A surface reflectance standard product from LDCM and supporting activities June 07 - Update

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Rationale for the research activities

- A Surface Reflectance standard product developed for MODIS provides the basis for a number of higher order land products for global change and applications research
- It is possible to develop an operational robust, globally applicable and fully automated code for integration into the LDCM processing chain and the code made openly available for others to use (e.g. LDCM ground stations).
- The approach has already been testing by the LEDAPS project.

R and D Areas

Extend validation/evaluation exercise and develop fully automated procedures

Refine the Cloud/Cloud shadow algorithm

Establish absolute radiometric calibration to the 2% level

Operational implementation of the adjacency effect correction

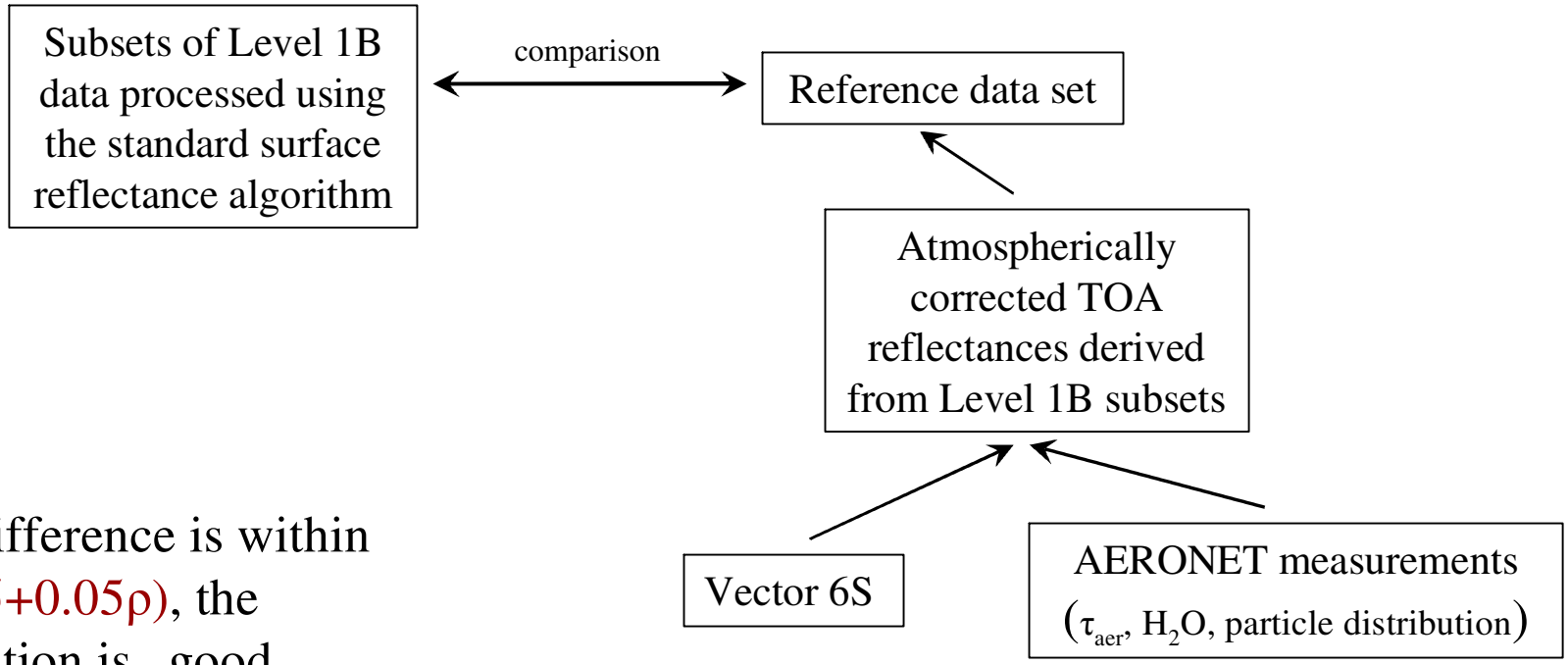
Coastal water retrievals

Aerosol type inversion

Performance of the MODIS C5 algorithms

To evaluate the performance of the MODIS Collection 5 algorithms, we analyzed 1 year of Terra data (2003) over **127** AERONET sites (**4988** cases in total).

Methodology:

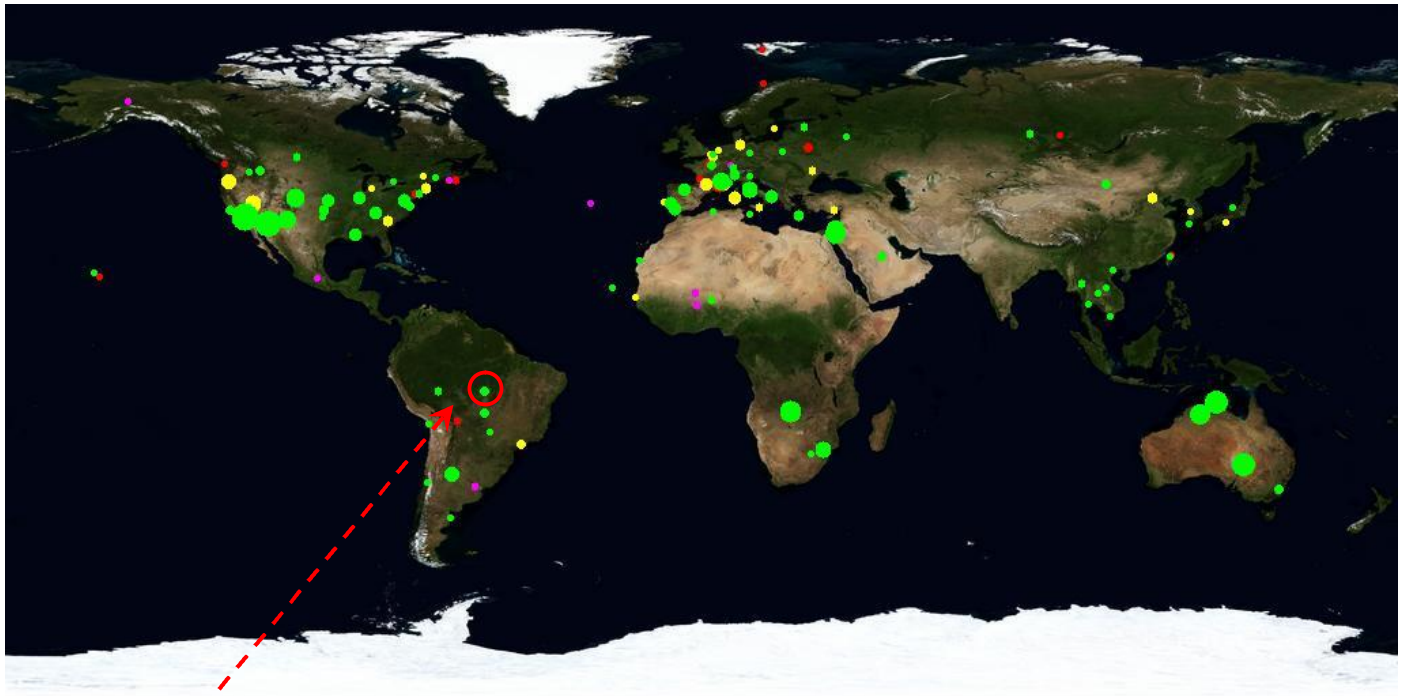


If the difference is within $\pm(0.005+0.05\rho)$, the observation is good .

http://mod09val.ltdri.org/cgi-bin/mod09_c005_public_allsites_onecollection.cgi

Validation of MOD09 (1)

Comparison between the MODIS band 1 surface reflectance and the reference data set.



