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C6 MODIS Land Algorithm Change Testing and Reprocessing Status

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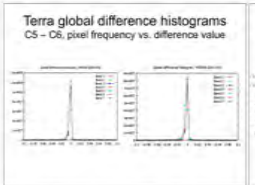
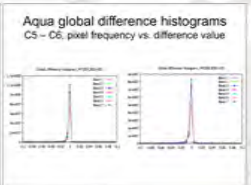
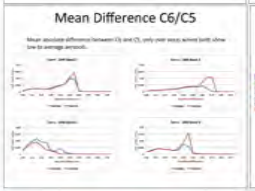
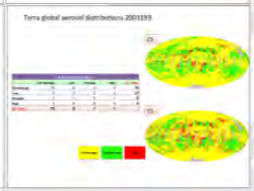
Land Surface Reflectance

- Improved aerosol retrieval and correction. Revised the aerosol model using the latest result of the AERONET database, in particular the accounting for particles non-sphericity and the version 2, level 2 particles properties inversions. Also included is a new model for dust.
- Refined internal snow/cloud/cloud shadow mask through use of BRDF database to better constraint the different threshold used.
- Implement for non-lambertian effect correction in the modeling of the coupling atmosphere surface.
- Absolute difference in retrieved reflectance may be less than .1%, with local improvements from improved aerosol retrieval, internal cloud and snow state, identification of salt pans etc.



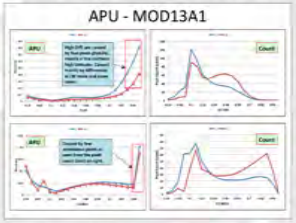


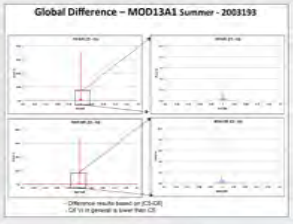


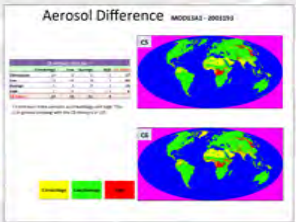


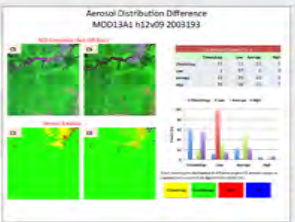
16-day Composite NDVI / EVI

- VI suite of products is generated using 8-day composite reflectance products (MOD09A1/MYD09A1) from the two 8-day periods in the 16-day as input, as opposed to 16-days of daily surface reflectance L2G product used in C5. Uses the QA compositing approach similar to the C5 VI approach for selecting the observation from the two 8-day periods. The C6 approach provides traceability to the input observations similar to C5.
- C6 VI product compare in par with the C5, with random difference at pixel level and no mean bias in the retrieved VI. Larger differences are confined to coastal pixels and water bodies.

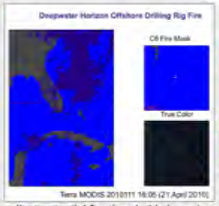


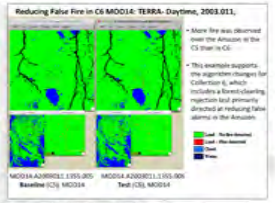






Active Fire

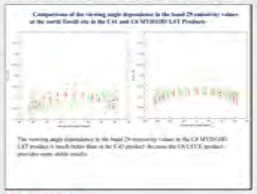


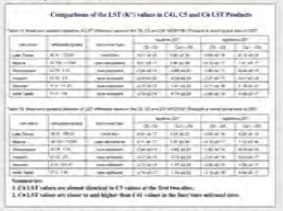


- Dynamically adjust potential fire thresholds based on scan angle, location, landcover type, season etc. facilitating detection of small fires.
- Processing extended to oceans and other large water bodies to detect off-shore gas flaring.
- Reduce false alarms in Amazon caused by small forest clearings.
- Improved cloud mask

Land Surface Temperature

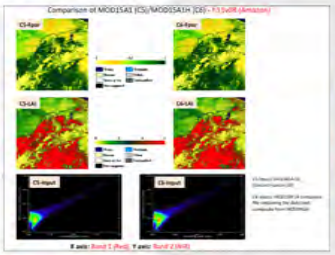
- C6 LST is expected to replace the current operational C5 and C41 versions
- Remove cloud-contaminated LST in L2 product.
- Update the coefficient LUT for the split-window algorithm with comprehensive regression analysis of MODIS simulation data in bands 31 and 32.
- Extended the upper boundary for (LST – Ts-air) in arid and semi-arid regions.
- Increased the overlapping between various sub-ranges to reduce the sensitivity of the algorithm to the uncertainties in the input data (i.e., column water vapor and air surface temperature from MOD07 and MYD07).
- Make minor adjustments in the classification-based surface emissivity values
- Tune the day/night algorithm by adjusting weights to improve its performance.

