



Validation of the DigitalGlobe Surface Reflectance product and its comparison to FLAASH and QUAC



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Agenda

- Introduction
- Consistency of the spectral information
- Validation
- DG-AComp extended to other platforms
- Conclusions

- Surface reflectance is a beta product available to selected DigitalGlobe customers

- This presentation illustrates the 2014 work to validate DG-AComp, the DigitalGlobe proprietary method to automatically compensate atmospheric effects in very high spatial resolution VNIR, SWIR, and PAN images

- DG-AComp has been validated on six locations with different climates:
 - rural (Fresno, CA, Longmont, CO, Halifax, Canada)
 - urban (Washington D.C.)
 - semi-arid (Phoenix, AZ)
 - semi-tropical (Jacksonville, FL)

Introduction (2/2)

- For each location, multiple sets of BRDF measurements were taken using an ASD handheld for a total of more than 5,000 data samples.
- BRDF measurements were taken at the equinoxes to minimize the declination of the Sun
- Targets of interest included:
 - concrete surfaces
 - asphalted surfaces
 - tennis and basketball courts
 - sand
- The dataset used for the analysis was composed of more than 1,000 WorldView-2 images acquired from 2010 to 2014
- This talk will also show how DG-AComp has been extended to other satellite platforms, such as Landsat 8 and Pleiades



Consistency of the spectral information

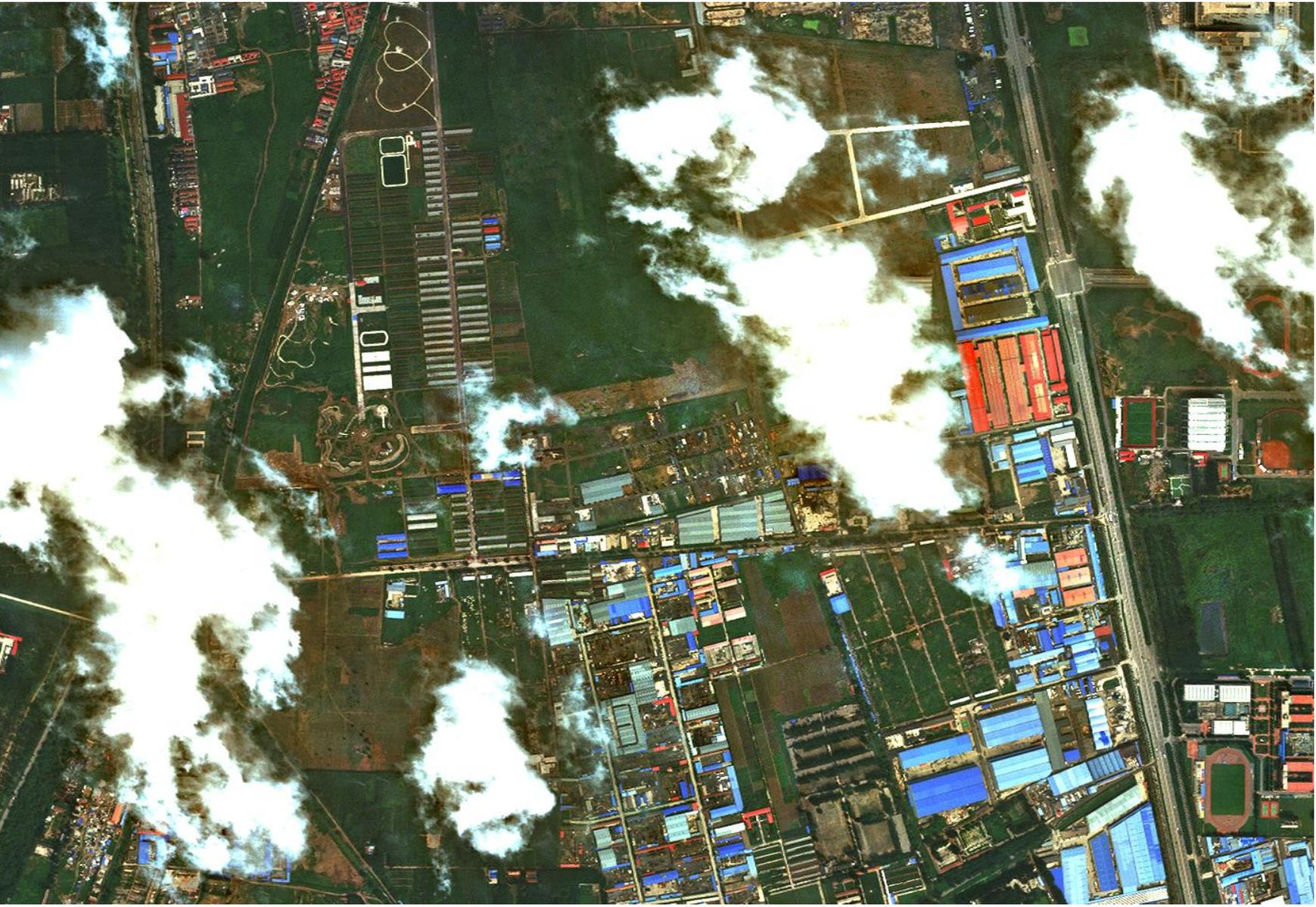
What color is this roof?



What color is this roof?

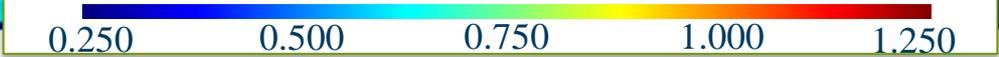
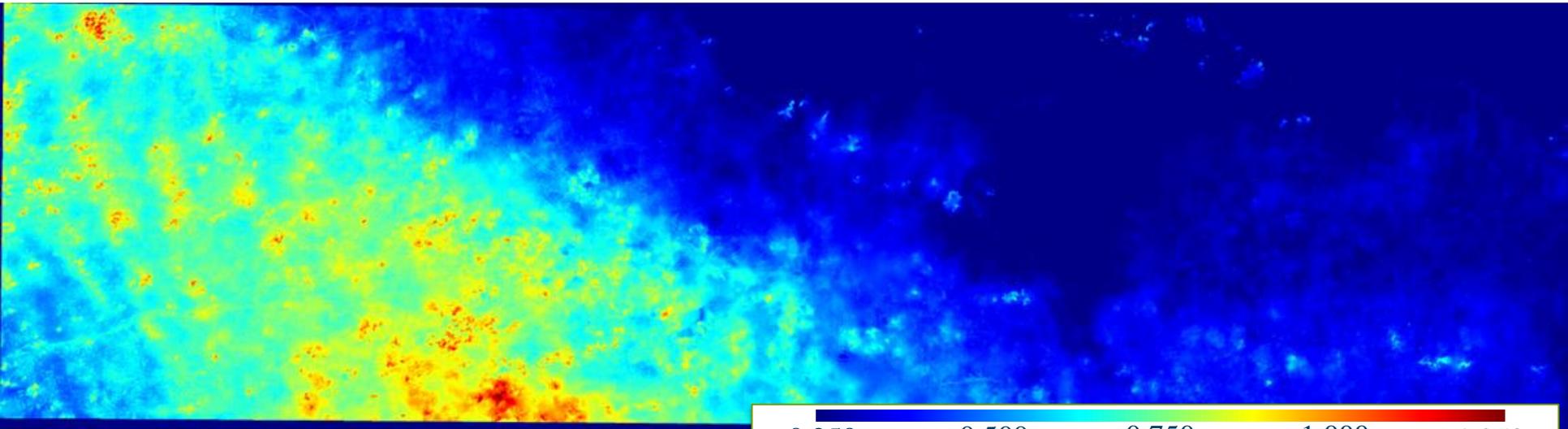


What color is this roof?



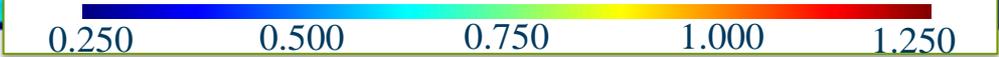
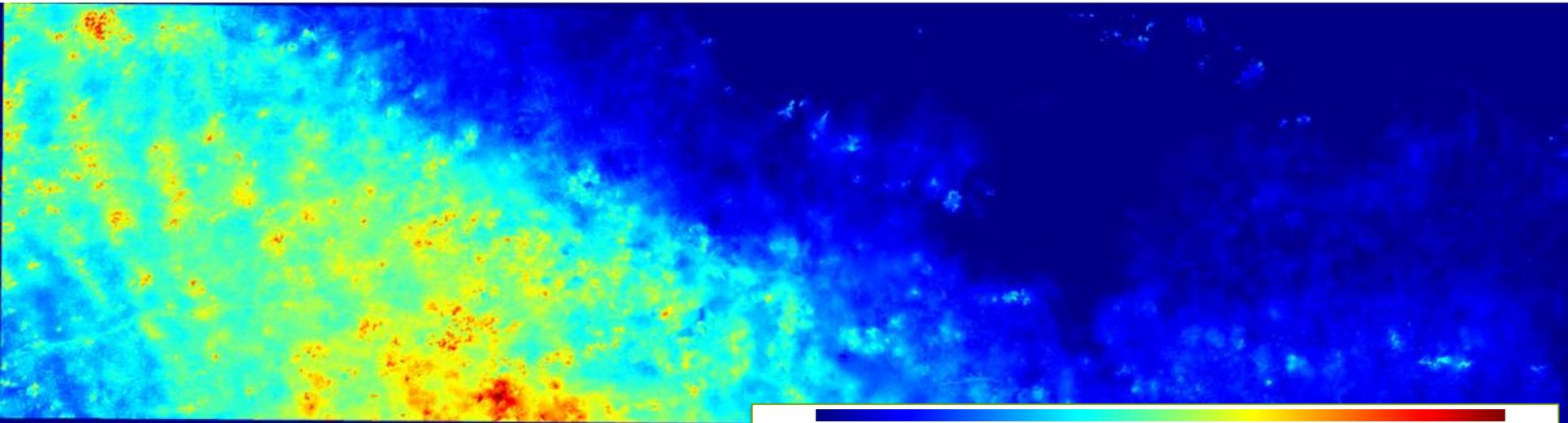
Pixel-based Approach!