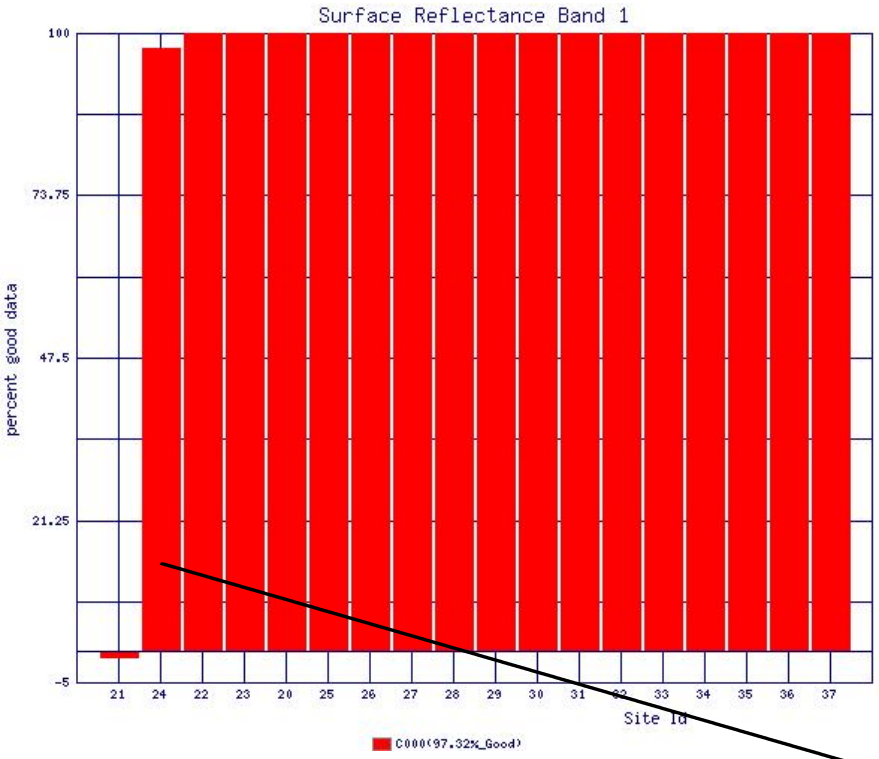
The circle color indicates the % of comparisons within the theoretical MODIS 1-sigma error bar:
green > 80%, 65% < yellow <80%, 55% < magenta < 65%, red <55%.

The circle radius is proportional to the number of observations.

Clicking on a particular site will provide more detailed results for this site.

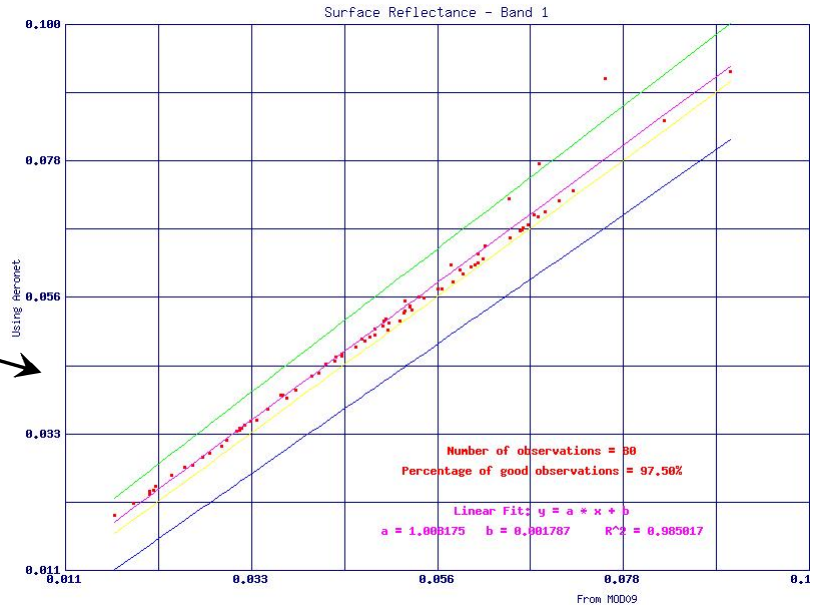
Validation of MOD09 (2)

Example: Summary of the results for the Alta Foresta site.



Each bar: date & time when coincident MODIS and AERONET observations are available

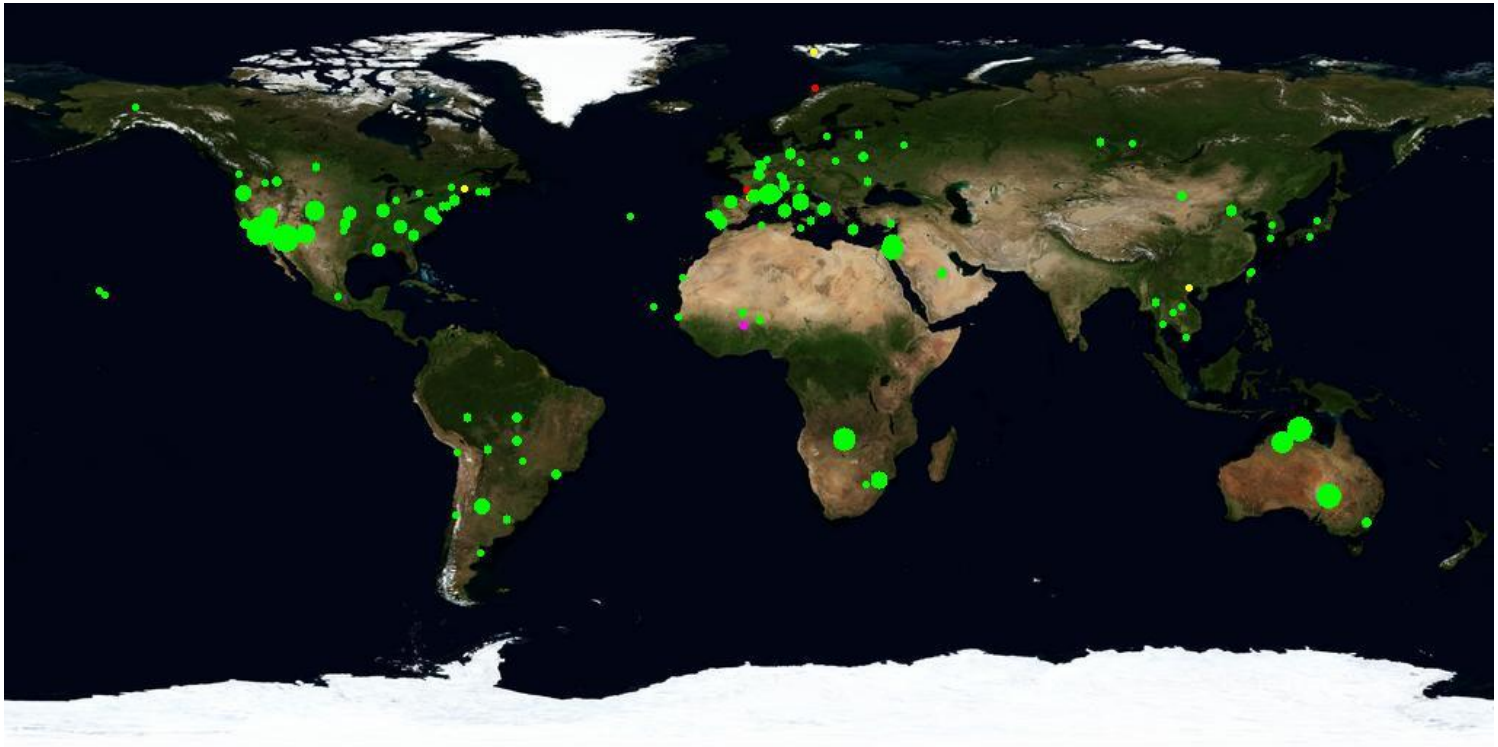
The size of a bar: the % of good surface reflectance observations



Scatter plot: the retrieved surface reflectances vs. the reference data set along with the linear fit results

