



Overview: MODLAND Production Status, Schedule and Time Series Issues (C4 to C5 Transition)

MODIS Land Collection 5 Workshop

Jan. 17, 2007

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NASA GSFC Code 614.5





MODIS Land Products

Energy Balance Product Suite

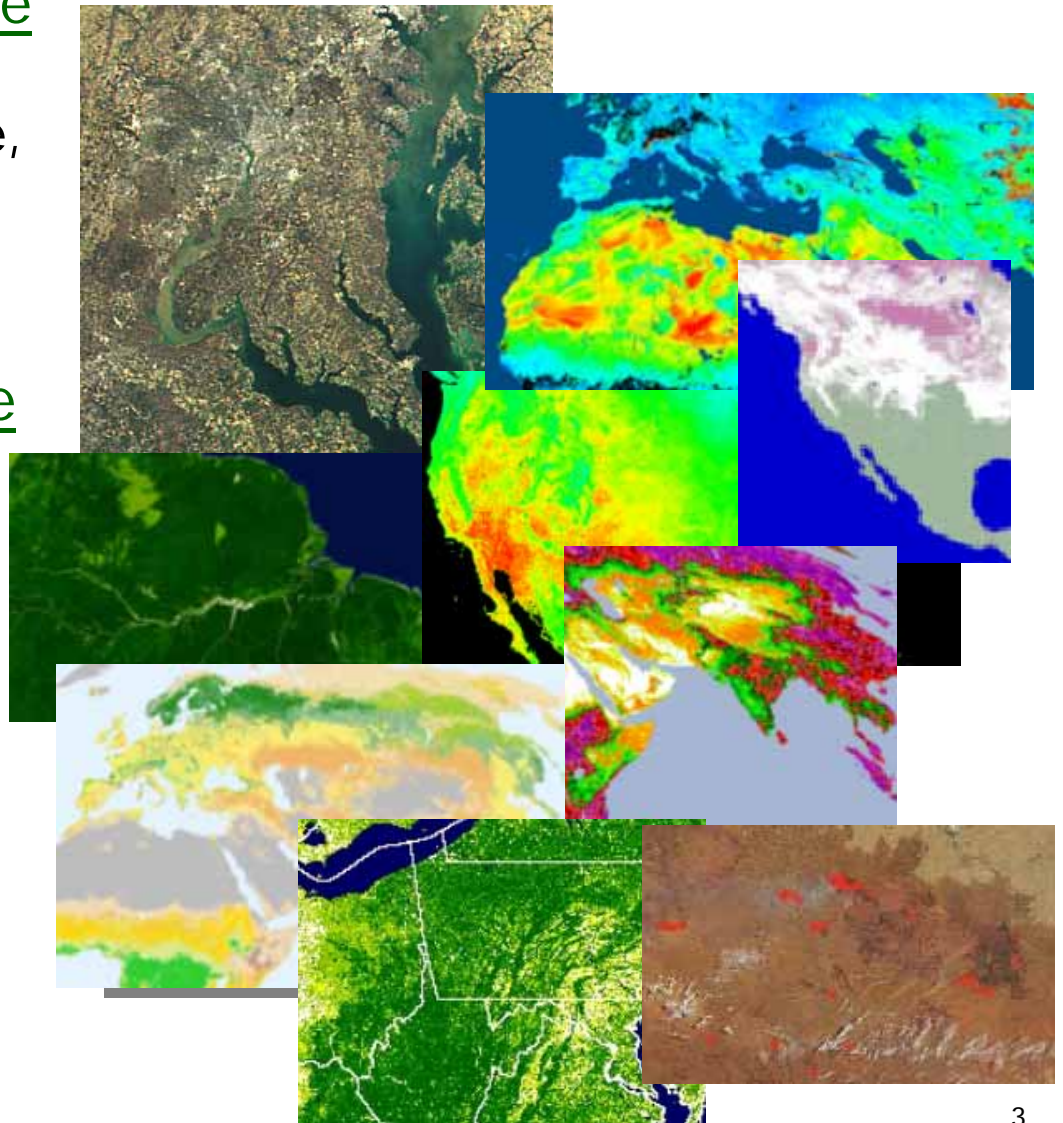
- Surface Reflectance
- Land Surface Temperature, Emmissivity
- BRDF/Albedo
- Snow/Sea-ice Cover

Vegetation Parameters Suite

- Vegetation Indices
- LAI /FPAR
- GPP/NPP

Land Cover/Land Use Suite

- Land Cover/Vegetation Dynamics
- Vegetation Continuous Fields
- Vegetation Cover Change
- Fire and Burned Area





MODLAND Website

<http://modis-land.gsfc.nasa.gov/>

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Mission

Global change research investigates the underlying processes of change and their manifestation, the impacts and the prediction of change. Monitoring these changes provides an important underpinning to both global change research and resource management. Monitoring of land cover and land use is an important element of the NASA Earth Science Enterprise. Moderate resolution remote sensing provides a means for quantifying land surface characteristics such as land cover type and extent, snow cover extent, surface temperature, leaf area index, fire occurrence. Satellite measurements of leaf area, leaf duration and net primary productivity provide important inputs to parameterize or validate ecosystem process models. High quality, consistent and well-calibrated satellite measurements are needed if we are to detect and monitor changes and trends in these variables. Developing the next-generation data sets for global change research is the challenge given to the MODIS Science Team.