Beijing (China) - August 12, 2012: original image



Pixel-based Approach!

Beijing (China) - August 12, 2012: DG-AComp



The Consistency of Information

Construction of the National Stadium of Brazil Mané Garrincha (2010-2013)



Hanoi (Vietnam) – time series (1/6)



original image

surface reflectance

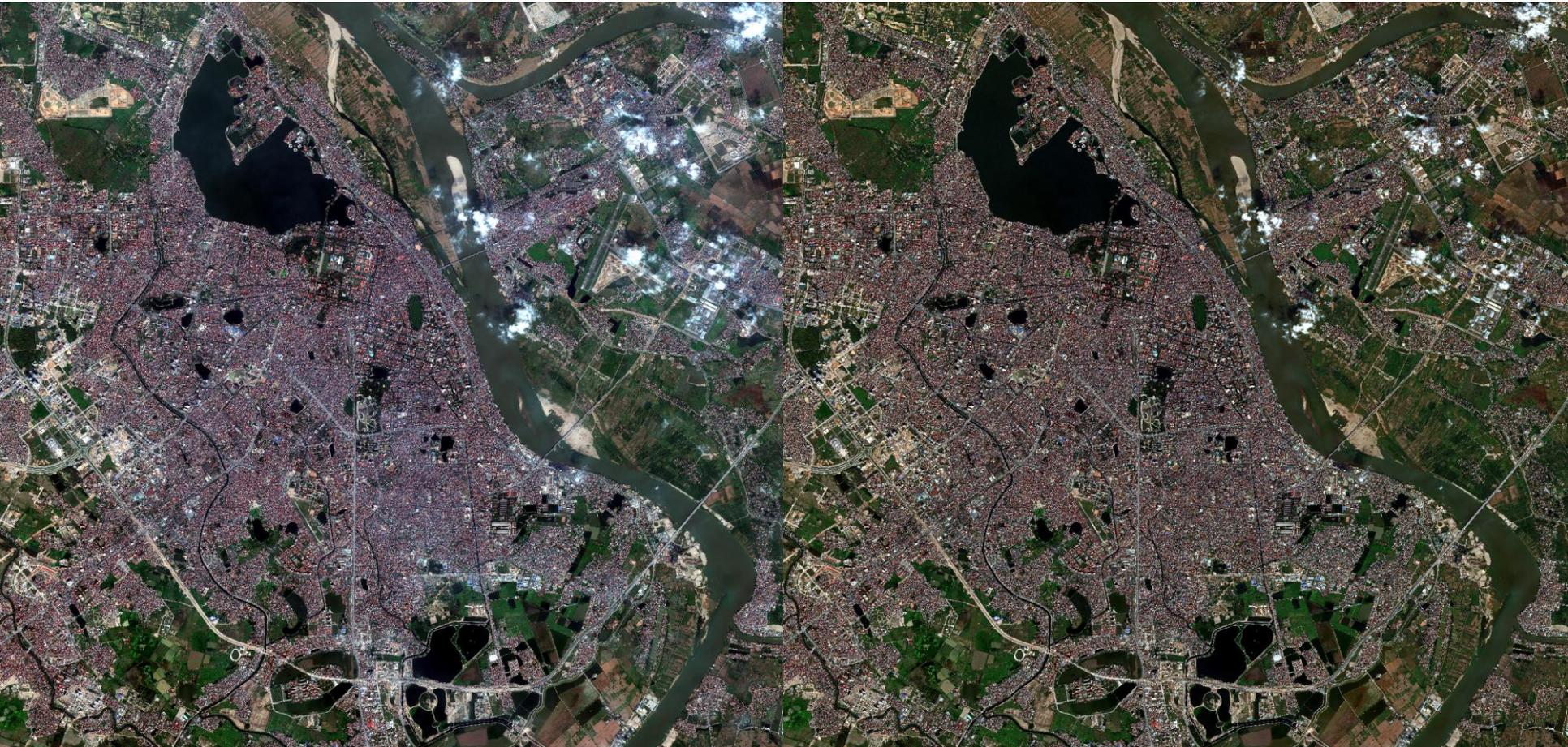
Hanoi (Vietnam) – time series (2/6)



original image

surface reflectance

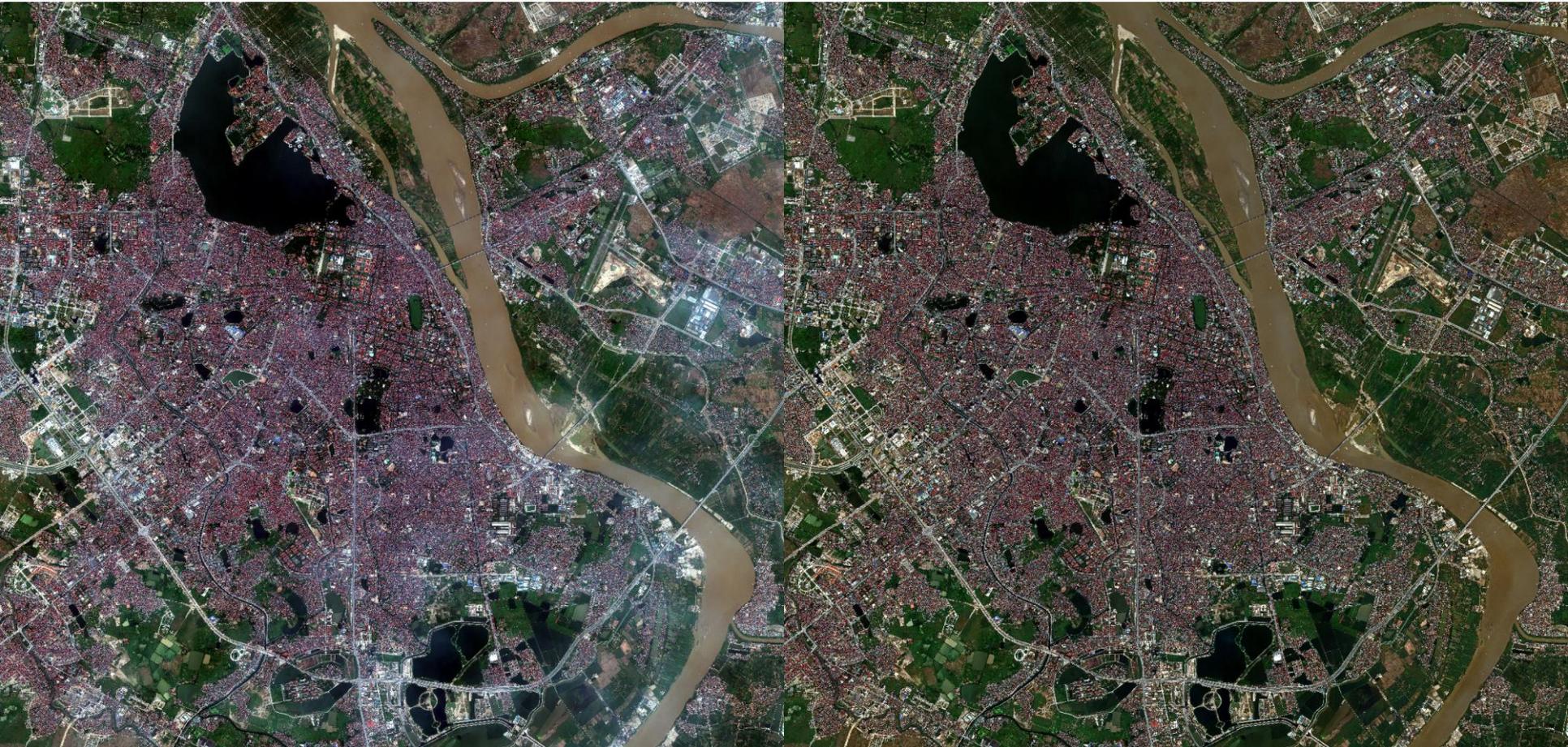
Hanoi (Vietnam) – time series (3/6)