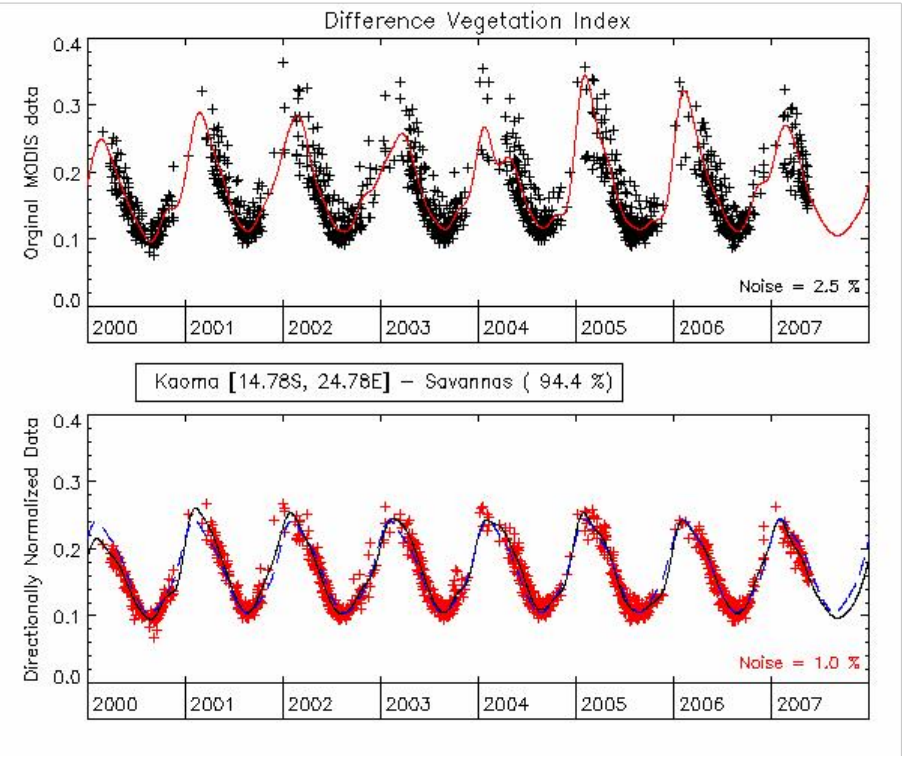
Validation of MOD13 (NDVI)

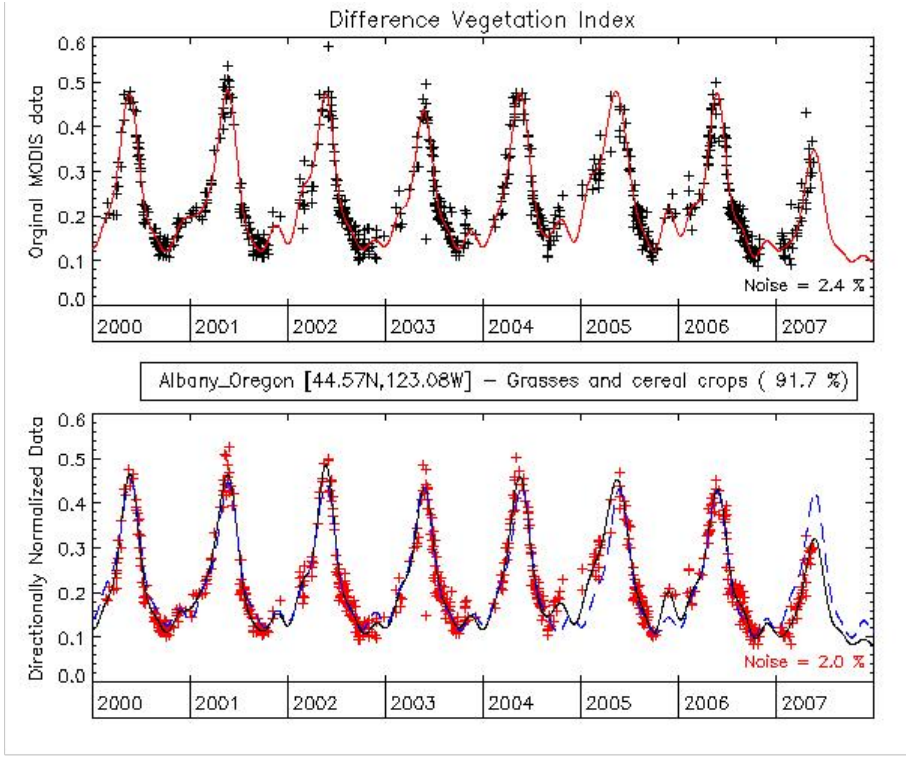
Comparison of MODIS NDVI and the reference data set for all available AERONET data for 2003. Globally, 97.11% of the comparison fall within the theoretical MODIS 1-sigma error bar (±(0.02 + 0.02VI)).



green > 80%, 65% < yellow <80%, 55% < magenta < 65%, red <55%

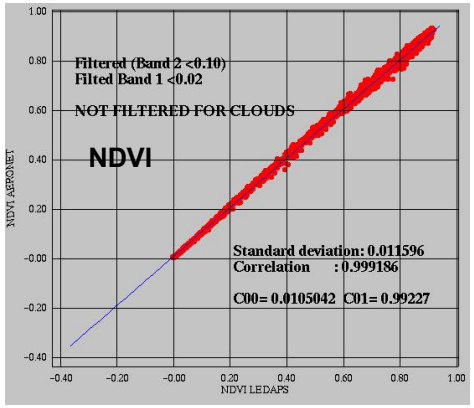
The MODIS Vegetation index performances are real

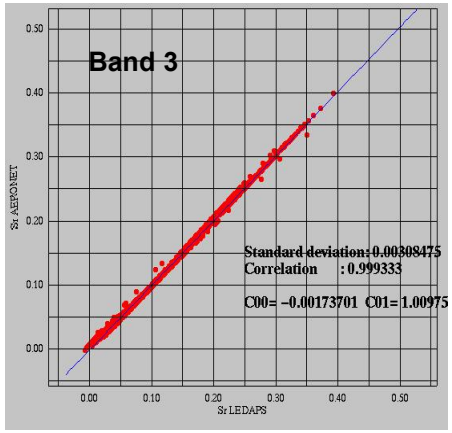


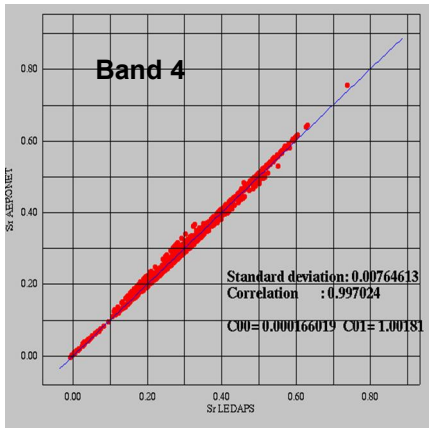


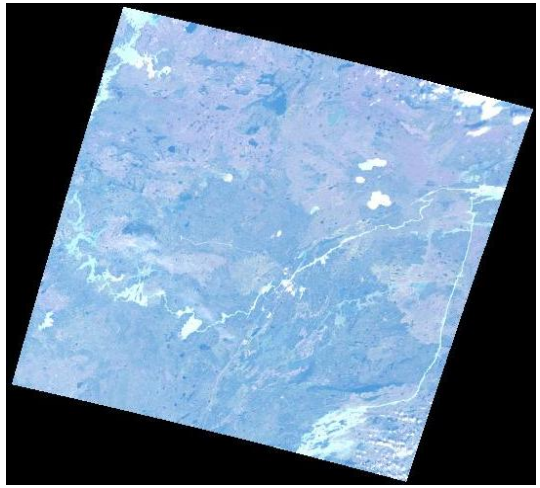
Maignan and Breon, Personal communication, 2007

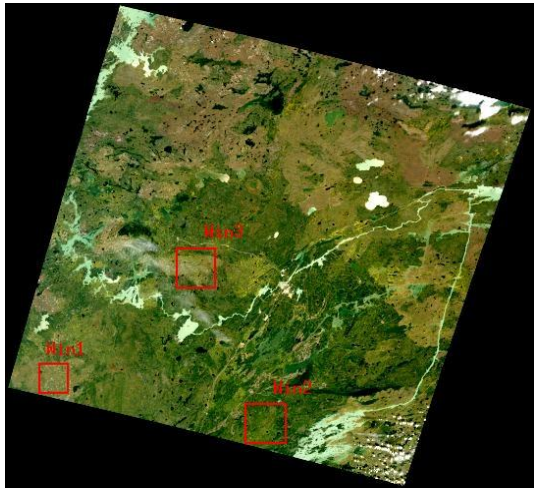
Analysis of the Landsat surface reflectance product performances over AERONET sites are very promising











