integration and testing of MODIS algorithms on schedule for operational processing on the PGS depends upon the timely availability of information and decisions.

3.1 Processes and Procedures

3.1.1 Product Generation System (PGS) Toolkit

The EOS Project intends to provide a PGS Toolkit which will serve to isolate the science software from hardware, system, and language interface library dependencies. The Toolkit will be implemented at the Science Computing Facilities (SCFs) as well as at the PGS. Science software will be developed using the Toolkit as a standard library of callable functions and subroutines including input/output, math and statistics support. Updating and modification of software will be much more straightforward in those cases where the PGS Toolkit is fully utilized. The ability of the SDST and TMs to use the toolkit and deliver software on schedule depends upon timely availability of the PGS Toolkit. It is assumed that the PGS Toolkit will support emulation of parallel processing code if such a CPU is a part of the ECS for MODIS processing.

3.2.2 Level-1 Design

The SDST is responsible for developing the MODIS Level-1A and -1B designs. Computer Aided Software Engineering (CASE) tools, such as Cadre Technologies Teamwork, will be used in the design process. These tools will also be on-line and accessible by the TMs for their use. Each preliminary design will be followed by a Preliminary Design Review (PDR). The design will then be refined and improved. Approval of the final design comes at the Critical Design Review (CDR). The design reviews will involve representatives from the MODIS Science Team, the MODIS Characterization Support Team (MCST), and the EOS Project.

3.2.3 Code Development

The code for implementing the Level-1A and -1B designs will be produced by the SDST.

3.2.4 Test Plan & Test Data Development

The SDST will develop a Level-1 Test Plan and test data sets which will exercise all of the viable branches (within reason) in the code, checking for proper results. The tests will also check for proper functioning of the software in the presence of anomalous or meaningless data.

3.2.5 Test and Delivery to ECS

After the software has been thoroughly tested on the TLCF, the SDST is responsible for porting the software to the EOSDIS Product Generation Service (PGS) and participating in the test process in the PGS.

3.2.6 Calibration

The MODIS Characterization Support Team (MCST) is responsible to the MODIS Science Team Leader for the development of the MODIS calibration algorithms and the implementing code. The calibration code will be delivered to the SDST for optimization and integration into the MODIS Level-1B software. The delivery will contain:

- source code, installation instructions and "make" file
- operating instructions, and other documentation,
- test input and output data sets which test all paths in the code
- test drivers which run the code with the input test data, compare the results with the corresponding output data sets, and flag any inconsistencies.

operational system on the EOSDIS. The Higher-Level Processing Shell will be provided in three versions, ß, V1 and V2, with V2 being the operational version at launch. Iteration with the TMs will be emphasized during the Shell development.

3.3.3 Review of Team Member Algorithms

The MODIS Science Team will establish a process for science review of Team Member algorithms. Progress review for the EOS Project will be on an annual basis. The SDST and Team Members will conduct iterative reviews of algorithm status.

3.3.4 TM Code Development

MODIS Team Members are responsible for developing the code for their own algorithms. The ß, V1 and V2 versions will be completed and delivered according to the schedule in Appendix B, to provide time for integration, testing and delivery to the EOSDIS. Early availability of the coding recommendations and the PGS toolkit are essential prerequisites to meeting the software development schedule.

##########################

Miami will provide a section here on Oceans algorithms.

##########################

3.3.5 Integration of Team Member Code

Each Team Member is responsible, with the assistance of the SDST, for porting his code to the PGS and integrating the code into the Higher-Level Processing Shell. This will be an iterative process wherein the TM delivers the latest version of the:

- source code, installation instructions and "make" file,
- operating instructions, and other documentation (standards to be supplied (TBS)),
- test input and output data sets which test all paths in the code
- test drivers which run the code with the input test data, compare the results with the corresponding output data sets, and flag any inconsistencies.

The SDST will port the software to the PGS and run the test cases. It is anticipated that the SDST will have to modify the code to account for differences in environment between the development machine and the PGS. Only necessary changes will be made. If serious problems

3.4 Utilities

The SDST will develop utility software for generating MetaData and Browse data, for Earth location/matching to in situ data, for data conversion, resampling, subsampling, etc.

3.5 Configuration Management

The operational software is under EOSDIS configuration management control to assure the identification of data products with the associated processing software versions, and to assure that modified software is adequately tested before being implemented. The SDST provides the documentation to the PGS to support configuration management.

Configuration management is not intended to inhibit the use of development versions of the code to test algorithm variations and new techniques. As new software is proven and tested, it will be incorporated into the operational version through the approved configuration management process.

During the iterative period of porting and integration, the CM must keep track of versions, making sure that new code has a new ID number, but not hampering the process.