MODIS News...

- Collection 5 processing of MODIS Land data has begun
- [Register!](#) - MODIS Land Collection 5 Workshop, Jan. 17-18, 2007, University of Maryland, [Draft Agenda](#)
- Seeking community input on the [ESDR White Papers](#) developed by the NASA Land Measurement Team

How to Get MODIS Data

- Land Processes (EDC) DAAC
- MODIS Snow/Ice Products from NSIDC DAAC
- Level 1 and Atmosphere Distribution System (LAADS)
- MODIS Rapid Response System
- UMD Web Fire Mapper
- MODIS Direct Broadcast

MODIS Web Organigram

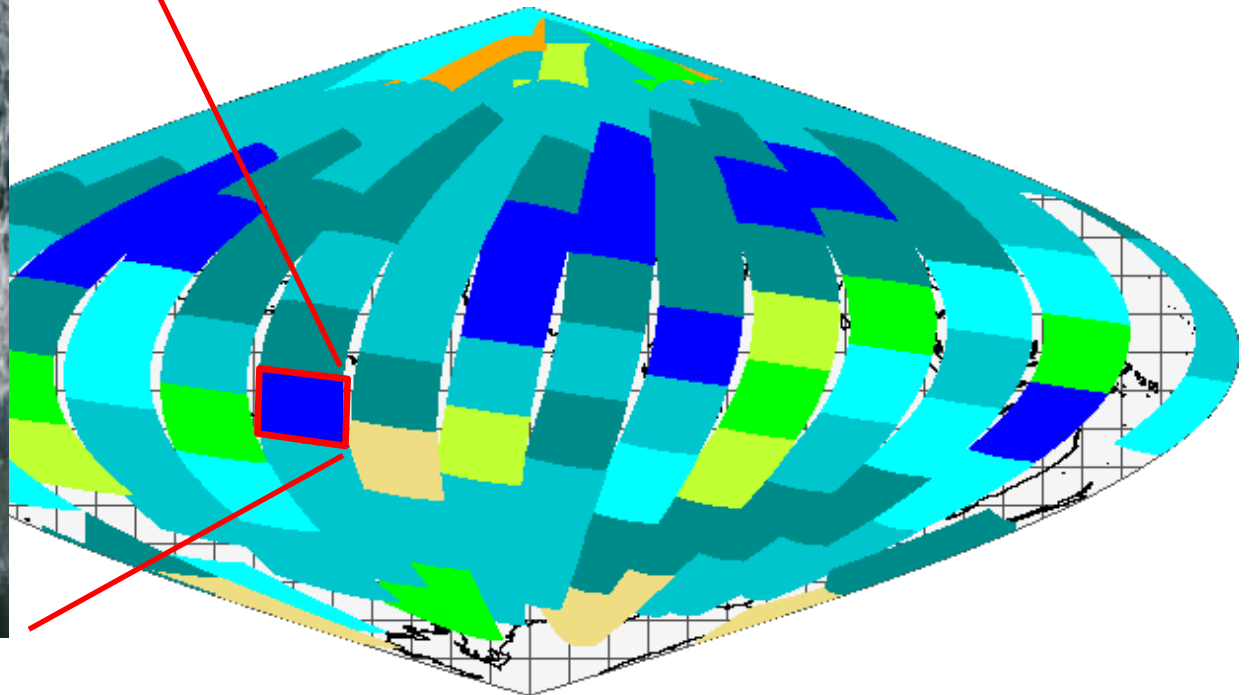
Additional MODIS Land Information

- MODIS Land Validation
- [MODIS Land QA](#)
- MODIS Land Global Browse Images
- MODIS Land Golden Tile Browse Images
- MODIS Land Time Series Plots
- MODIS Home Page