DATE.PATH/ROW	AOT	TIMEDIFF	AERONET SITE
a2000122.w2p041r036	0.0932345	15	Rogers_Dry_Lake-001221821.mie
a2000122.w2p041r037	0.162749	15	UCLA-001221823.mie
a2000170.w2p009r029	0.0449007	60	Kejimkujik-001701451.mie
a2000191.w2p028r035	0.0858729	30	Cart_Site-001911659.mie
a2000247.w2p036r038	0.0365191	205	Tucson-002471753.mie
a2000261.w2p022r039	0.0722956	14	Stennis-002611628.mie
a2000267.w2p048r026	0.0727889	14	Saturn_Island-002671842.mie
a2001155.w2p034r036	0.105914	29	Sevilleta-011551737.mie
a2001216.w2p029r030	0.133025	14	Sioux_Falls-012161656.mie
a2001217.w2p036r025	0.0797376	188	Bratts_Lake-012171728.mie
a2001218.w2p043r028	0.0735507	254	Rimrock-012181817.mie
a2001267.w2p034r032	0.0717833	14	BSRN_BAO_Boulder-012671730.mie
a2001278.w2p015r033	0.147011	15	GSFC-012781537.mie

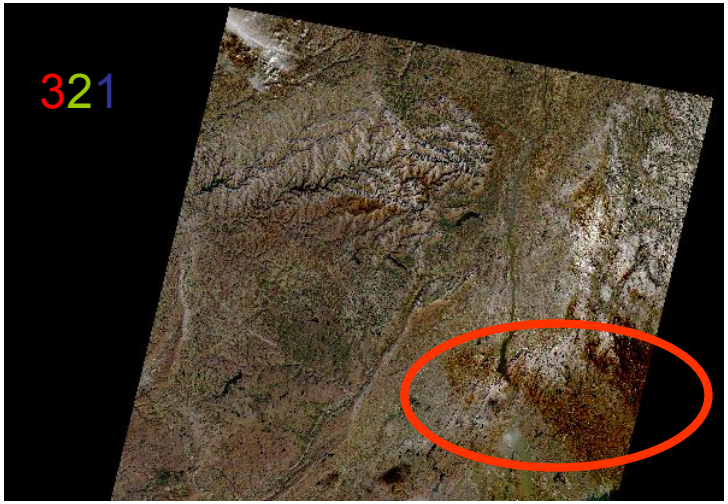
Improvements in the robustness of the 1km aerosol retrieval