During the first 18 (or perhaps 36) months after launch, it will be necessary to operate at a reduced level of configuration management control of algorithm updates in order to permit TMs to respond to new information and preliminary results, and to refine and improve their algorithms in a timely manner. During this interim period, TMs will have CM control of their algorithms, making changes as often as required, with the condition that no changes will be permitted which will overwhelm the system. During this period after launch, the CM system will keep records of versions of software used to generate the products, with the TMs retaining control over which version is to be used for production. Decisions to reprocess all data using a new software version must be coordinated with the Project, giving consideration to the availability of resources.

3.6 Reprocessing

The procedure for initiating reprocessing is TBD.

4 MODIS Data Processing

4.1 Data Product Descriptions

The MODIS Science Data Products are tabulated in Appendix C along with the responsible Team Members.

5 MODIS Data Storage and Archiving

MODIS data storage and archiving are the responsibility of the DAACs. The TLCF and SCFs will have adequate storage to support development, integration and testing, but no archiving.

6 MODIS Data Access and Distribution

MODIS data access and distribution are the responsibility of the DAACs.

7 MODIS Data Discard Policy

Policy governing discarding of EOS data is TBD. The SDST assumes that Level-0 MODIS data will be maintained for the life of the MODIS project.

8 Post Launch Products

The development of post-launch products will follow the same guidelines as those for at-launch products.

CORRELATIVE DATA are scientific data, generally from outside sources, needed to evaluate and validate EOS data products.

CRITICAL DESIGN REVIEW (CDR) TBS

DATA QUALITY REQUEST is a request issued by the PGS to a scientist at an SCF to perform QA of a particular product before future processing or distribution. A time window is applied to the request in keeping with the production schedule.

DATA PRODUCTS TBS

DIGITAL ELEVATION MODEL (DEM) TBS

DIGITAL TERRAIN MODEL (DTM) TBS

DOCUMENTS are the hardcopy or digitized references or records about an algorithm, or the data products generated by the algorithm. These shall be archived at the DADS.

EARTH LOCATION TBS

HIGHER-LEVEL refers to Level-2, 3 and 4 products or algorithms.

INPUT DATA TBS

INTERACTIVE SESSION DIALOG consists of messages that flow between a scientist at an SCF and the PGS that support general communication with the Integration and Test Service. This includes logins, mail messages, etc.