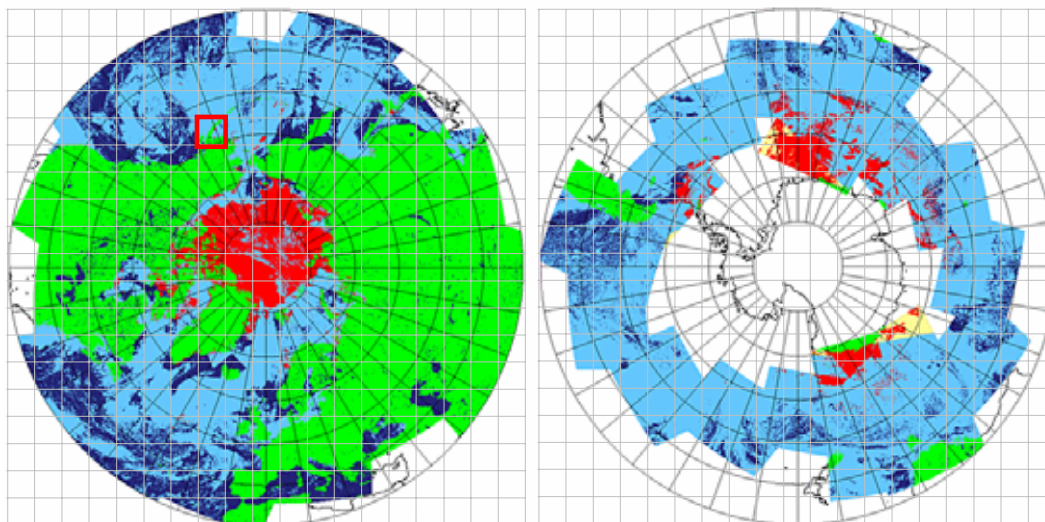
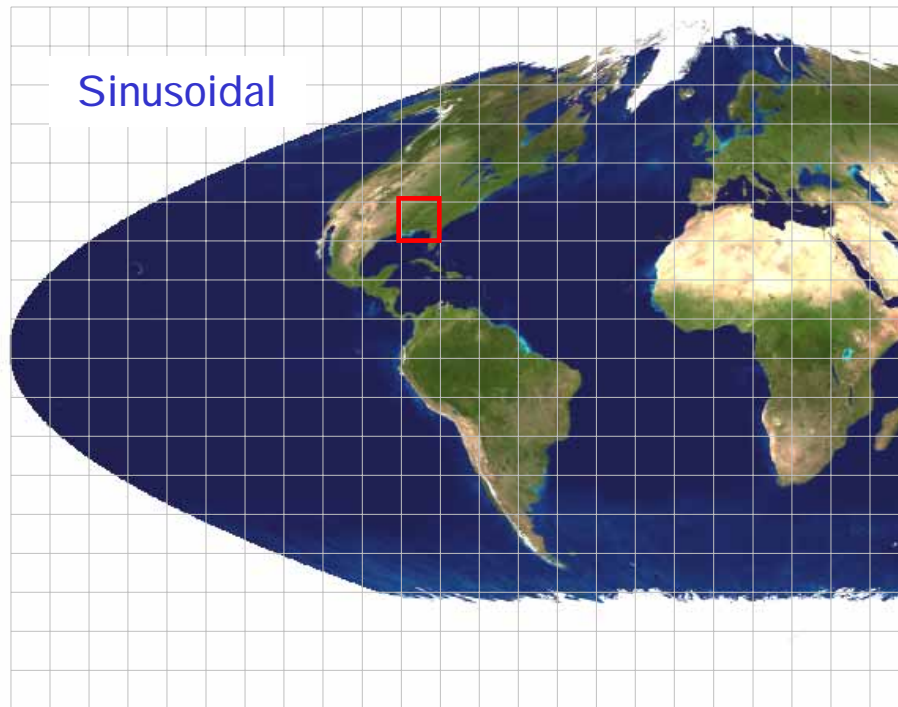
Level 2 Products

- Retrieved geophysical parameters at the same location and in the same format as the MODIS Level 1 instrument data
 - 288 granules/day; 5 min.; approx. 2340 x 2030 km
 - 250m, 500m and 1km nadir resolutions





Level 2G, 3 and 4 Products (fine resolution)