Snow Contamination

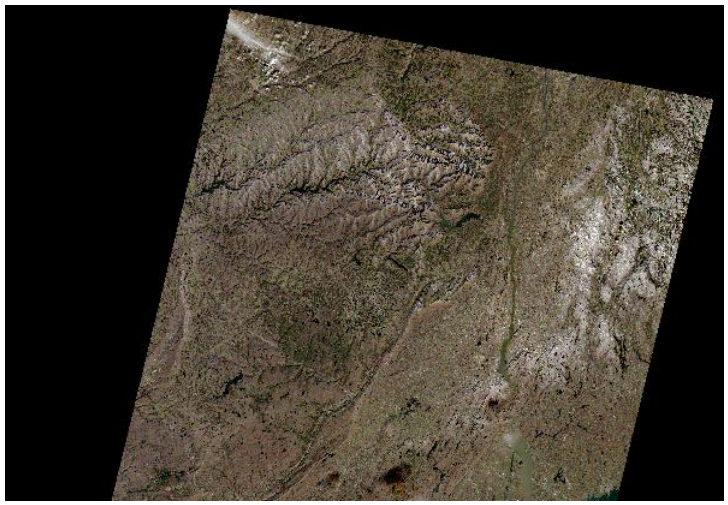
Salt Pan test

Snow/Thin cloud Contamination
East coast Winter scenes

No filtering for Snow/Thin clouds



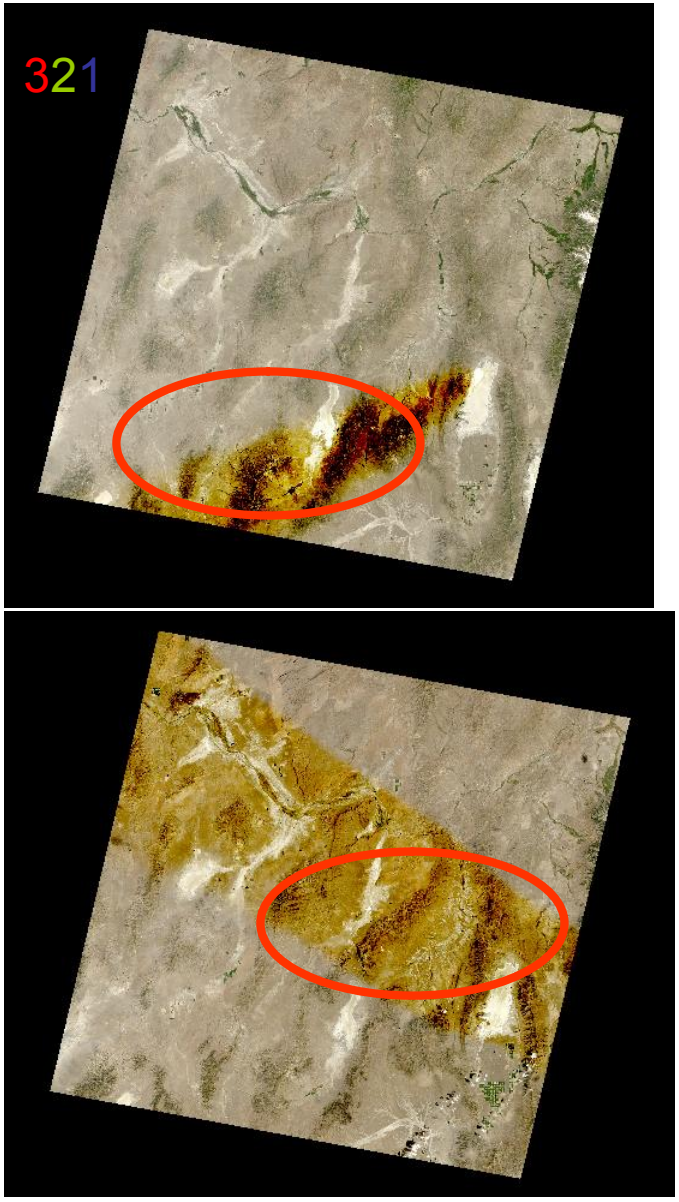
Updated Surface reflectance algorithm

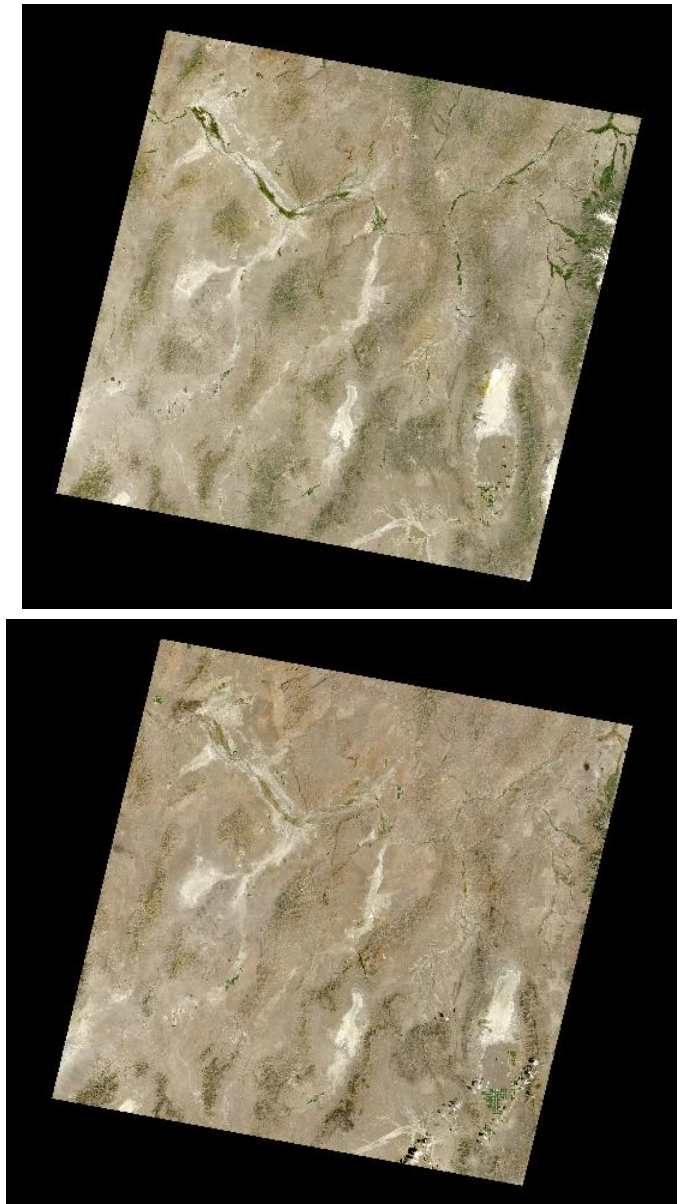


Salt Pan test /West coast scenes