original image

surface reflectance

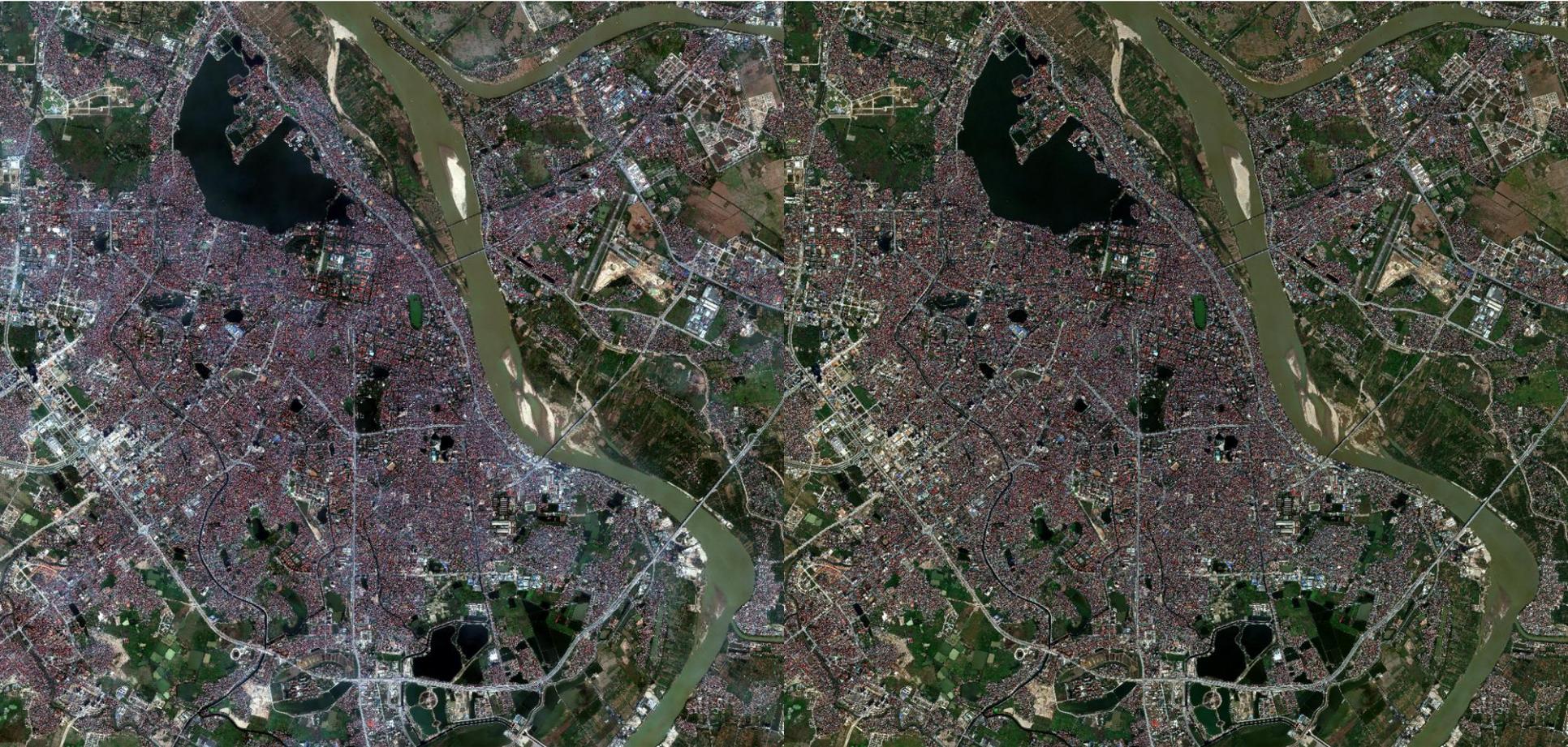
Hanoi (Vietnam) – time series (4/6)



original image

surface reflectance

Hanoi (Vietnam) – time series (5/6)



original image

surface reflectance

Hanoi (Vietnam) – time series (6/6)



original image

surface reflectance

Hanoi (Vietnam) – an extreme case!