LEVEL-0 DATA TBS

LEVEL-1A DATA PRODUCTS TBS

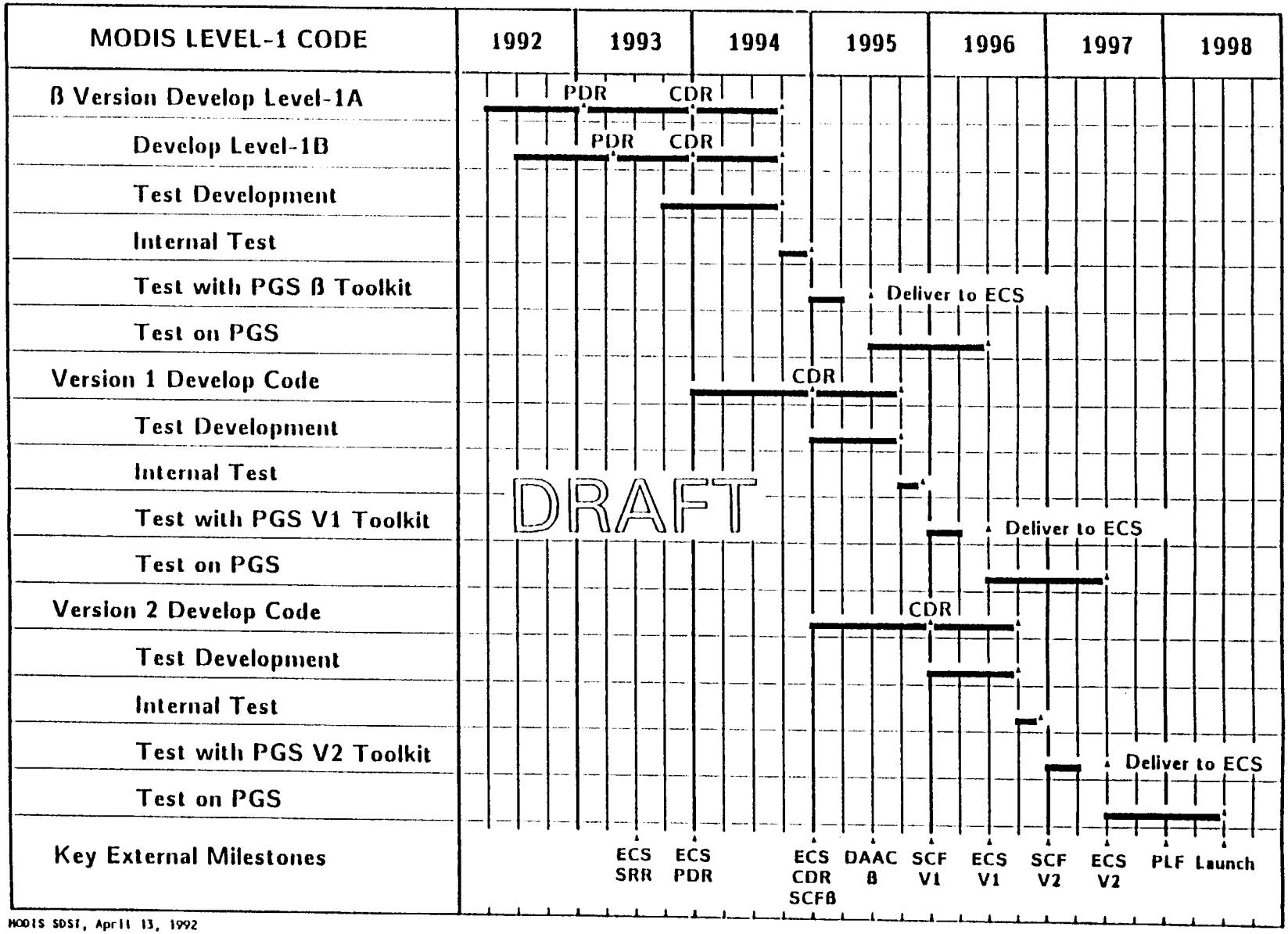
LEVEL-1B DATA PRODUCTS TBS

LEVEL-2 TO 4 DATA PRODUCTS TBS

METADATA is data which describes the content, format, and utility of a Standard Product. It includes standard metadata (i.e., algorithm and calibration numbers, size of product, date created, etc.), algorithm-derived metadata, QA information from the PI's, summary statistics and an audit trail. Metadata is received by each DADS with the corresponding data sets. DADS validates it physically, updates it with inventory information, enters it into a distributed database (to which the IMS has access), and archives it. Metadata about special products produced at SCFs shall be sent to DADS along with their associated data products.

METADATA UPDATES are additional or changed metadata items relating to a previously delivered product.