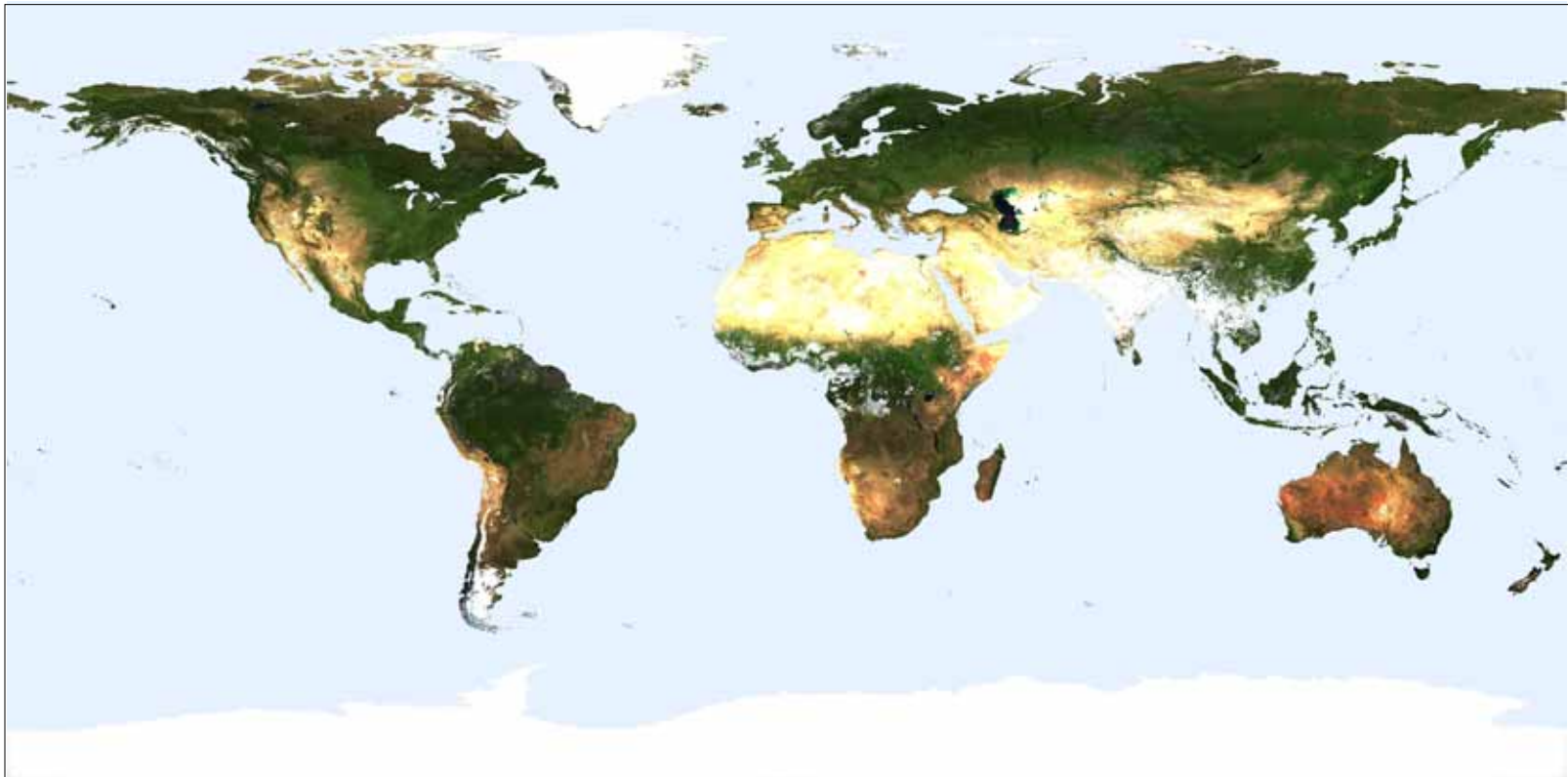
- Level 2G/3: earth-gridded geophysical parameters
- Level 4: earth-gridded model outputs
- Daily, 8-day, 16-day, 32-day, monthly and yearly products
- $10^\circ \times 10^\circ$ Tiles (□)
- Sinusoidal (equatorial); 7.5, 15 and 30 arcsec. resolution (roughly 250m, 500m and 1 km)