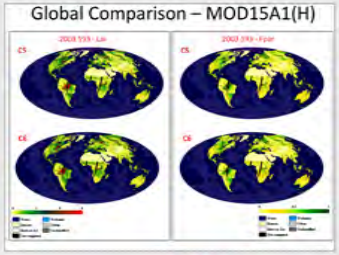


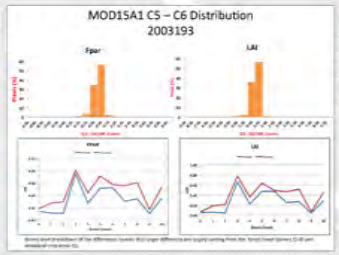


LAI / FPAR and GPP/PSNnet

- Products produced at 500m resolution are comparable with C5 products generated at 1km resolution. For analysis the C6 product is aggregated to 1km using the majority biome.
- Globally the absolute difference in FPAR is generally within C5 ± 0.04 and that for LAI is C5 ± 0.4
- Most of the larger differences (>10%) in LAI/FPAR are seen over semi-arid areas where the LAI/FPAR are small. The relative differences are mostly consistent with the differences in the surface reflectance input.

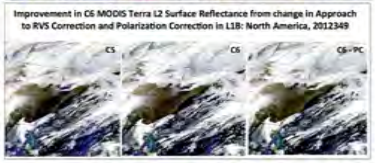






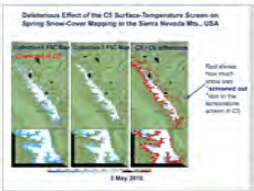
C6 L1B with Polarization Correction

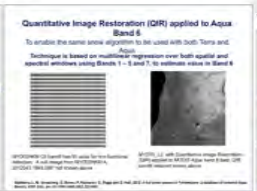
- Terra MODIS products impacted by increasing polarization sensitivity since launch leading to visible artifacts in products since 2007. Anomaly in the form of striping noticed in global browse images of C5 MODIS Terra Daily L2 Land Surface Reflectance on the right edge of swath – attributed to error in RVS correction and mirror side polarization difference.
- Though change to the RVS correction approach for Terra in C6 improved the L1B significantly, residuals from polarization sensitivity were continued to be present.
- Polarization correction recommended for both Terra (time dependent) and Aqua (pre-launch) in C6 reprocessing.
- Polarization Correction approach implemented as a post processing PGE generating the new L1B product with polarization correction (MxD02PCQKM, MxD02PCHKM, MxD021KM) applied to the operational C6 L1B.
- Polarization corrected L1B will be identical in format to the operational C6 L1B with selected bands (1, 2, 3, 4, 8, 9 and 10) updated with correction or gain change.

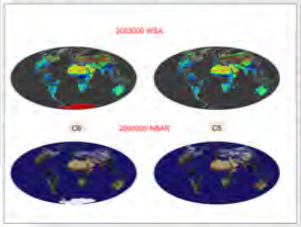
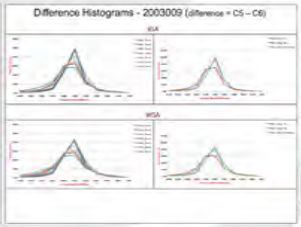
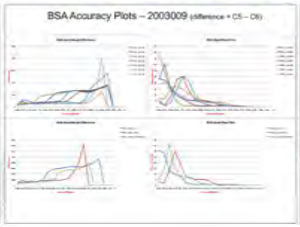
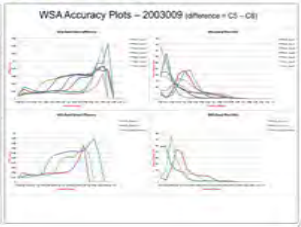


Snow Cover

- C6 snow products contain Snow Cover Fraction.
- Dropped the surface temperature screen that erroneously reversed snow detection on some mountains during spring and summer in C5.
- For Aqua products, implemented the QIR (quantitative image restoration) to improve snow mapping using Aqua MODIS (with non-functional B6 detectors).
- Added new screens to alleviate snow commission errors.
- Increased data information content in the QA data to enable better evaluation of the snow cover; QA flags set for screens applied
- This change results in a small improvement in mapping snow cover in some areas, especially under less-than-ideal viewing conditions.





BRDF / Albedo

- The C6 product is daily rolling 16-day composite replacing the 8-day rolling product in C5.
- BRDF/Albedo is computed for the first day of the 2nd 8-day period in the 16-day composite. Product data day is the mid of the 16-day period as opposed to first day of the 16-day period. In C6 observations are weighed based on temporal, observation coverage and band quality thus producing realistic Albedo for the data day (center of the 16-day period). C6 can capture smooth change in surface within the 16-day period.
- Backup database in C5 was land cover based. C6 uses pixel based updated from the latest full inversion.
- Algorithm uses all available observations as opposed to limit of 4 observations in C5 – improving the retrieval quality and number of retrievals
- Improved snow – C5 used majority snow-non-snow status from the 16-day period, C6 uses current day snow/non-snow status.
- Improved CMG product at 500m resolution.