Appendix B: Software Development Schedule



MODIS SDST, April 13, 1992

MODIS\PLANS\GHANI.08E

Prod #	Product Name	Cat	Investigator	Instrument	Platform	DAAC	Time frame	Units	Accuracy Abs :: Rel	Temporal Resolution	Horizontal Resol. :: Cover.	Vertical Resol. :: Cover.
2575	*Chlorophyll Fluorescence Line Height*	OB	Abbott	MODIS	AM,PM	GSFC	AL	mW/cm^2/sr/u	.004 :: .001	1/day, 1/wk	4 km :: Ocean/G,R	N/A :: TOO
2576	Chlorophyll Fluorescence Line Height	OB	Abbott	MODIS	AM,PM	GSFC	AL	mW/cm^2/sr/u	.004 :: .001	1/day, 1/wk	1 km :: Ocean/R,L	N/A :: TOO
2566	Chlorophyll_a Conc (via Fluorescence)	OB	Abbott	MODIS	AM,PM	GSFC	PL	mg/m^3	50-100% :: 35%	1/day, 1/wk	1 km :: Ocean/R,L	N/A :: TOO
2567	Chlorophyll_a Conc (via Fluorescence)	OB	Abbott	MODIS	AM,PM	GSFC	PL	mg/m^3	50-100% :: 35%	1/day, 1/wk	4 km :: Ocean/G,R	N/A :: TOO
2602	Ocean Productivity, Primary, Near_sfc [via Fluorescence]	OB	Abbott	MODIS	AM,PM	GSFC	PL	mg-C/m^3/day	:: 50-100%	1/day, 1/wk	1 km :: Ocean-I/R,L	N/A :: TOO
2603	Ocean Productivity, Primary, Near_sfc [via Fluorescence]	OB	Abbott	MODIS	AM,PM	GSFC	PL	mg-C/m^3/day	:: 50-100%	1/day, 1/wk	4 km :: Ocean-I/G,R	N/A :: TOO
2110	Land_sfc Emissivity	LR	Barton	MODIS	AM,PM	EDC	PL	dimensionless	0.01 :: 0.01	1/day, 1/wk	1 km :: G,R	N/A :: Sfc
2111	Land_sfc Emissivity	LR	Barton	MODIS	AM,PM	EDC	PL	dimensionless	0.01 :: 0.01	1/day, 1/wk	50 km :: G,R	N/A :: Sfc
2527	*Sea_sfc Temperature (SST)*	OR	Brown	MODIS	AM,PM	GSFC	AL	K	0.3-0.5 K :: 0.1-0.3 K	1/day, 1/wk, 1/mo	1 km :: Ocean/L	N/A :: Sfc
2528	Sea_sfc Temperature (SST)	OR	Brown	MODIS	AM,PM	GSFC	AL	K	0.3-0.6K :: 0.1-0.3K	1/day, 1/wk, 1/mo	20 km :: Ocean/G,R	N/A :: Sfc
2529	Sea_sfc Temperature (SST)	OR	Brown	MODIS	AM,PM	GSFC	AL	K	0.3-0.6K :: 0.1-0.3K	1/day, 1/wk, 1/mo	4 km :: Ocean/R,L	N/A :: Sfc
2530	Sea_sfc Temperature (SST)	OR	Brown, Barton	MODIS	AM,PM	GSFC	AL	K	0.3-0.6K :: 0.1-0.3K	1/day, 1/wk, 1/mo	4 km :: Ocean/R,L	N/A :: Sfc
2531	Sea_sfc Temperature (SST)	OR	Brown, Barton	MODIS	AM,PM	GSFC	AL	K	0.3-0.6K :: 0.1-0.3K	1/day, 1/wk, 1/mo	20 km :: Ocean/G,R	N/A :: Sfc
2532	Sea_sfc Temperature (SST)	OR	Brown, Barton	MODIS	AM,PM	GSFC	AL	K	0.3-0.4K :: 0.1-0.6K	1/day, 1/wk, 1/mo	50 km :: Ocean	N/A :: Sfc
2569	Chlorophyll_a Conc	OB	Carder	MODIS	AM,PM	GSFC	AL	mg/m^3	50% :: 10%	1/day, 1/wk, 1/mo	1 km :: Ocean II/L	N/A :: TOO
2570	Chlorophyll_a Conc	OB	Carder	MODIS	AM,PM	GSFC	AL	mg/m^3	50% :: 10%	1/day, 1/wk, 1/mo	1 km :: Ocean-II/G,R	N/A :: TOO
2580	Organic Matter Conc, Dissolved	OB	Carder	MODIS	AM,PM	GSFC	PL	mg/m^3	150% :: 30%	1/day, 1/wk, 1/mo	20 km :: Ocean	N/A :: TOO
2581	Organic Matter Conc, Dissolved	OB	Carder	MODIS	AM,PM	GSFC	PL	mg/m^3	150% :: 30%	1/day, 1/wk, 1/mo	1 km :: Ocean/R,L	N/A :: TOO
