MODIS Collection 5 Level 1 Products
[**DRAFT** – R. Wolfe, March 21, 2005]

The MODIS Science Team has begun a reprocessing campaign with improved versions of Level 1 science algorithms, to be called Collection 5 (C5). The reprocessing of five years of MODIS/Terra and almost three years of MODIS/Aqua data began in March 2005 and will be completed by March 2007. Parallel forward processing using the current Collection 4 algorithms will continue through the end of August 2005 to allow users to move over to the C5 products in an orderly fashion. The MODIS Land, Ocean and Atmosphere discipline reprocessing are being done on a different schedule. A number of important changes for C5 are summarized below.

Level 1B Calibrated Reflectance and Radiance

For MODIS/Terra C5 the Thermal Emissive Bands (TEB) Response vs. Scan angle (RVS), which is based on the Terra Deep Space Maneuver (DSM), will be applied for the entire mission. The updated RVS has been applied to the TEB starting in March 2004 (V4.3.0.5). The algorithm was changed to allow the Shortwave Infrared (SWIR) Out-of-band (OOB) correction to be performed using alternative detectors if the detector that would normally be used is noisy or non-functional. The algorithm was also changed to distinguish the two mirror sides when processing band 21, just like the other TEBs. To more accurately describe the mapping between the finer-resolution image data and geolocation data, new HDF file attributes were added (HDF_EOS_FractionalOffset*) and the 250 meter HDF-EOS DimensionMap offsets were corrected.

Level 1A and Geolocation

The long-term geolocation trend for MODIS Terra and Aqua was updated based on the each mission's entire data set. An algorithm was added to perform a correction to instrument orientation that depends upon the solar "elevation" angle and a corresponding set of coefficients was provided for MODIS/Terra to correct for a measured within-orbit bias. The C5 geolocation algorithm will use a MODIS-derived land-water mask and a more accurate SRTM derived digital elevation model. The software now uses a list of planned/actual maneuvers to set a scan-level quality flag when maneuvers occur.

Cloud Mask

Significant improvements have been made to the MODIS cloud mask (MOD35) in preparation for C5. Most of the modifications are realized for nighttime scenes where polar and oceanic regions will see marked improvement. For polar night scenes, two new spectral tests using the 7.2 mm water vapor absorption band have been added as well as updates to the 3.9-12 mm and 11-12 mm cloud tests. More non-MODIS ancillary data has been added for nighttime processing. Land and sea surface temperature maps provide crucial information for middle and low-level cloud detection and lessen dependence on ocean brightness temperature variability tests. Sun-glint areas are also improved by use

of sea surface temperatures to aid in resolving observations with conflicting cloud vs. clear-sky signals, where visible and NIR reflectances are high, but infrared brightness temperatures are relatively warm.

Further details and examples of improvements can be found in slides at:
　　　http://modis-atmos.gsfc.nasa.gov/C005_Changes/C005_CloudMask.pdf

Atmospheric Profiles

The Atmospheric Profiles product (MOD07) is now updated with changes to the training data used to create the regression coefficients, including more profiles and better characterization of the surface. Training data and retrievals are now also partitioned into separate land and ocean classes, and new BT zones are used. In addition, destriping is performed on the L1B data before performing the retrievals, and updated radiance bias values are used.

These changes reduced the moist bias for dry cases and improved moisture retrievals in the tropics. We reduced the along-track noise and across-track striping. The polar ozone was significantly improved and prior overestimates reduced. Total predictable water retrievals now compare more favorably to surface measurements at the SGP CART site, with RMS errors in TPW reduced to around 3 mm.

Further details and examples of improvements can be found in slides at:
　　　http://modis.gsfc.nasa.gov/sci_team/meetings/200407/presentations/atmos/Seemann.pdf