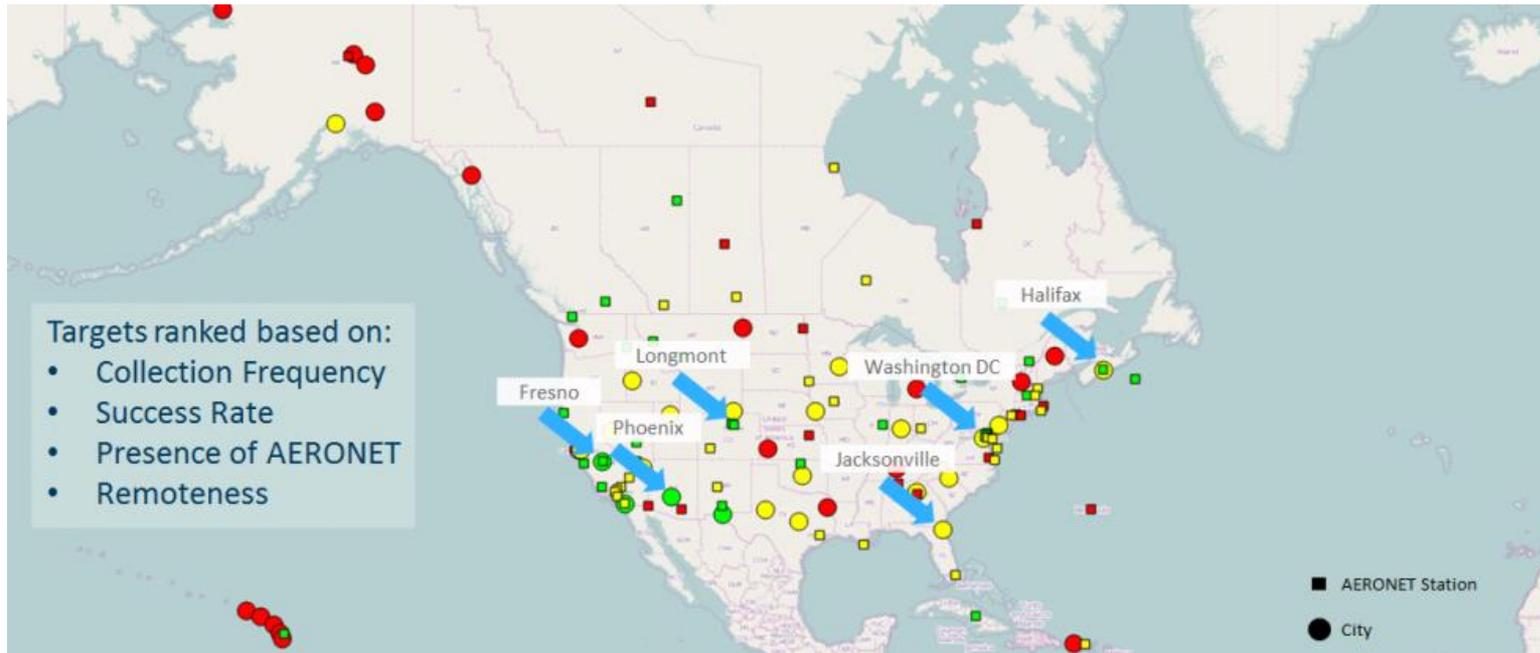
original image

surface reflectance

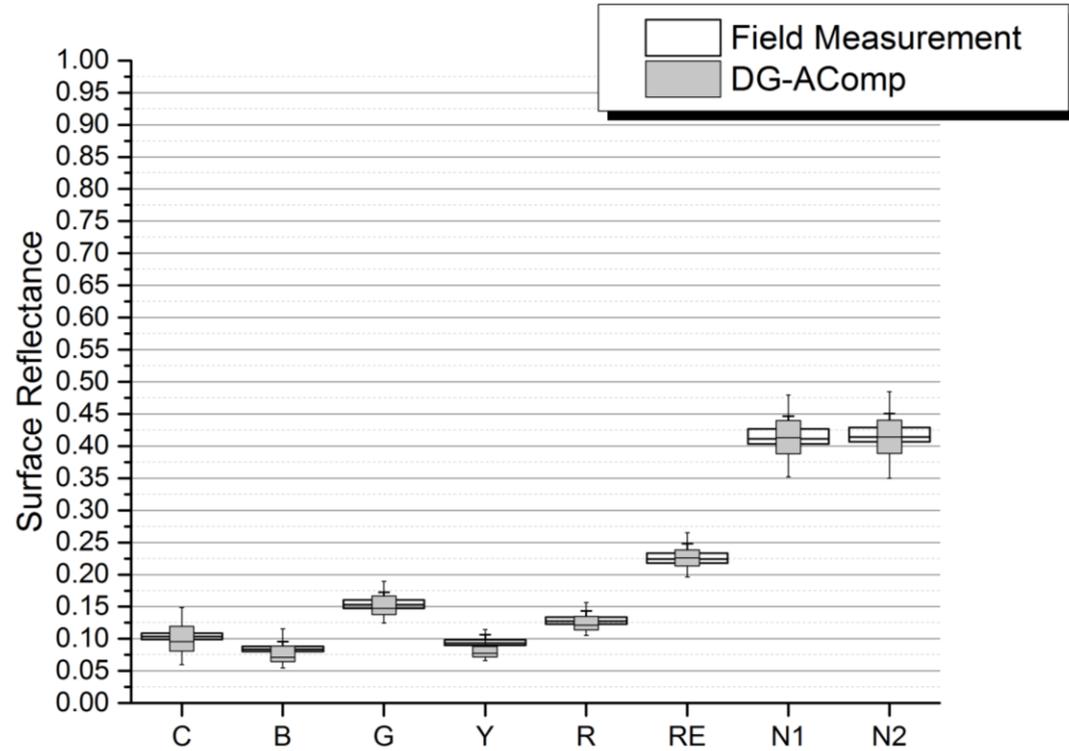
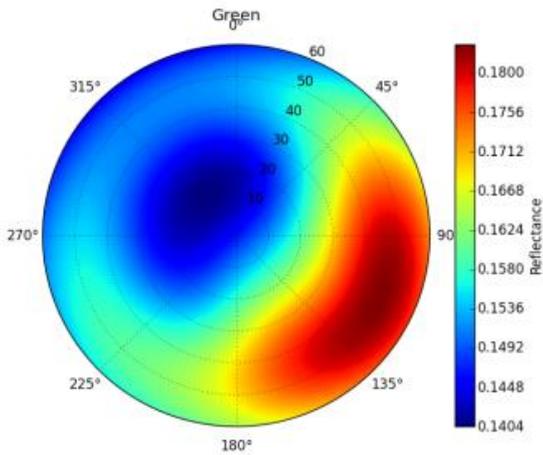
Validation

DG-AComp validation in numbers (so far)

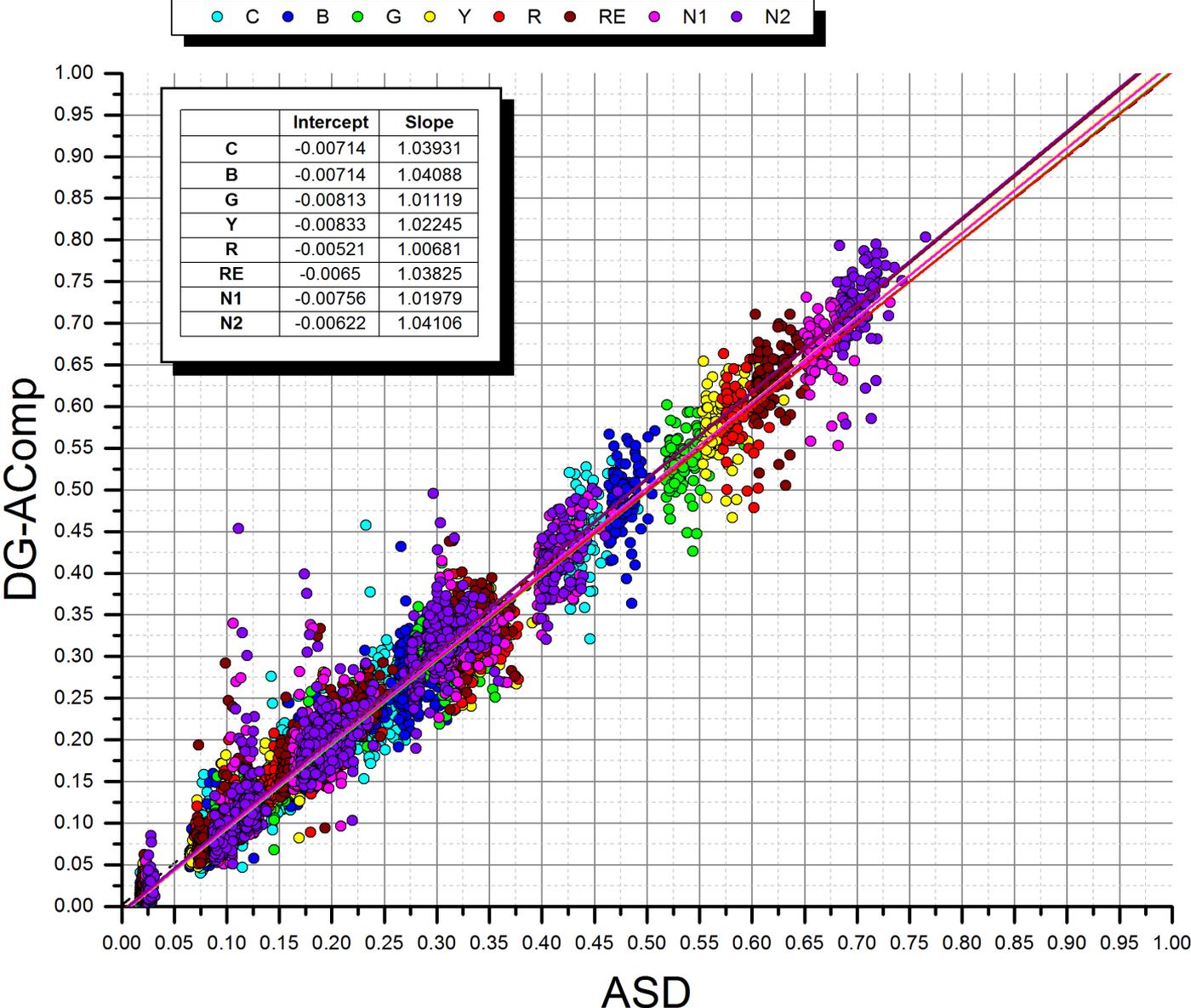
- 6 locations with different climates: rural, semi-arid, semi-tropical, and urban
- 5,000+ ASD measurements