3662	Organic Matter Degradation_Product Absorption Coef@415nm (DOM+Detritus)	OB	Carder	MODIS	AM,PM	GSFC	AL	/m	40% :: 15%	1/day, 1/wk, 1/mo	20 km :: Ocean	N/A :: TOO
3663	Organic Matter Degradation_Product Absorption Coef@415nm (DOM+Detritus)	OB	Carder	MODIS	AM,PM	GSFC	AL	/m	40% :: 15%	1/day, 1/wk, 1/mo	1 km :: Ocean/R,L	N/A :: TOO
2571	*Chlorophyll_a Conc*	OB	Clark	MODIS	AM,PM	GSFC	AL	mg/m^3	30% :: 10%	1/day, 1/wk, 1/mo	1 km :: Ocean-I/L	N/A :: TOO
2572	*Chlorophyll_a Conc*	OB	Clark	MODIS	AM,PM	GSFC	AL	mg/m^3	30% :: 10%	1/day, 1/wk, 1/mo	20 km :: Ocean-I/G,R	N/A :: TOO
2031	Ocean Water Attenuation Coef, PAR	OR	Clark	MODIS	AM,PM	GSFC	PL	/m	35% :: 10%	1/day, 1/wk	1 km :: Ocean-I/L	N/A :: TOO
2032	Ocean Water Attenuation Coef, PAR	OR	Clark	MODIS	AM,PM	GSFC	PL	/m	35% :: 10%	1/day, 1/wk	20 km :: Ocean-I	N/A :: TOO
3206	Ocean Water Attenuation Coef@520nm, Beam	OR	Clark	MODIS	AM,PM	GSFC	PL	/m	35% :: 10%	1/day, 1/wk	1 km :: Ocean	N/A :: TOO
3207	Ocean Water Attenuation Coef@520nm, Beam	OR	Clark	MODIS	AM,PM	GSFC	PL	/m	35% :: 10%	1/day, 1/wk	20 km :: Ocean	N/A :: TOO
2608	Organic Matter Conc, Particulate	OB	Clark	MODIS	AM,PM	GSFC	PL	mg/m^3	50% :: 30%	1/day, 1/wk	20 km :: Ocean	N/A :: TOO
3664	Organic Matter Conc, Particulate	OB	Clark	MODIS	AM,PM	GSFC	PL	mg/m^3	50% :: 30%	1/day, 1/wk	1 km :: Ocean-I/L	N/A :: TOO
3085	Suspended-Solids Conc, Ocean Water	OC	Clark	MODIS	AM,PM	GSFC	AL	g/m^3	50% :: 35%	1/day, 1/wk, 1/mo	20 km :: Ocean	N/A :: TOO
3086	Suspended-Solids Conc, Ocean Water	OC	Clark	MODIS	AM,PM	GSFC	AL	g/m^3	50% :: 35%	1/day, 1/wk, 1/mo	1 km :: Ocean/R,L	N/A :: TOO
2606	Ocean Productivity, Primary	OB	Esaias	MODIS	AM,PM	GSFC	AL	mg/m^3	<35% :: <20%	1/wk, 1/mo, 1/yr	20 km :: Ocean/G,R	N/A :: TOO
2330	PAR	AR	Esaias	MODIS	AM,PM	GSFC	PL	quanta/m^2/s	TBD :: TBD	1/day	N/A :: G	N/A :: Atmos
3303	Calibration Data, MODIS	IC	Evans	MODIS	AM,PM	GSFC	AL	variable		1/day, 1/wk, 1/mo	N/A :: Ocean/G,R,L	N/A :: Sfc
2295	*Aerosol Angstrom Exponent*	AR	Gordon	MODIS	AM,PM	GSFC	AL	dimensionless	15% :: 5%	1/day, 1/wk, 1/mo	1 km :: Ocean/R,L	N/A :: Atmos
2296	*Aerosol Angstrom Exponent*	AR	Gordon	MODIS	AM,PM	GSFC	AL	dimensionless	15% :: 5%	1/day, 1/wk, 1/mo	20 km :: Ocean	N/A :: Atmos
2344	*Aerosol Radiance*	AR	Gordon	MODIS	AM,PM	GSFC	AL	mW/cm^2/sr/u	10% :: 5%	1/day, 1/wk, 1/mo	1 km :: Ocean/G,R,L	N/A :: Atmos
2345	*Aerosol Radiance*	AR	Gordon	MODIS	AM,PM	GSFC	AL	mW/cm^2/sr/u	10% :: 5%	1/day, 1/wk, 1/mo	20 km :: Ocean/G,R,L	N/A :: Atmos
2556	Coccolith Backscatter Coef	OR	Gordon	MODIS	AM,PM	GSFC	PL	/m	25% :: 10%	1/day, 1/wk, 1/mo	1 km :: Ocean/R	N/A :: TOO
2557	Coccolith Backscatter Coef	OR	Gordon	MODIS	AM,PM	GSFC	PL	/m	25% :: 10%	1/day, 1/wk, 1/mo	20 km :: Ocean	N/A :: TOO
2254	Glint Field	OR	Gordon	MODIS	AM,PM	GSFC	PL	dimensionless		1/orbit [d]	1 km :: Ocean/R	N/A :: Sfc