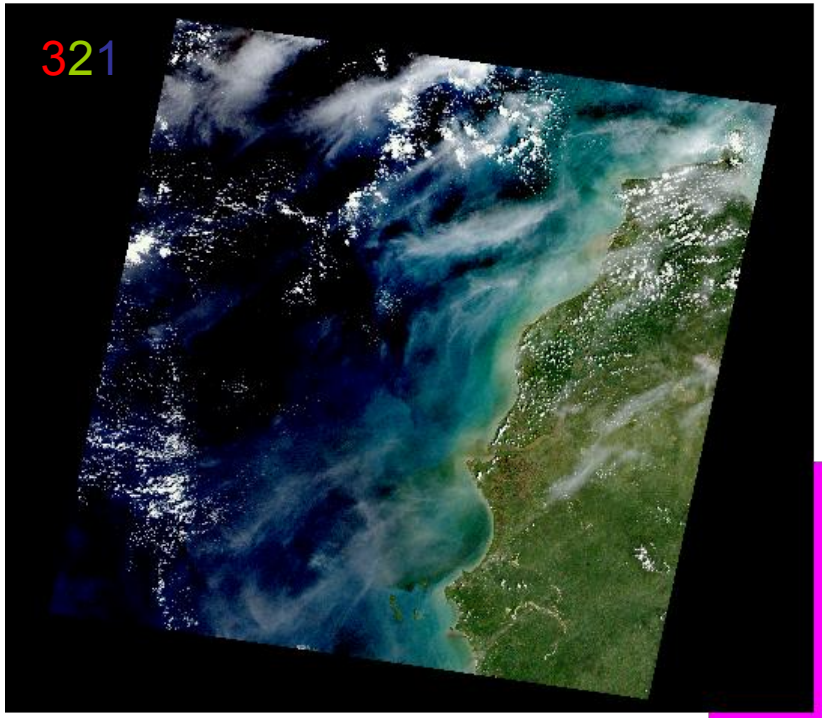
No filtering for salt pan

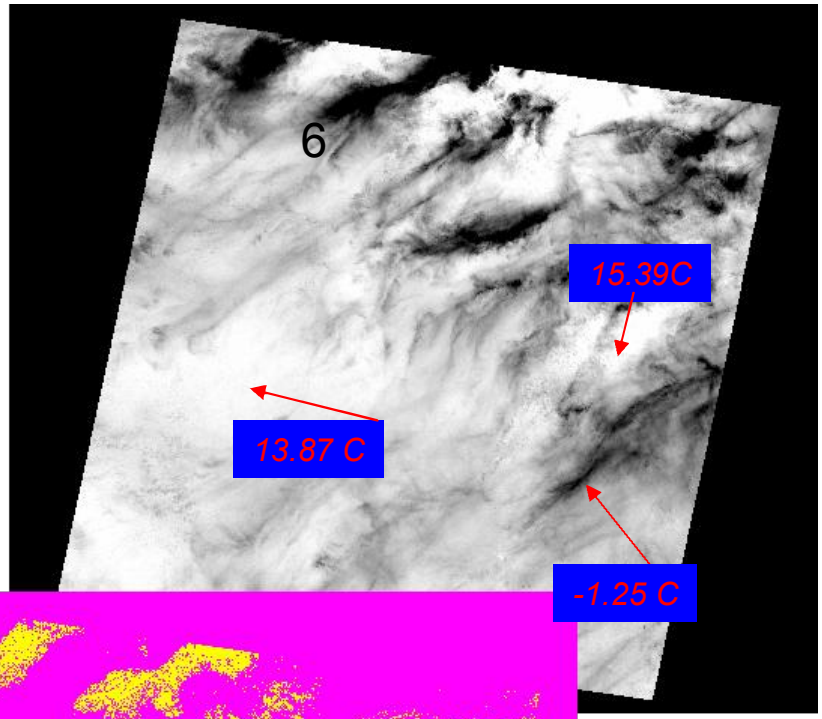
Updated Surface reflectance algorithm



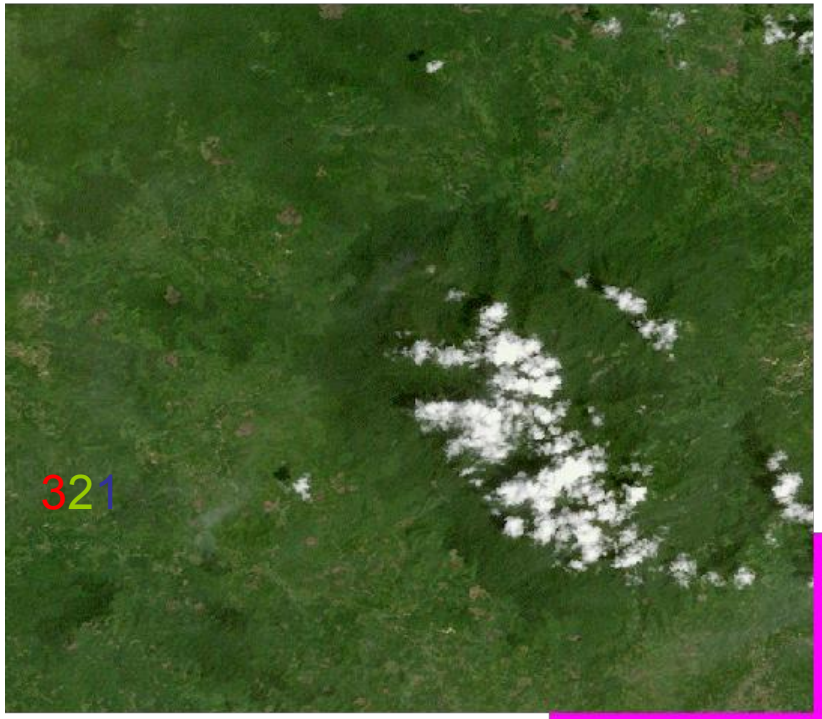


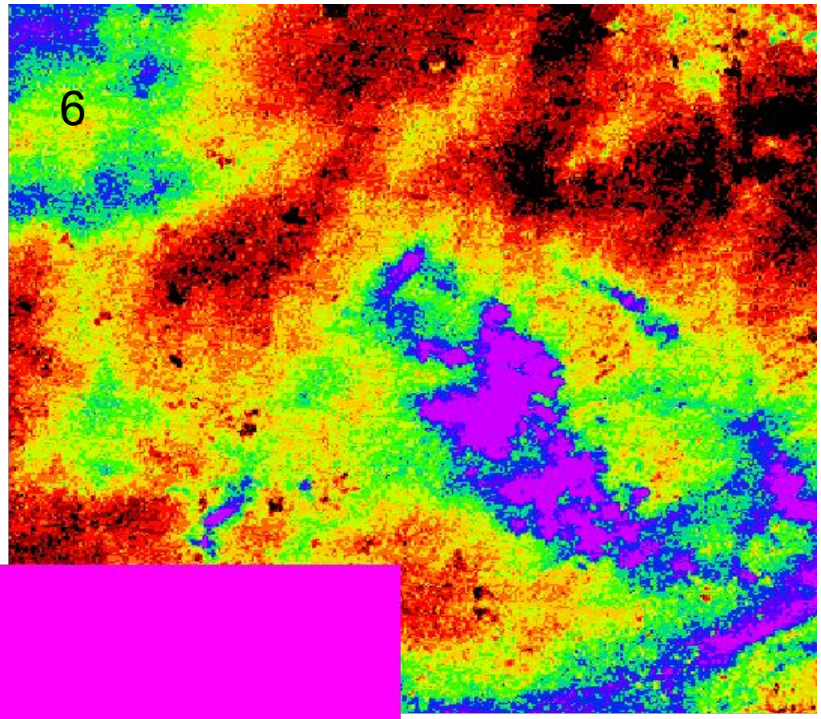
Borneo scene



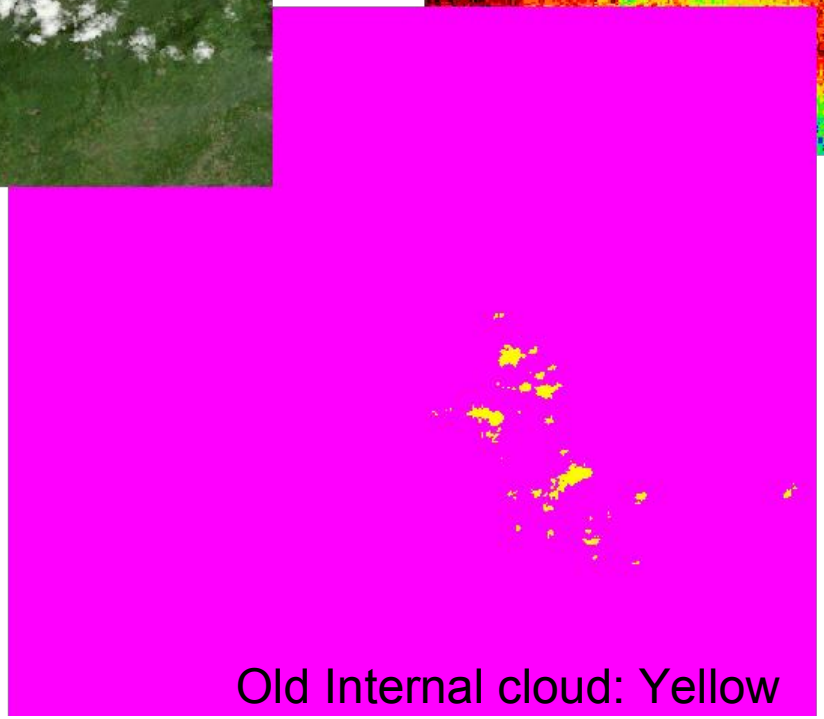


Borneo Scene (details)