 - 12 BRDF targets: man-made materials like asphalt or concrete
- 5 years of data: 2010-2014
 - ~1,000 WorldView-2 images



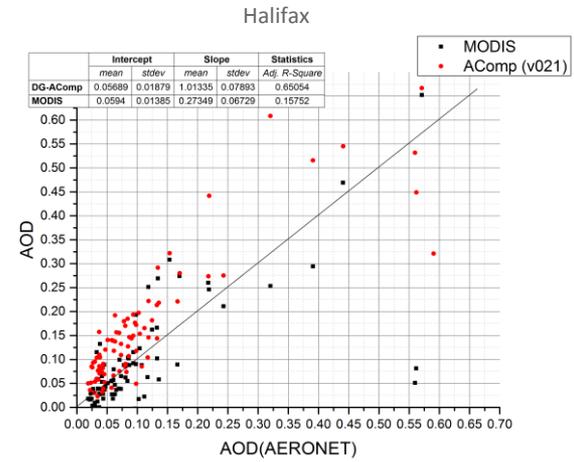
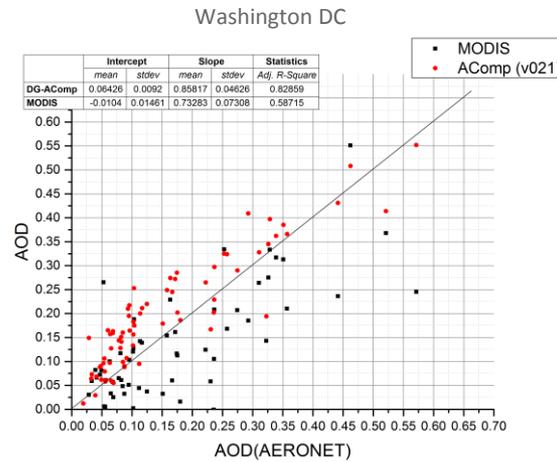
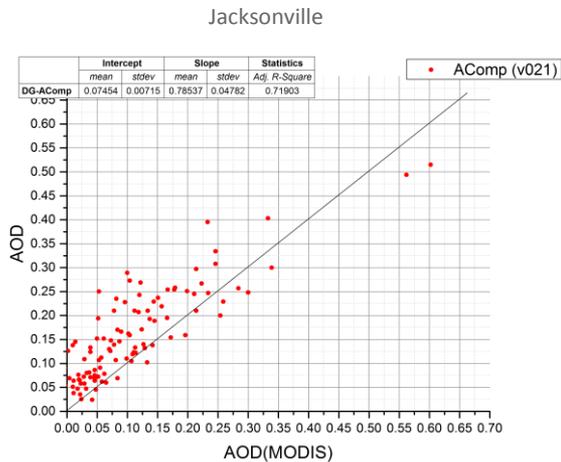
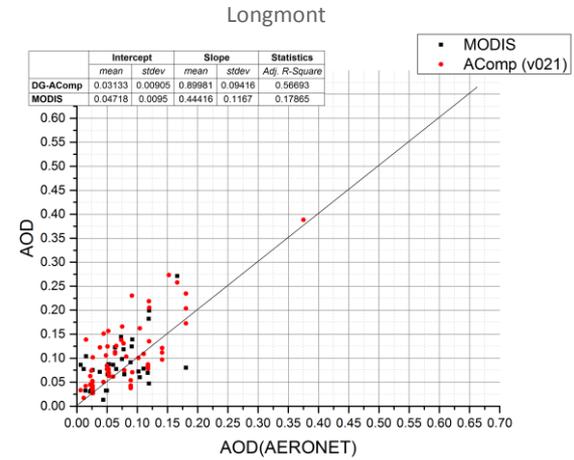
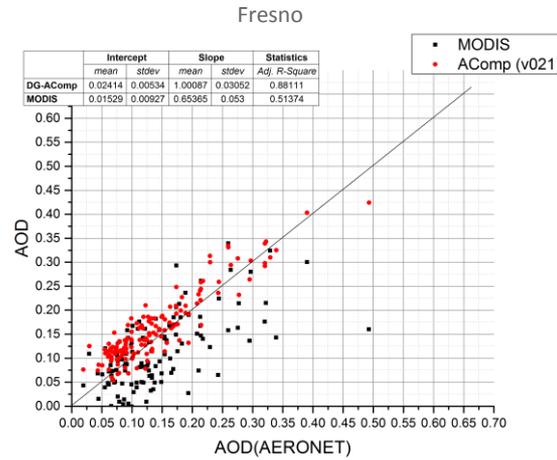
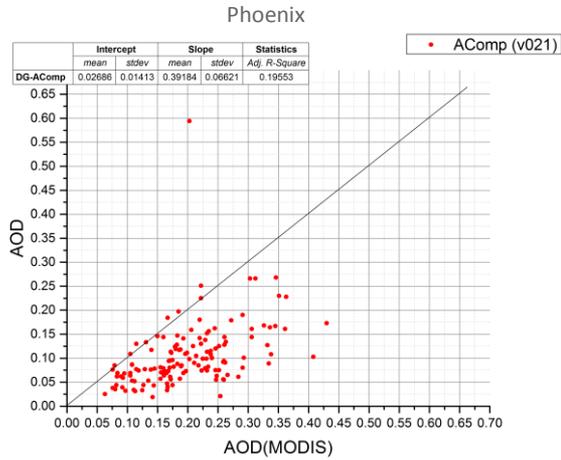
For each target ..