Prod #	Product Name	Cat	Investigator	Instrument	Platform	DAAC	Time frame	Units	Accuracy Abs :: Rel	Temporal Resolution	Horizontal Resol. :: Cover.	Vertical Resol. :: Cover.
3305	Data Characteristics, MODIS	IC	Justice, Strahler	MODIS	AM,PM	GSFC	PL	dimensionless	30,10, 5% ::	1/day	10 km :: G	N/A :: Sfc
3306	Data Characteristics, MODIS	IC	Justice, Strahler	MODIS	AM,PM	GSFC	PL	dimensionless	30,10, 5% ::	1/day	50 km :: G	N/A :: Sfc
2068	Cloud Field Area	AH	Kaufman	MODIS	AM,PM	GSFC	PL	km^2		1/mo	1 dg :: G	N/A :: Sfc
2092	Cloud Field Perimeter	AH	Kaufman	MODIS	AM,PM	GSFC	PL	km		1/mo	1 dg :: G	N/A :: Sfc
2429	Land_sfc Reflectance, Directional	LR	Kaufman et al	MODIS	AM,PM	EDC	AL	dimensionless	0 01 :: 0 005	1/day	1 km :: G	N/A :: Sfc
2430	Land_sfc Reflectance, Directional	LR	Kaufman et al	MODIS	AM,PM	EDC	AL	dimensionless	0 01 :: 0 005	1/day	0 5 km :: G	N/A :: Sfc
2431	Land_sfc Reflectance, Directional	LR	Kaufman et al	MODIS	AM,PM	EDC	AL	dimensionless	0 01 :: 0 005	1/day	0.25 km :: G	N/A :: Sfc
2711	Fire Class	LB	Kaufman, Justice	MODIS	AM,PM	EDC	AL	C	10 C :: 5 C	1/day, 1/wk	10 km :: Land	N/A :: Sfc
2663	*Fire Count*	LB	Kaufman, Justice	MODIS	AM,PM	EDC	AL			1/day, 1/wk	1 km :: Land/R	N/A :: Sfc
2664	*Fire Count*	LB	Kaufman, Justice	MODIS	AM,PM	EDC	AL			1/day, 1/wk	10 km :: Land	N/A :: Sfc
2665	*Fire Extent*	LB	Kaufman, Justice	MODIS	AM,PM	EDC	AL			1/day, 1/wk	1 km :: Land/R	N/A :: Sfc
2666	*Fire Extent*	LB	Kaufman, Justice	MODIS	AM,PM	EDC	AL			1/day, 1/wk	1 dg :: Land	N/A :: Sfc
2471	*Fire Temperature*	LB	Kaufman, Justice	MODIS	AM,PM	EDC	AL	C	10 C :: 5 C	1/day, 1/wk	1 km :: Land/R	N/A :: Sfc
1017	*Aerosol Mass Loading*	AC	Kaufman, Tanre	MODIS	AM,PM	GSFC	AL	g/m^2	30% :: 10%	1/day,1/mo	0 5 dg :: G,R	N/A :: Atmos
2293	*Aerosol Optical Depth, Spectral*	AR	Kaufman, Tanre	MODIS	AM,PM	GSFC	AL	dimensionless	0 1 :: 0 05	1/day, 1/mo	0 5 dg :: Land	N/A :: Atmos
2379	Level-2 Radiance, Land_leaving	LR	Kaufman, Tanre	MODIS	AM,PM	GSFC	AL	W/m^2/sr/um	10% :: 5%	1/day	1 km :: Land/R	N/A :: Sfc
2380	Level-2 Radiance, Land_leaving	LR	Kaufman, Tanre	MODIS	AM,PM	GSFC	AL	W/m^2/sr/um	10% :: 5%	1/day, 1/mo	10 km :: Land	N/A :: Sfc
2381	Level-2 Radiance, Land_leaving	LR	Kaufman, Tanre	MODIS	AM,PM	GSFC	AL	W/m^2/sr/um	10% :: 5%	1/day	0 5 km :: Land/R	N/A :: Sfc
1874	Precipitable Water	AH	Kaufman, Tanre	MODIS	AM,PM	GSFC	AL	dimensionless ?	8% :: 6%	1/day	5 km :: Land	N/A :: Atmos
3321	Precipitable Water	AH	Kaufman, Tanre	MODIS	AM,PM	GSFC	AL	dimensionless ?	12% :: 8%	1 day, mo	1 km :: Land	N/A :: Atmos
3322	Precipitable Water	AH	Kaufman, Tanre	MODIS	AM,PM	GSFC	AL	dimensionless ?	5% :: 3%	1 day, mo	1 dg :: Land	N/A :: Atmos