- LAEA (sea-ice products, polar projection)

Lambert
Azimuthal
Equal Area
(LAEA)



Climate modeling grid products

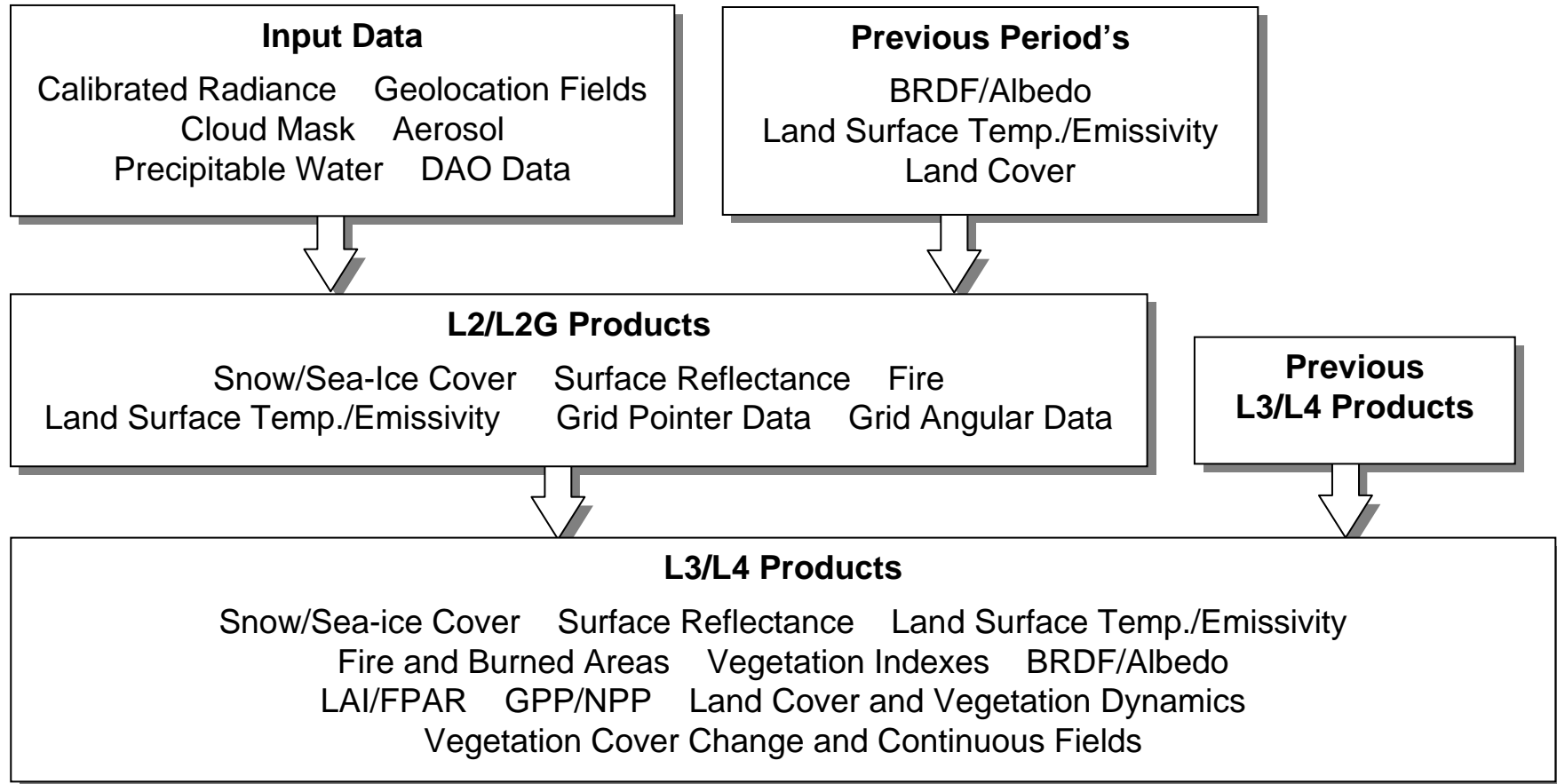
- Resolution: 0.05° (now) and 0.25° (previous) degrees
- Almost all products are lat/long
 - sea-ice is current exception – in polar grid (snow in C5)