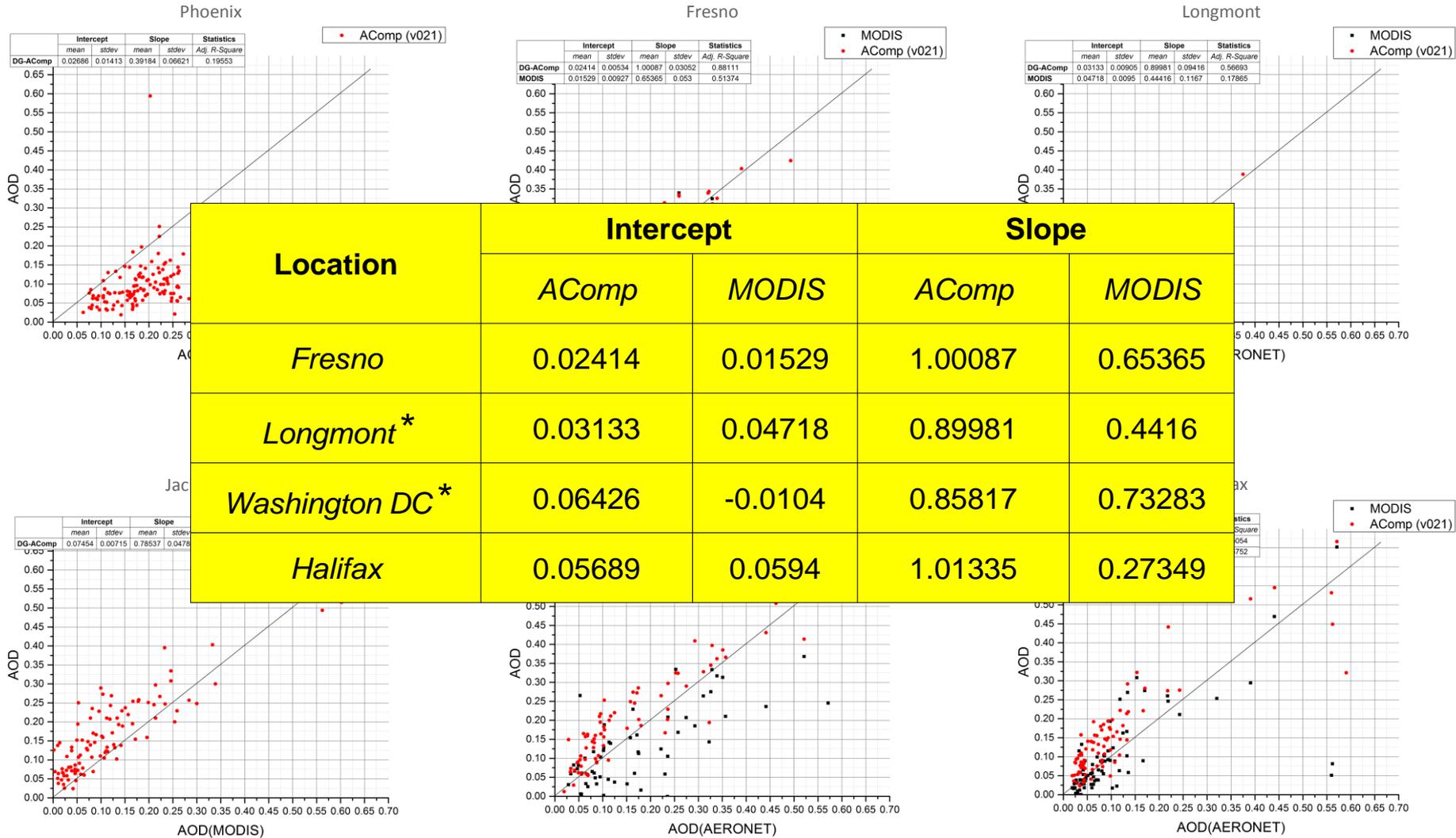
Surface Reflectance Comparison to ASD



AOD Comparison to AERONET and MODIS

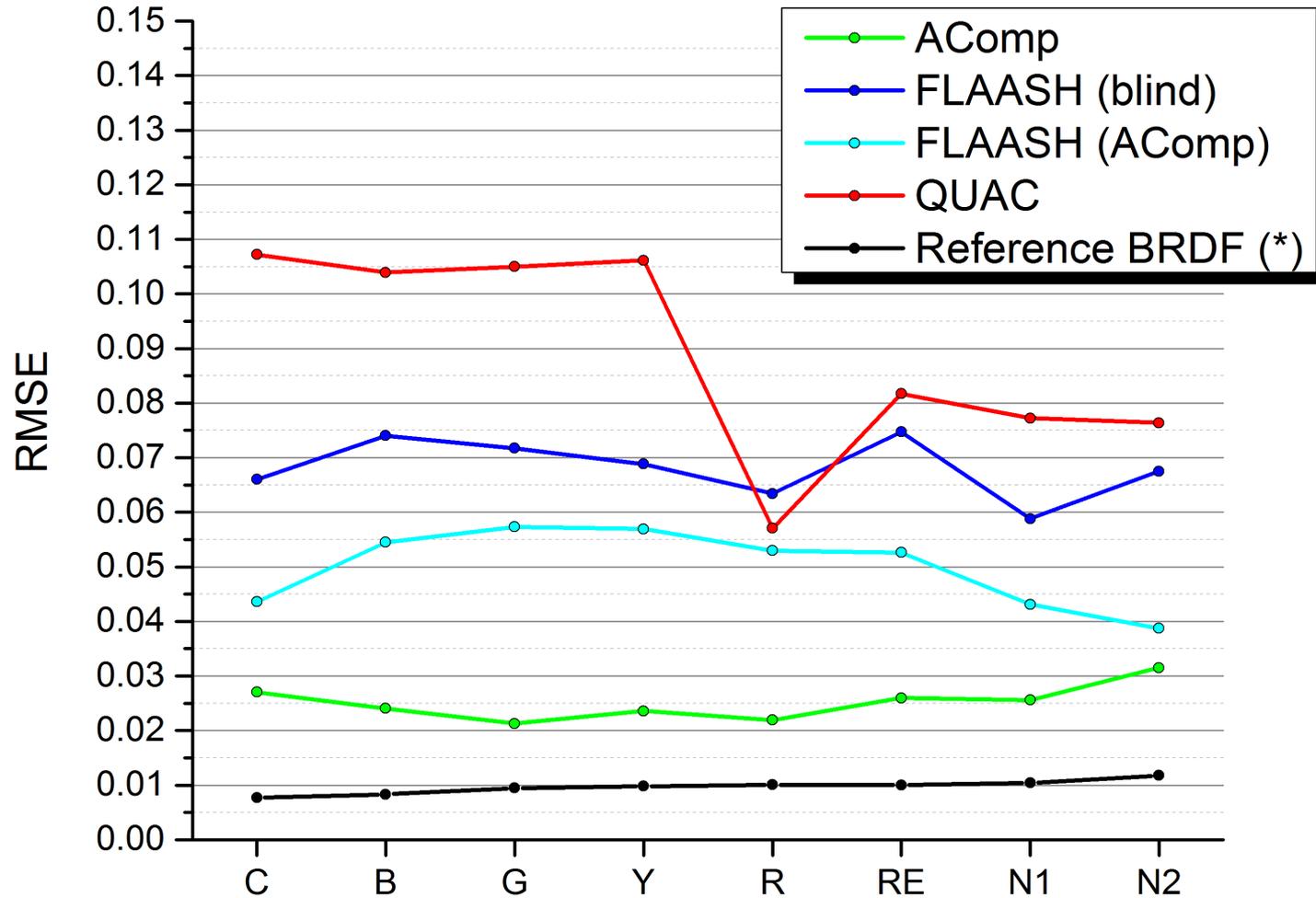


AOD Comparison to AERONET and MODIS



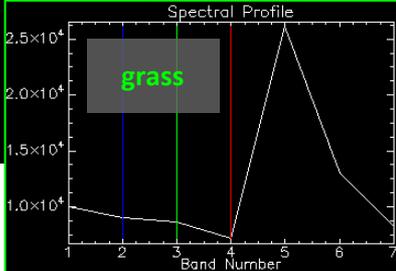
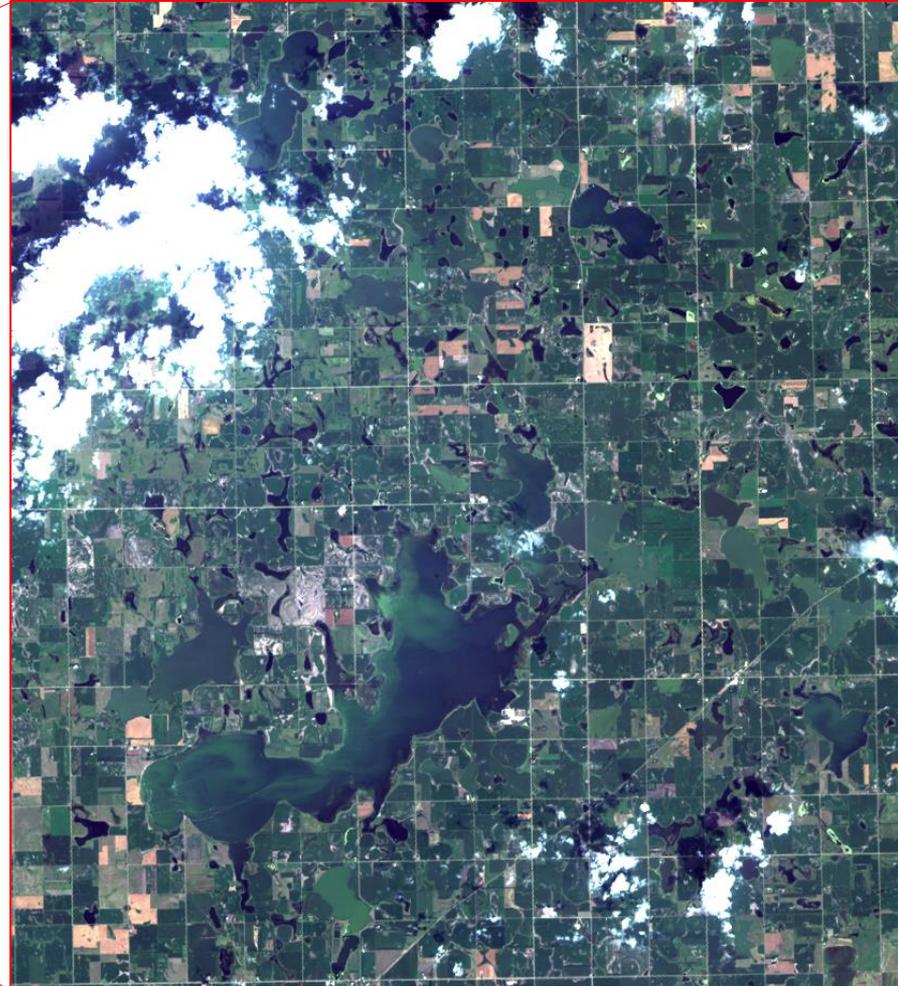
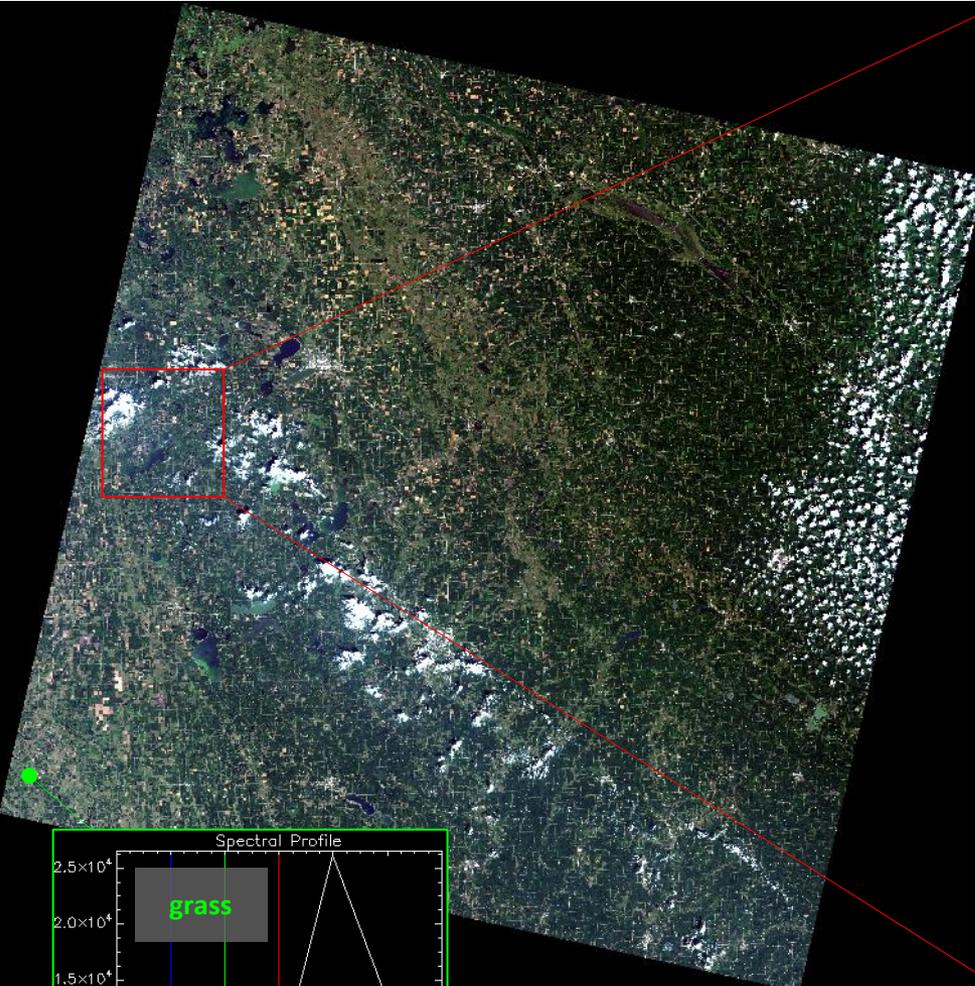
* Longmont and Washington DC AERONET stations are outside the region imaged by WorldView-2

Comparison to FLAASH and QUAC (all targets)