2081	Cloud Cover	AH	King	MODIS	AM,PM	GSFC	AL	%	10% :: 5%	2/day [d,n], 1/mo	5 km :: G	N/A :: Cloud
2082	Cloud Cover	AH	King	MODIS	AM,PM	GSFC	AL	%	10% :: 5%	1/day, 1/mo	1 dg :: G	N/A :: Cloud
2311	*Cloud Optical Depth*	AR	King	MODIS	AM,PM	GSFC	AL	dimensionless	20% :: 10%	1/day [d]	5 km :: G	N/A :: Cloud
2312	*Cloud Optical Depth*	AR	King	MODIS	AM,PM	GSFC	AL	dimensionless	20% :: 10%	1/day, 1/mo	1 dg :: G	N/A :: Cloud
1764	Cloud Drop Phase	AH	King, Menzel	MODIS	AM,PM	GSFC	AL	water/ice	90% Conf :: 90% Conf	1/day	5 km :: G	N/A :: Cloud
1765	Cloud Drop Phase	AH	King, Menzel	MODIS	AM,PM	GSFC	AL	water/ice	90% Conf :: 90% Conf	1/day, 1/mo	1 dg :: G	N/A :: Cloud
1780	Cloud Drop Size(Effective Radius)	AH	King, Menzel	MODIS	AM,PM	GSFC	AL	um	0 40% :: 5%	1/day	5 km :: G	N/A :: Cloud
1781	Cloud Drop Size(Effective Radius)	AH	King, Menzel	MODIS	AM,PM	GSFC	AL	um	0 40% :: 5%	1/day, 1/mo	1 dg :: G	N/A :: Cloud
2094	Cloud JPDF	AH	King, Menzel	MODIS	AM,PM	GSFC	PL	dimensionless		1/day, 1/mo	1 dg :: G	N/A :: N/A
2126	*Cloud Emissivity*	AR	Menzel	MODIS	AM,PM	GSFC	AL	dimensionless	0 10 :: 0 05	2/day	5 km :: G	N/A :: Cloud
2127	*Cloud Emissivity*	AR	Menzel	MODIS	AM,PM	GSFC	AL	dimensionless	0 10 :: 0 05	1/day, 1/mo	1 dg :: G	N/A :: Cloud
2116	Cloud Emissivity	AR	Menzel	MODIS	AM,PM	GSFC	PL	dimensionless				N/A :: Cloud
1528	Cloud Pressure, Top	AH	Menzel	MODIS	AM,PM	GSFC	AL	mb	50 mb :: 20 mb	2/day	5 km :: G	N/A :: Cloud
1529	Cloud Pressure, Top	AH	Menzel	MODIS	AM,PM	GSFC	AL	mb	50 mb :: 20 mb	1/day, 1/mo	1 dg :: G	N/A :: Cloud
2466	*Cloud Temperature, Top*	AR	Menzel	MODIS	AM,PM	GSFC	AL	C	2 C :: 1 C	1/day, 1/mo	1 dg :: G	N/A :: Cloud
2467	*Cloud Temperature, Top*	AR	Menzel	MODIS	AM,PM	GSFC	AL	C	2 C :: 1 C	2/day	5 km :: G	N/A :: Cloud
1333	O3 Total Burden	AC	Menzel	MODIS	AM,PM	GSFC	AL	DU	15-20DU :: 10DU	2/day, 1/day	5 km :: G	Column :: Atmos
1334	O3 Total Burden	AC	Menzel	MODIS	AM,PM	GSFC	AL	DU	15-20DU :: 10DU	1/day, 1/mo	0.5 dg :: G	Column :: Atmos
1875	Precipitable Water	AH	Menzel	MODIS	AM,PM	GSFC	AL	mm	10 mm :: 5 mm	2/day	5 km :: G	N/A :: Atmos
1559	Stability (Lifted Index), Atmospheric	AD	Menzel	MODIS	AM,PM	GSFC	AL	C	2 C :: 1 C	2/day	5 km :: G	N/A :: Atmos
1560	Stability (Lifted Index), Atmospheric	AD	Menzel	MODIS	AM,PM	GSFC	AL	C	2 C :: 1 C	2/day, 1/mo	0 5 dg :: G	N/A :: Atmos
3668	Ground Control Points, Potential	IU	Muller	MODIS	AM,PM	GSFC	AL		0 3 pixels ::		0.3 pixels :: Land/L	N/A :: Sfc
2404	Land_sfc Radiance-Correction, Topographic	LR	Muller	MODIS	AM,PM	EDC	AL		1 km :: 0 3 km	1/day	1 km :: Land/R	N/A :: Sfc
2405	Land_sfc Radiance-Correction, Topographic	LR	Muller	MODIS	AM,PM	EDC	AL		1 km :: 0 3 km	1/day	10 km :: Land	N/A :: Sfc