(from BU – NBAR CMG – days 193-208, 2001)

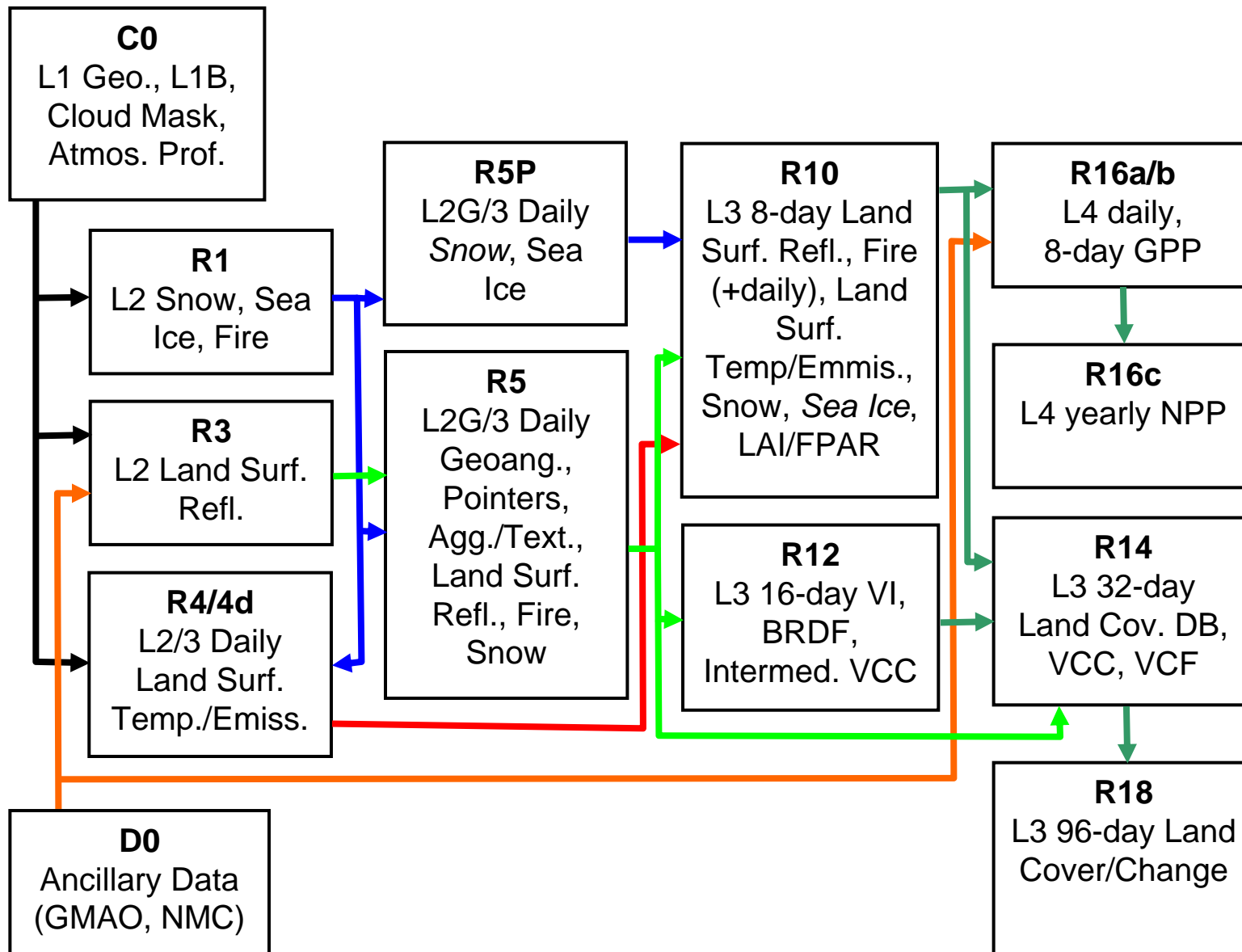


Land Algorithm Dependency





MODLAND Production Details





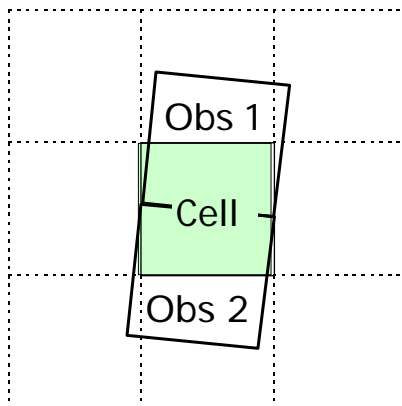
Product Format

- Hierarchical Data Format (HDF) – Self describing file format
- Science Data Sets (SDSs) – 2D, 3D or 4D arrays
 - Bit Fields – unsigned integers broken into groups of bits
 - Discrete values – e.g., Snow, Cloud, etc.
 - Scaled Integers – valid range, scale and offset included
- Attributes – text or other data that annotates the file (global) or arrays (SDSs)
- Metadata – ECS metadata for products (stored as attributes)
 - includes QA information, date/time products acquired/produced, etc.
- .met file also contains the ECS core metadata
 - some additional fields
 - some fields (QA, etc.) may be updated when product distributed
- HDF-EOS Metadata (SWATH or GRID) – geometric information that relates data to specific earth locations

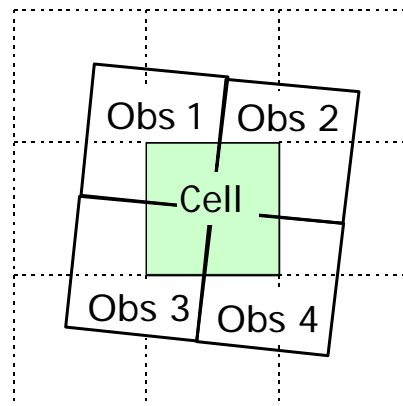


L2G – Multiple Observations – Simple Case

a. About 50% Overlap



b. 25% Overlap



Multiple observations covering a single grid cell:

- about 50% of overlap distributed into two observations
- 25% of overlap distributed over four observations.

Distribution of coverage for each of the observation with the largest intersection with a cell

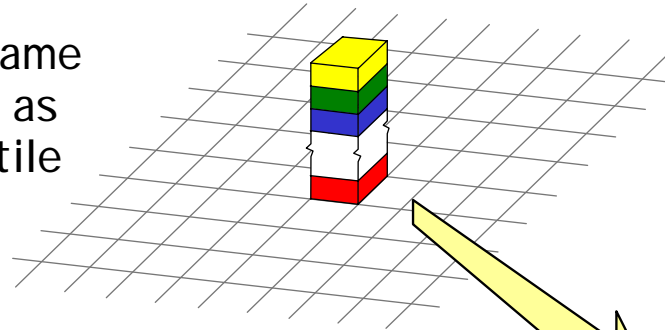
Observation Coverage (%)	Percent of Observations
75 to 100	16
50 to 75	57
25 to 50	37
0 to 25	0