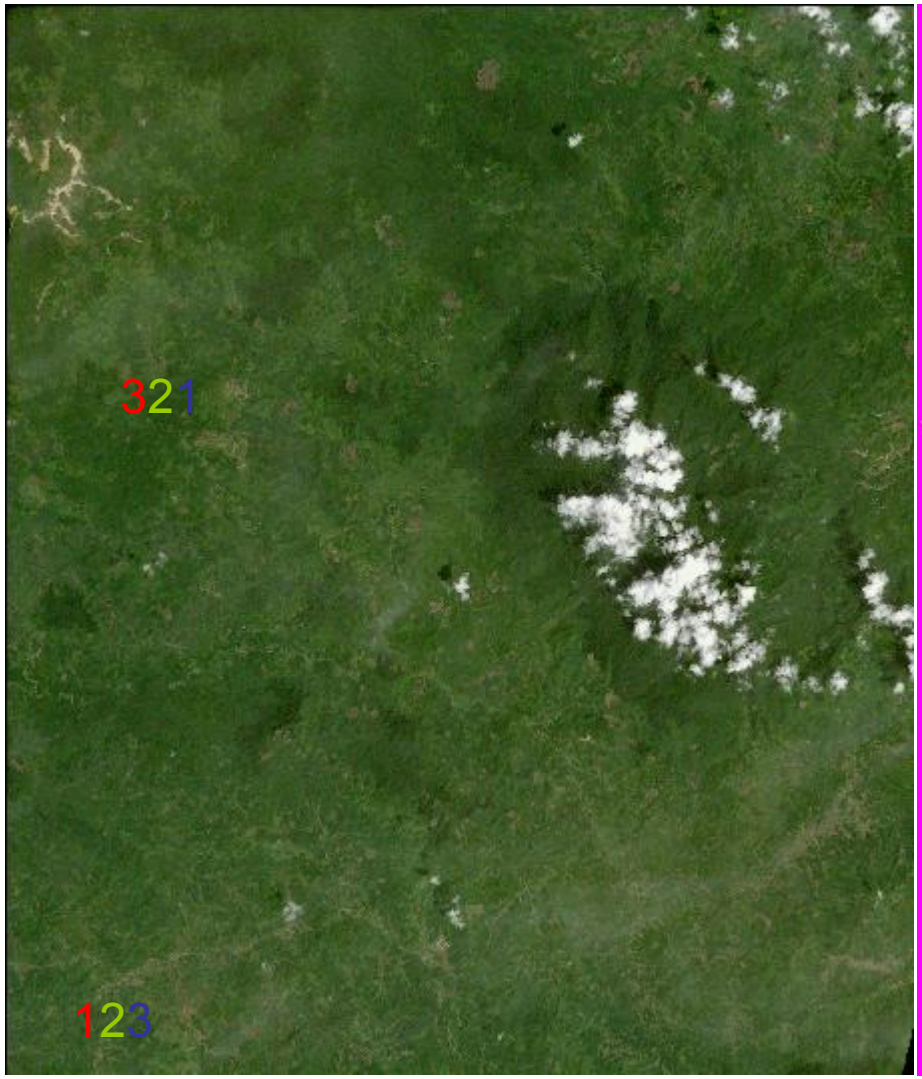


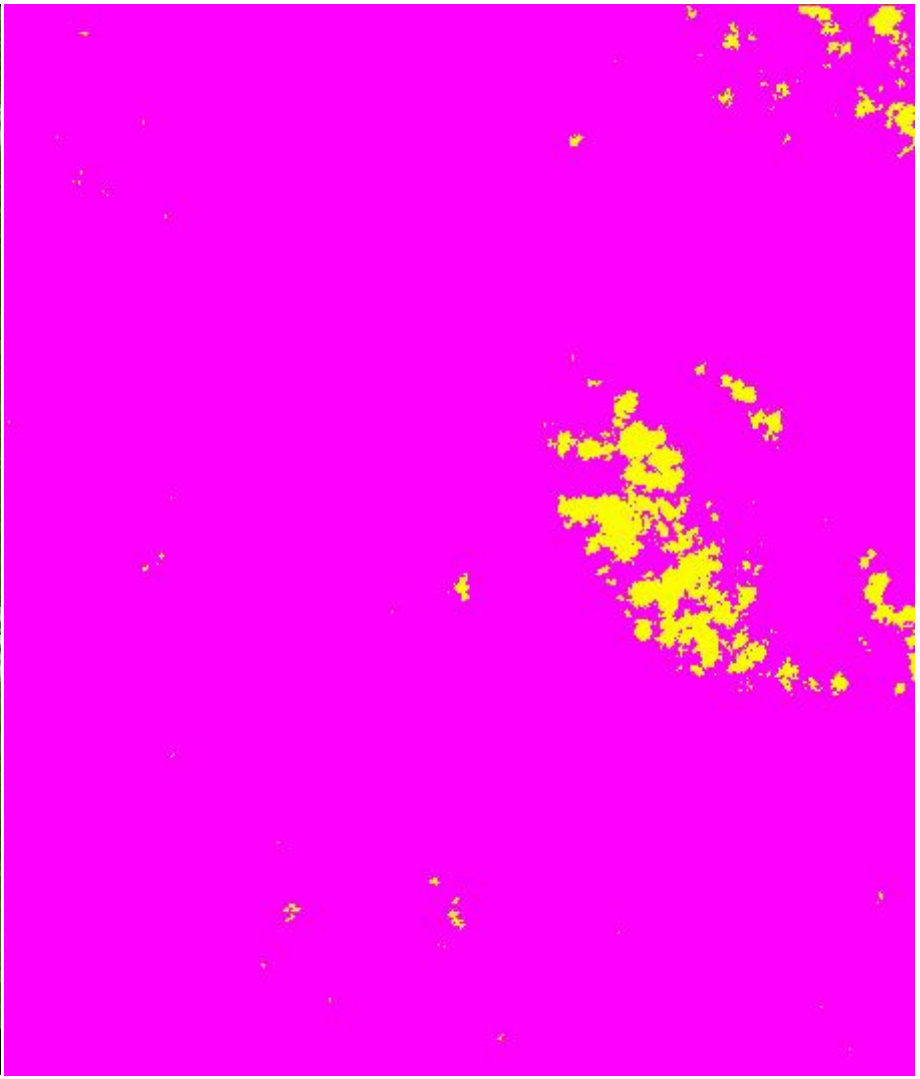
8.85C to 12C



Old Internal cloud: Yellow

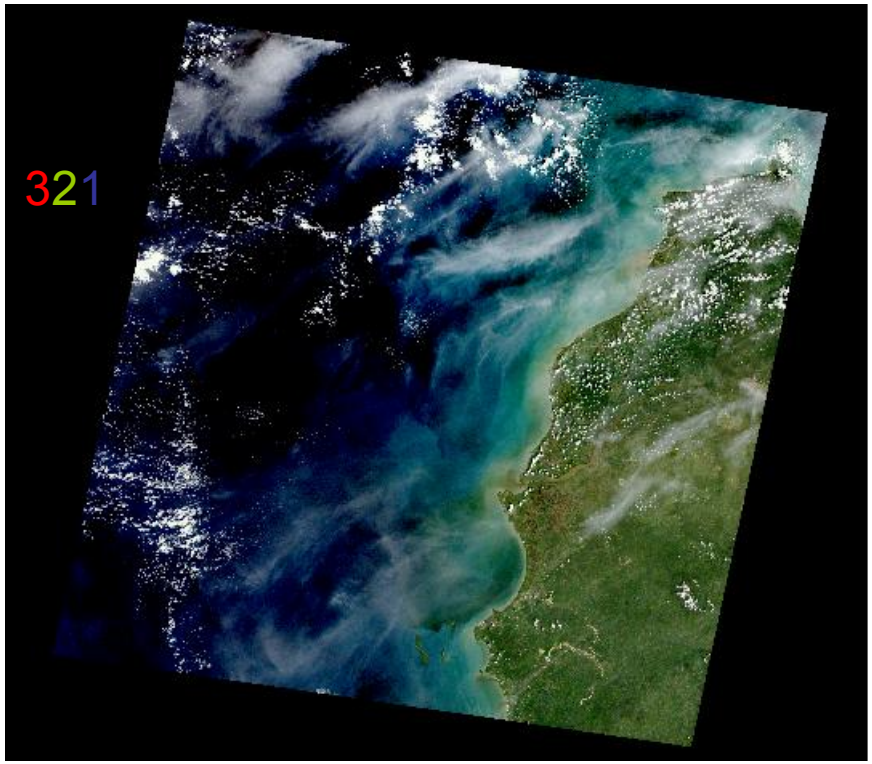
Borneo scene (details)
New cloud mask: Directly on the surface reflectance product using visible anomaly test: Blue-Red/2 >0.03





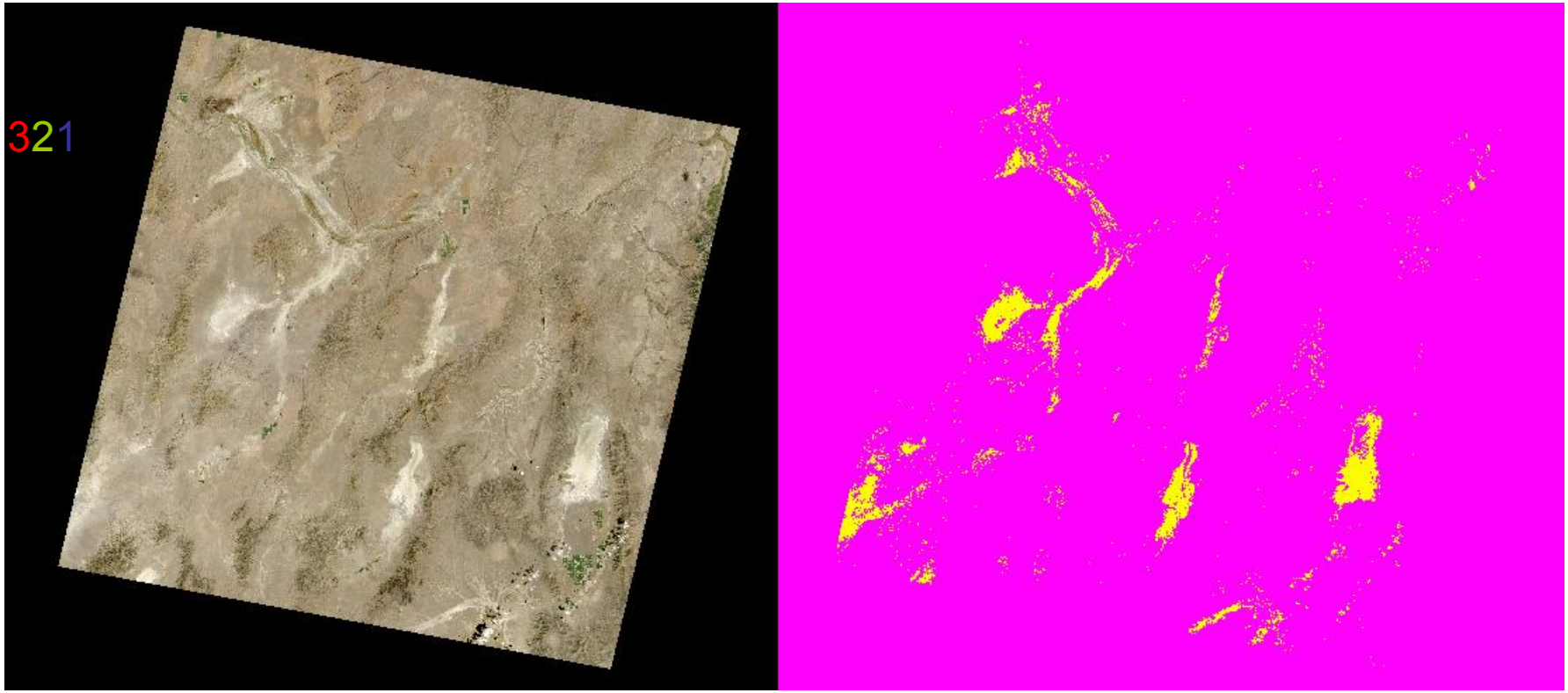
New Internal cloud: Visible anomaly

Borneo Scene with visible anomaly test and additional test for false detection over turbid water band 5 (1.6mic) threshold 0.03