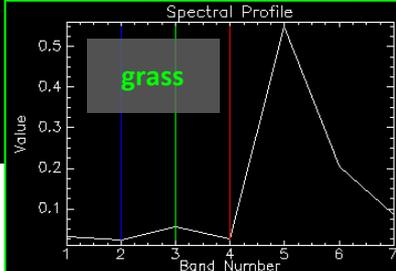
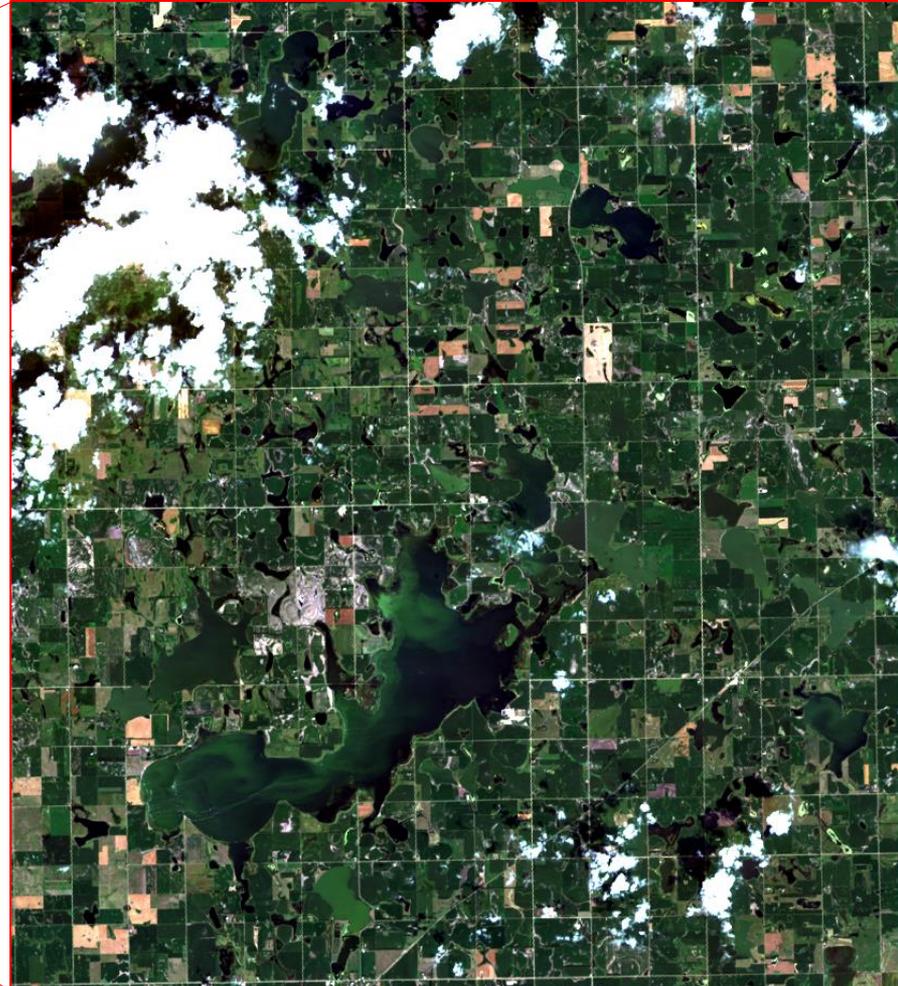
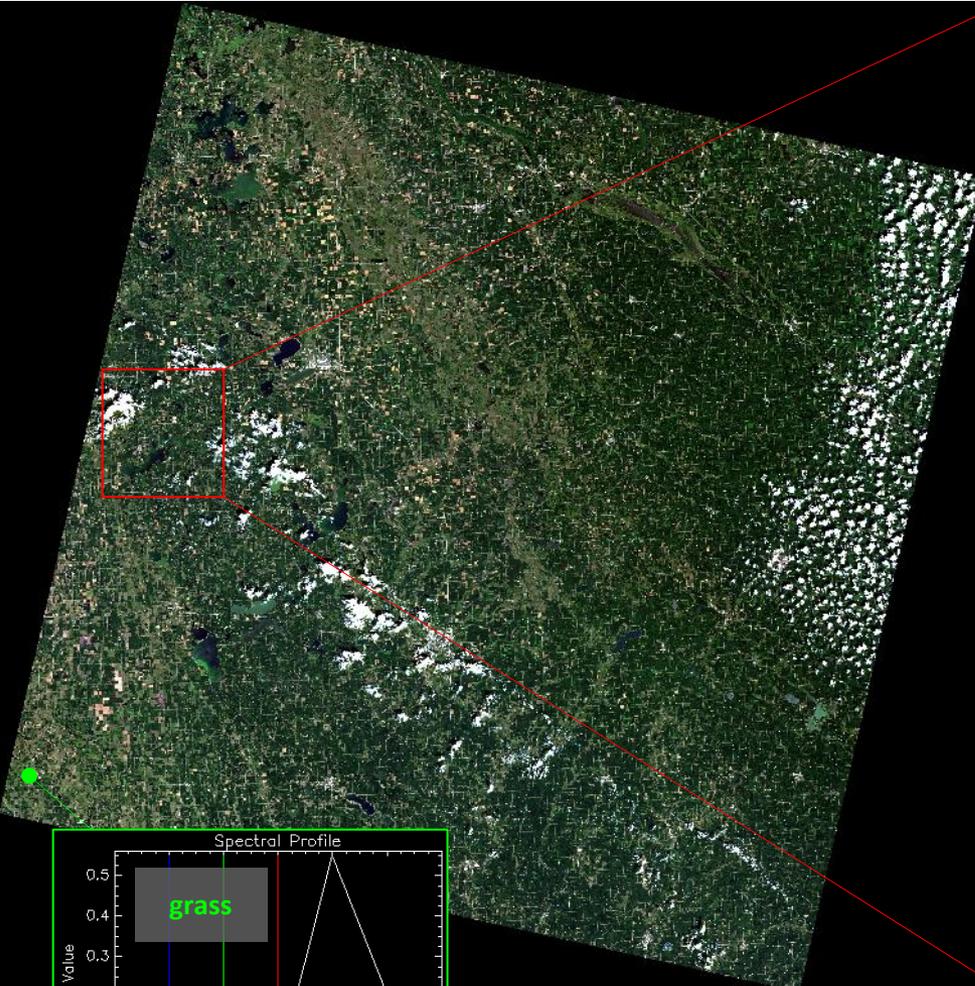
DG-AComp extended to other platforms

Landsat 8 (original)



Brookings, SD – August 13, 2013

Landsat 8 (AComp)



Brookings, SD – August 13, 2013

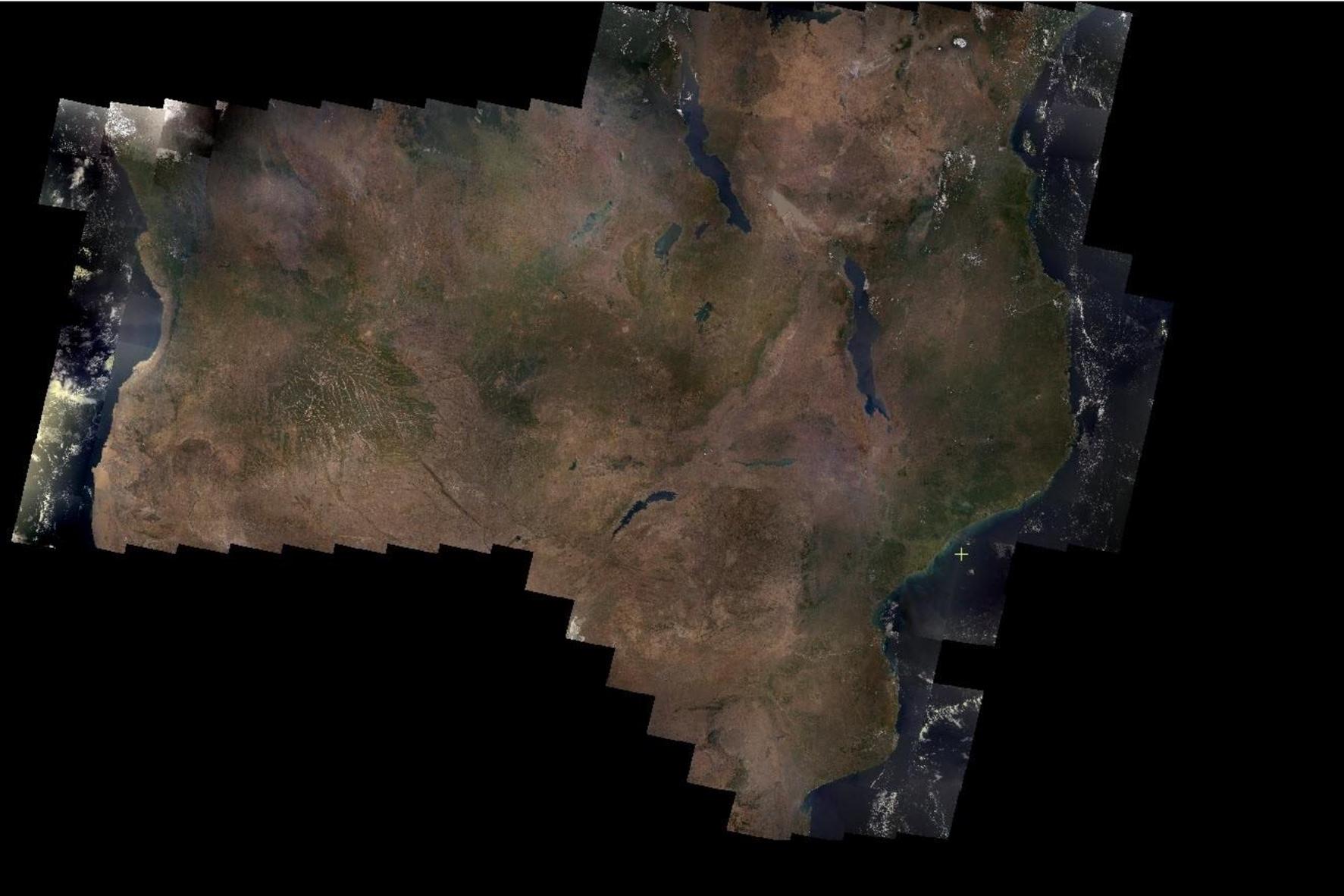
Landsat 8 mosaic of SE Asia (original)