Observations and grid cell are the same size and have the same orientation



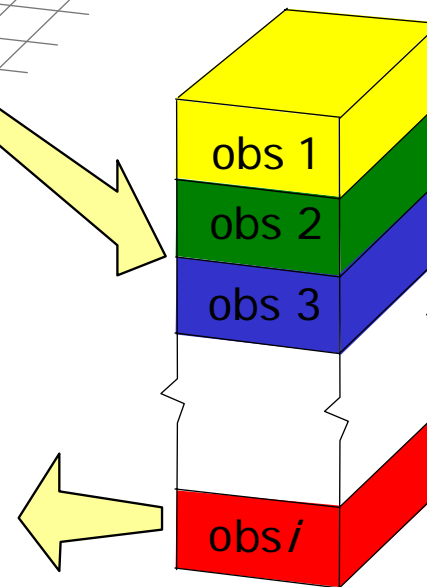
L2G Format

L2G product with same spatial dimensions as corresponding L3 tile



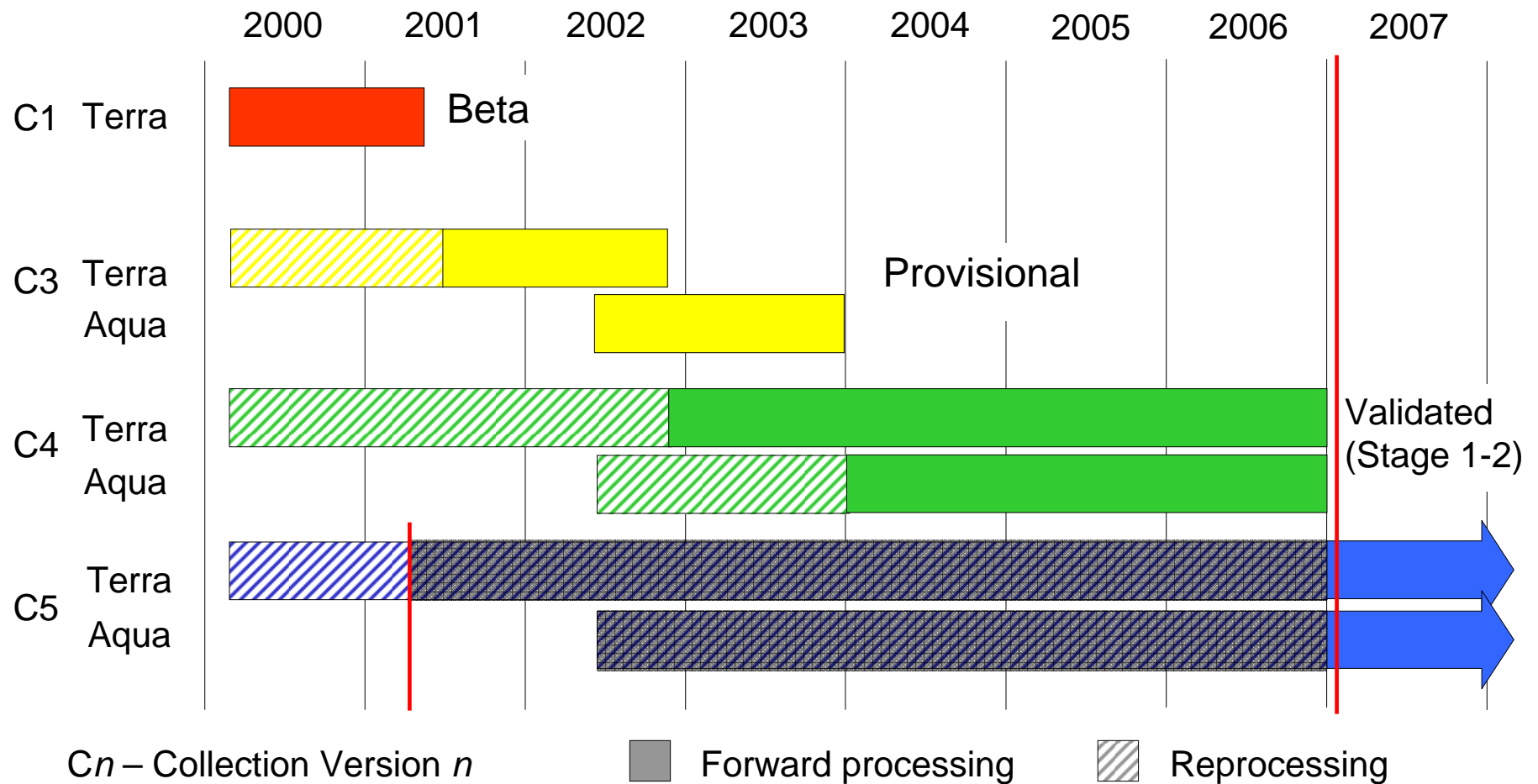
Stack of observations per output grid cell

Observation i
Pointer information: <i>granule pointer,</i> <i>line, sample, etc.</i>
Geophysical parameters: <i>e.g., land surf. reflectance,</i> <i>thermal anomalies, etc.</i>
Viewing geometry: <i>view zenith,</i> <i>solar zenith, etc.</i>





MODIS Land Collections



Each collection represents an improvement in science quality



Land Collection 5 production schedule

- Sept. 2006 Terra-only interval reprocessing starts
- Jan. 2007 Terra and Aqua C5 forward processing started
- May 2007 Complete Terra-only interval from
Feb. '00 to June '02 (26 months @ 3X)
- June 2007 Terra and Aqua reprocessing starts
- Sept. 2007 Complete year of combined products available
- Sept. 2008 Complete Aqua and Combined products from
July '02 to Dec '06 (108 months @ 7X)



MODIS Land Collection 5 Changes – Summary

- Used improved Land/Water mask and new Land Cover map based on 3 years of Collection 4 data
- Refined surface reflectance by adopting a dynamic aerosol model in atmospheric correction
- Reduced size and complexity of daily surface reflectance products
- Improved quality of the Land Surface Temperature by revising the day/night algorithm and improving the detection and filtering of cloud contaminated observations
- Increased resolution of BRDF/Albedo products to 500m
- Refined LAI /FPAR LUTs to improve numerical accuracy of the radiative transfer simulations
- Added fractional snow algorithm in the snow product
- Burned area product added
- Improved ancillary data interpolation to remove artifacts in the NPP product
- Reduced size of all Land products through HDF internal compression



Land C5 Reduced Product Volume

	MODAPS Production (GB/day)		Export Volume (GB/day)			
			LP DAAC		NSI DC DAAC	
	C4	C5	C4	C5	C4	C5
L2 – L3 Daily	456	140	265	31	7	<1
Level 3 8-day +	23	26	70	19	1	<1
Total	479	166	335	50	8	1