Prod #	Product Name	Cat	Investigator	Instrument	Platform	DAAC	Time frame	Units	Accuracy Abs :: Rel	Temporal Resolution	Horizontal Resol. :: Cover.	Vertical Resol. :: Cover.
3647	Reflectance, Exoatmospheric, MODIS Level-2	IC	Salomonson, Barker	MODIS	AM,PM	GSFC	AL					
3653	Reflectance, Lunar, MODIS Level-2	IC	Salomonson, Barker	MODIS	AM,PM	GSFC	PL					
3658	Texture, MODIS Level-2	IU	Salomonson, Barker	MODIS	AM,PM	GSFC	AL					
3659	Texture, MODIS Level-3	IU	Salomonson, Barker	MODIS	AM,PM	GSFC	PL					
3660	Classification Masks, Clouds/Snow/Land/Water, MODIS Level-2	IU	Salomonson, Barker (with Hall)	MODIS	AM,PM	GSFC	AL					
3661	Classification Masks, Clouds/Snow/Land/Water, MODIS Level-3	IU	Salomonson, Barker (with Hall)	MODIS	AM,PM	GSFC	PL					
2669	*Land_Cover Type*	LB	Strahler, Huete et al	MODIS	AM,PM	EDC	AL	categorical fraction	10% :: 5%	1/mo, 1/seas	1 km :: Land	N/A :: Sfc
2670	*Land_Cover Type*	LB	Strahler, Huete et al	MODIS	AM,PM	EDC	AL	categorical fraction	10% :: 5%	1/mo, 1/seas	5 km :: Land	N/A :: Sfc
2671	*Land_Cover Type-Change*	LB	Strahler, Huete et al	MODIS	AM,PM	EDC	AL	categorical fraction	10% :: 7%	1/seas	1 km :: Land	N/A :: Sfc
2672	*Land_Cover Type-Change*	LB	Strahler, Huete et al	MODIS	AM,PM	EDC	AL	categorical fraction	10% :: 7%	1/seas	5 km :: Land	N/A :: Sfc
2268	PAR, Incident, (IPAR)	AR	Tanre	MODIS	AM,PM	EDC	PL	MJ/m^2	200 :: 5 - 20%	1/day, 1/wk	1 km :: G,R	N/A :: Atmos
2294	*Aerosol Optical Depth, Spectral*	AR	Tanre, Kaufman	MODIS	AM,PM	GSFC	AL	dimensionless	0.05 :: 0.02	1/day, 1/mo	0.5 dg :: Ocean	N/A :: Atmos
1022	*Aerosol Size-distribution (Radius-Dispersion)*	AC	Tanre, Kaufman	MODIS	AM,PM	GSFC	AL	um, dimensionless	10-30% :: 10%	1/day,1/mo	0.5 dg :: G,R	N/A :: Atmos
2003	*Albedo, Aerosol*	AR	Tanre, Kaufman	MODIS	AM,PM	GSFC	PL	dimensionless	0.06 :: 0.03	1/day, 1/mo	0.5 dg :: G,R	N/A :: Atmos
2015	Albedo, Land_sfc	LR	Tanre, Muller	MODIS	AM,PM	EDC	PL	dimensionless	15% :: 5 - 8%	1/day, 1/wk	1 km :: G,R	N/A :: Sfc
2016	Albedo, Land_sfc	LR	Tanre, Muller	MODIS	AM,PM	EDC	PL	dimensionless	15% :: 5 - 8%	1/day, 1/wk	10 km :: G,R	N/A :: Sfc
2424	Land_sfc Reflectance, Bi-directional, (BRDF)	LR	Tanre, Muller	MODIS	AM,PM	EDC	PL	%	15% :: 5 - 8%	1/day, 1/wk	1 km :: G,R	N/A :: Sfc
2425	Land_sfc Reflectance, Bi-directional, (BRDF)	LR	Tanre, Muller	MODIS	AM,PM	EDC	PL	%	15% :: 5 - 8%	1/day, 1/wk	10 km :: G,R	N/A :: Sfc
1556	Land_sfc Roughness	AD	Tanre, Muller	MODIS	AM,PM	EDC	PL	dimensionless	15% :: 5 - 8%	1/day, 1/wk	1 km :: G,R	N/A :: Sfc
1557	Land_sfc Roughness	AD	Tanre, Muller	MODIS	AM,PM	EDC	PL	dimensionless	15% :: 5 - 8%	1/day, 1/wk	10 km :: G,R	N/A :: Sfc
3696	Land_sfc BRDF, AM-PM Asymmetry	LR	Vanderbilt	MODIS	AM,PM	GSFC	PL	1/sr	5% :: 30%	1 day	250 m, 1 km :: Land	N/A :: Sfc
3697	Land_sfc BRDF, AM-PM Degree_of_Asymmetry	LR	Vanderbilt	MODIS	AM,PM	GSFC	PL	%	30% :: 30%	1 day	250 m, 1 km :: Land	N/A :: Sfc
2337	*Vegetation Index, Polarization*	LB	Vanderbilt	MODIS	AM,PM	EDC	PL	dimensionless		1/day	pixel_size :: Land	N/A :: Sfc
3323	Land_sfc Emissivity	LR	Wan	MODIS	AM,PM	EDC	PL	dimensionless	0.05 :: 0.02	1 day, 1 wk	1 km :: Land/R	N/A :: Sfc
3324	Land_sfc Emissivity	LR	Wan	MODIS	AM,PM	EDC	PL	dimensionless	0.05 :: 0.02	1 day, 1 wk	10 km :: Land	N/A :: Sfc
2484	*Land_sfc Temperature*	LR	Wan	MODIS	AM,PM	EDC	AL	C	1 C :: 1 C	1/day, 1/wk	1 km :: Land/R	N/A :: Sfc
2485	Land_sfc Temperature	LR	Wan	MODIS	AM,PM	EDC	AL	C	1-3 C :: 1 C	1/day, 1/wk	10 km :: Land	N/A :: Sfc