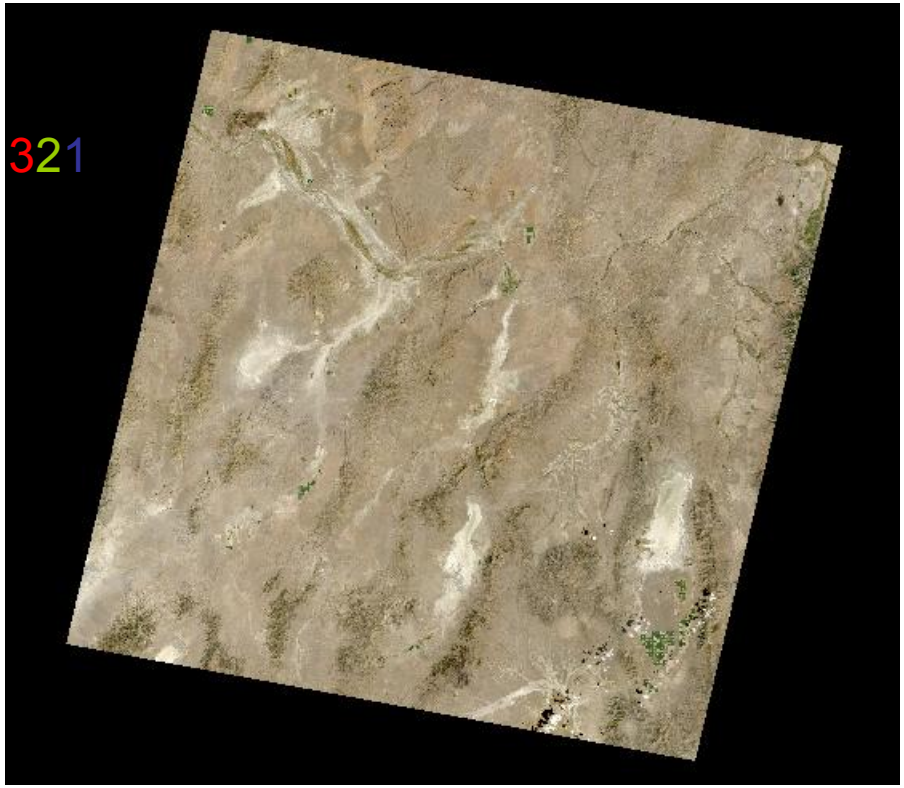
New internal cloud: visible anomaly and 1.6mic threshold

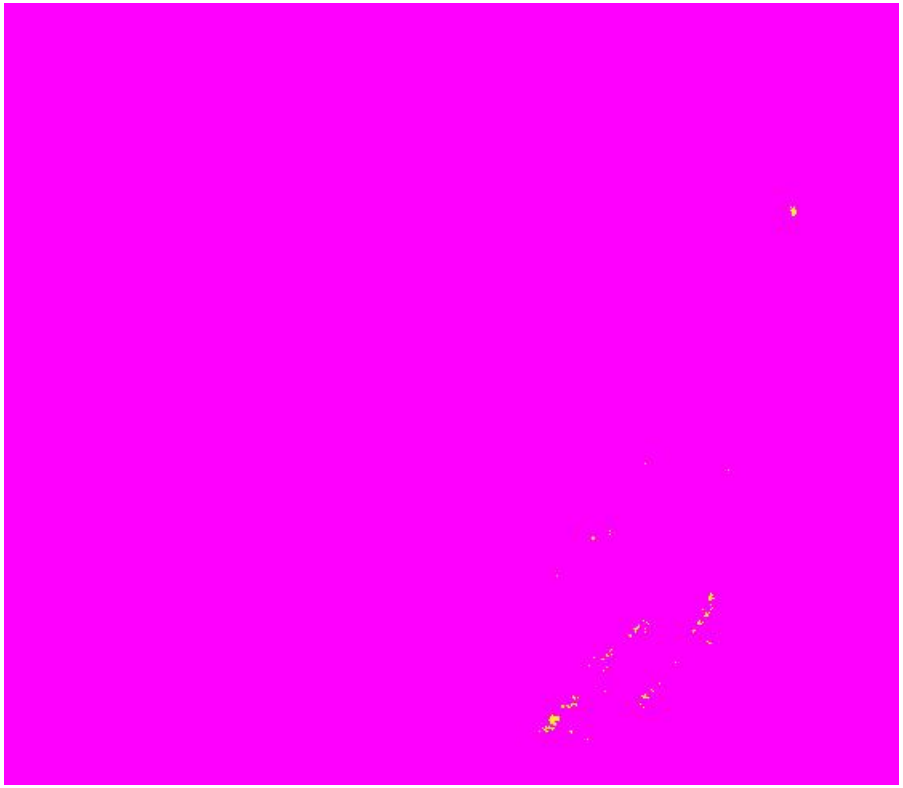
Visible anomaly test fails also over bright surfaces (salt pan) as “expected”



New internal cloud: visible anomaly and 1.6mic threshold

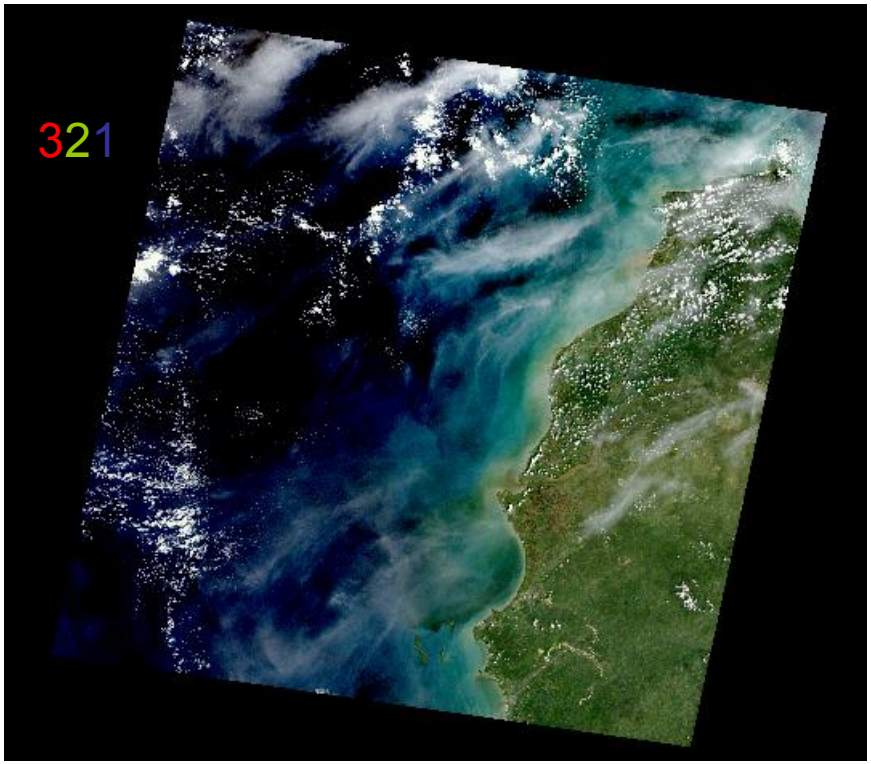
Visible anomaly test fails also over bright surfaces (salt pan) as “expected”
but a simple thermal test is very efficient to handle thos “false” cloud detection





New internal cloud: visible anomaly and 1.6mic threshold and thermal test

Final re-test on Borneo



New internal cloud: visible anomaly and 1.6mic threshold and thermal test

Conclusions

TECHNICAL LEVEL

An improved algorithm (robustness) for atmospheric correction has been implemented and will be tested in LEDAPS (the previous version was Beta). We take advantage of the high spatial resolution of Landsat (compared to MODIS) to filter out bad aerosol retrievals.

A consolidated per pixel cloud mask on the surface reflectance product (third pass) is under evaluation. It is relying on the thermal data.

Cloud shadow algorithm is available and needs to be evaluated on the new per pixel cloud mask.

RECOMMENDATION

The surface reflectance product and cloud/cloud shadow mask is now being used routinely by the Land community (MODIS, AVHHR and now Landsat 5/7). It is necessary to make plans to make those data available in the LDCM era.

FUTURE PLANS

Aerosol model update and inversion

Coastal Water