Reduced size of all Land products through HDF internal compression



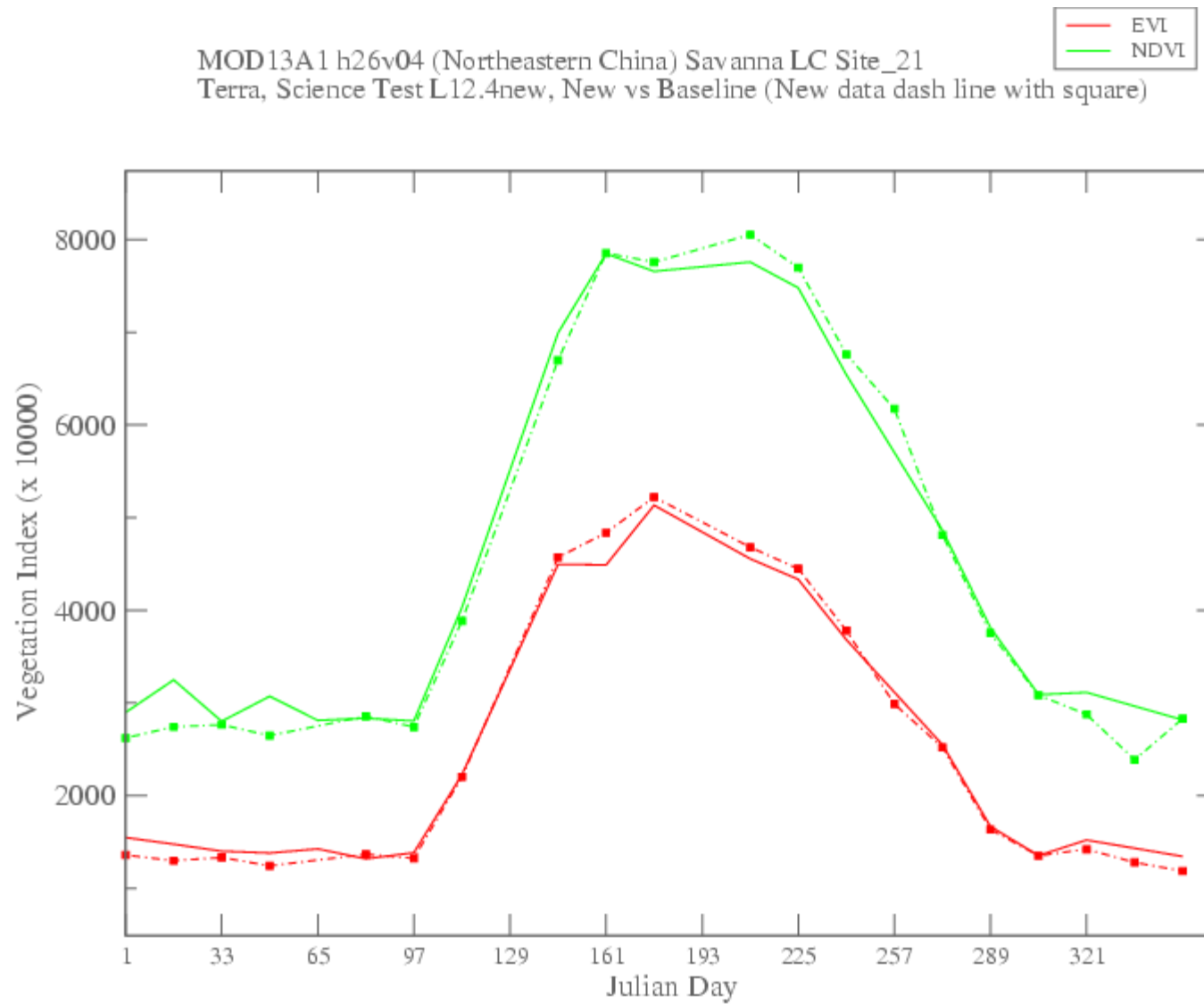
C4 to C5 Transition

- C5 data products are produced using the latest available versions of the science algorithms developed by the MODIS Land Science Team
 - changes to fix known problems
 - C5 science improvements
- C5 product format may have changed from the C4
- C5 product quality both at the pixel level and the granule level may differ from the C4
- It take $1\frac{3}{4}$ years to complete the remaining C5 reprocessing
 - until that time, the full data record will not have been processed into either C4 or C5
- So – caution should be used if combining C5 and C4 products
 - science team members will make specific recommendations



C4 vs. C5 Example - VI

MOD13A1 h26v04 (Northeastern China) Savanna LC Site_21
Terra, Science Test L12.4new, New vs Baseline (New data dash line with square)





Collection 6?

- We may not need to reprocess all products for C6
- A C6 reprocessing could incorporate
 - improvements in calibration and geolocation accuracy
 - essential improvements to science products
 - changes to product format
 - recent and new MODIS science products (e.g., Burned Area, MODIS water product)
 - new merged products from multiple instrument (e.g., MODIS & MISR)
- C6 would most likely not start until
 - after C5 reprocessing completes (Sept. '08)
 - until a recompeted science team (round 3) develops and tests any improvements – C5 took more than 2 years
- The breakout sessions tomorrow will give users an opportunity to discuss with the science team what C6 changes are needed



<http://modis-land.gsfc.nasa.gov/>



Questions?