Landsat 8 mosaic of SE Asia (AComp)



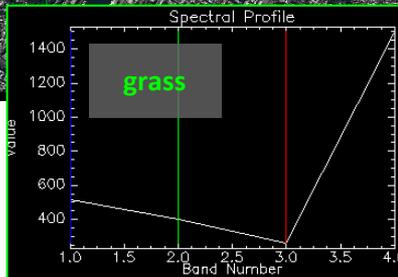
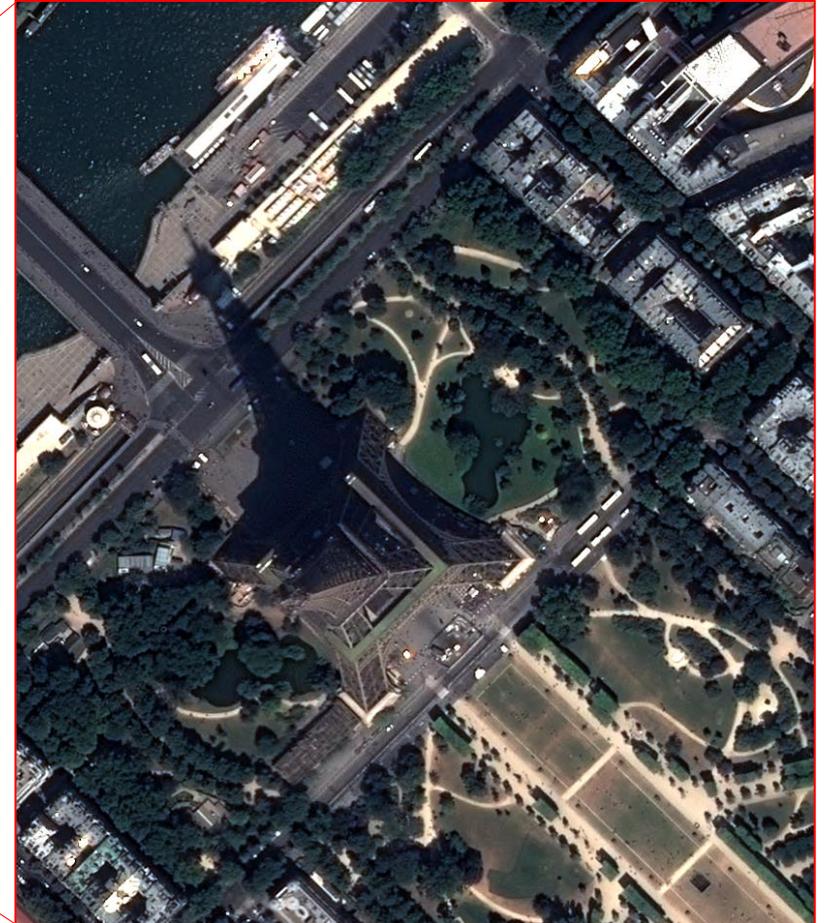
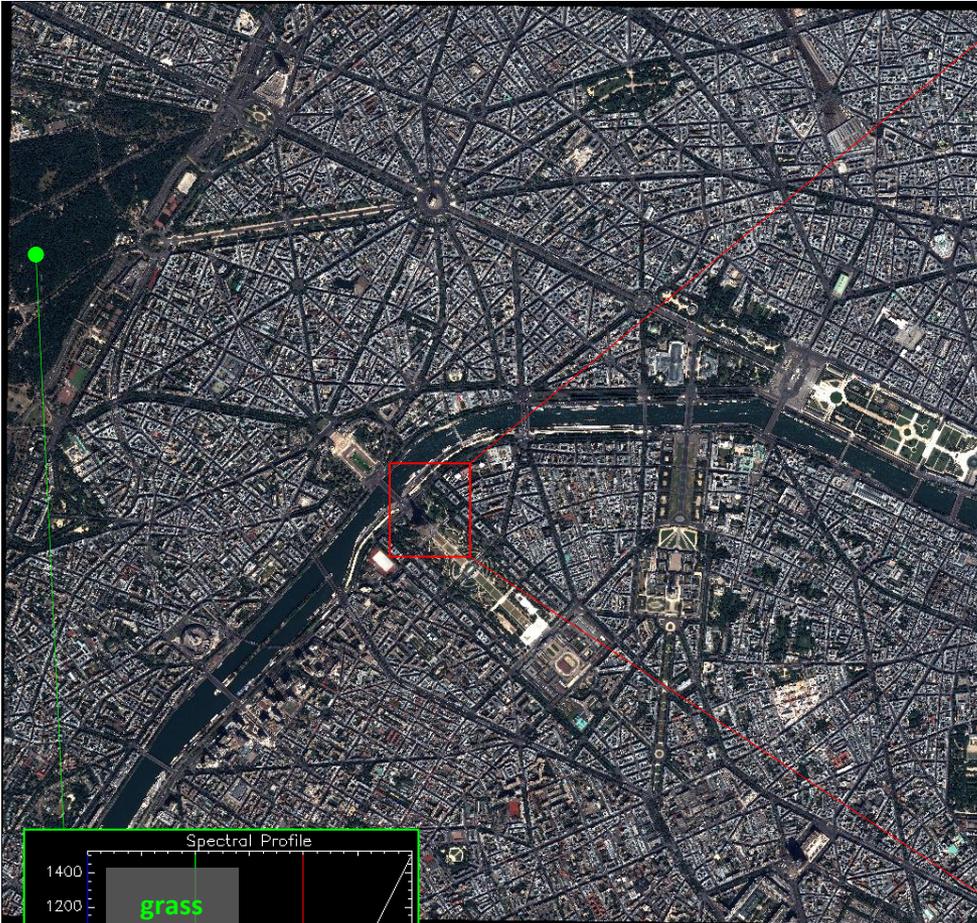
Landsat 8 mosaic of Central Africa (original)



Landsat 8 mosaic of Central Africa (AComp)

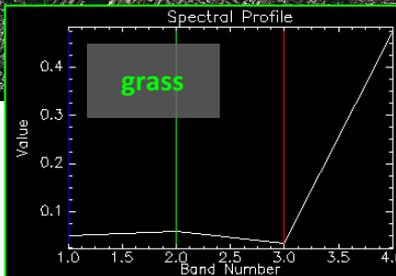
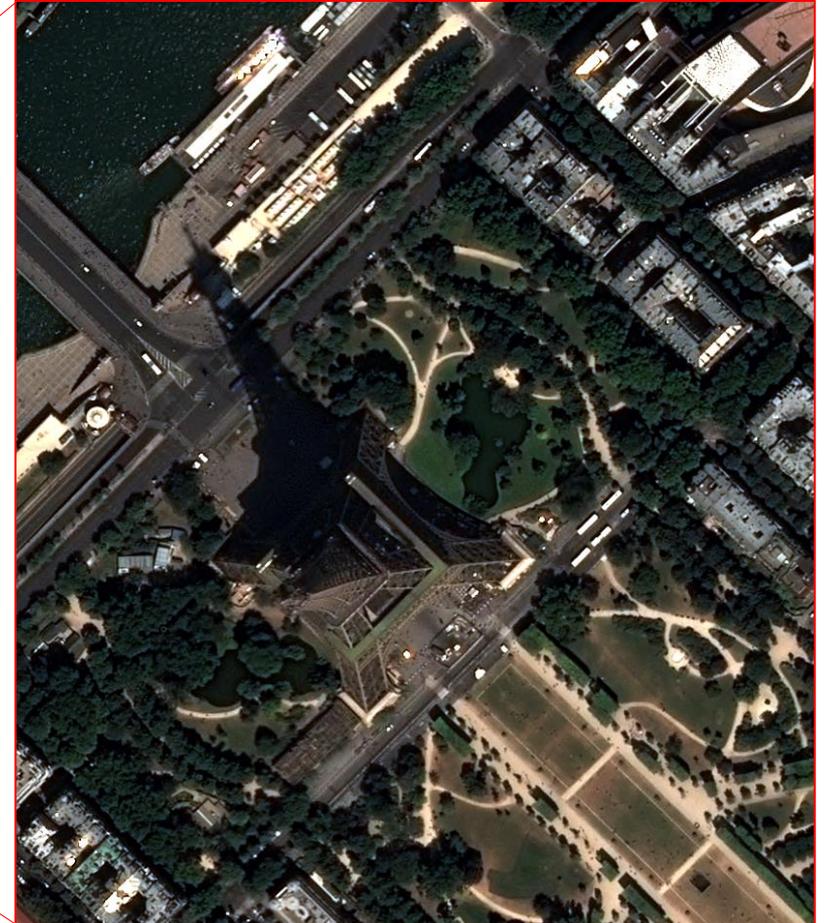
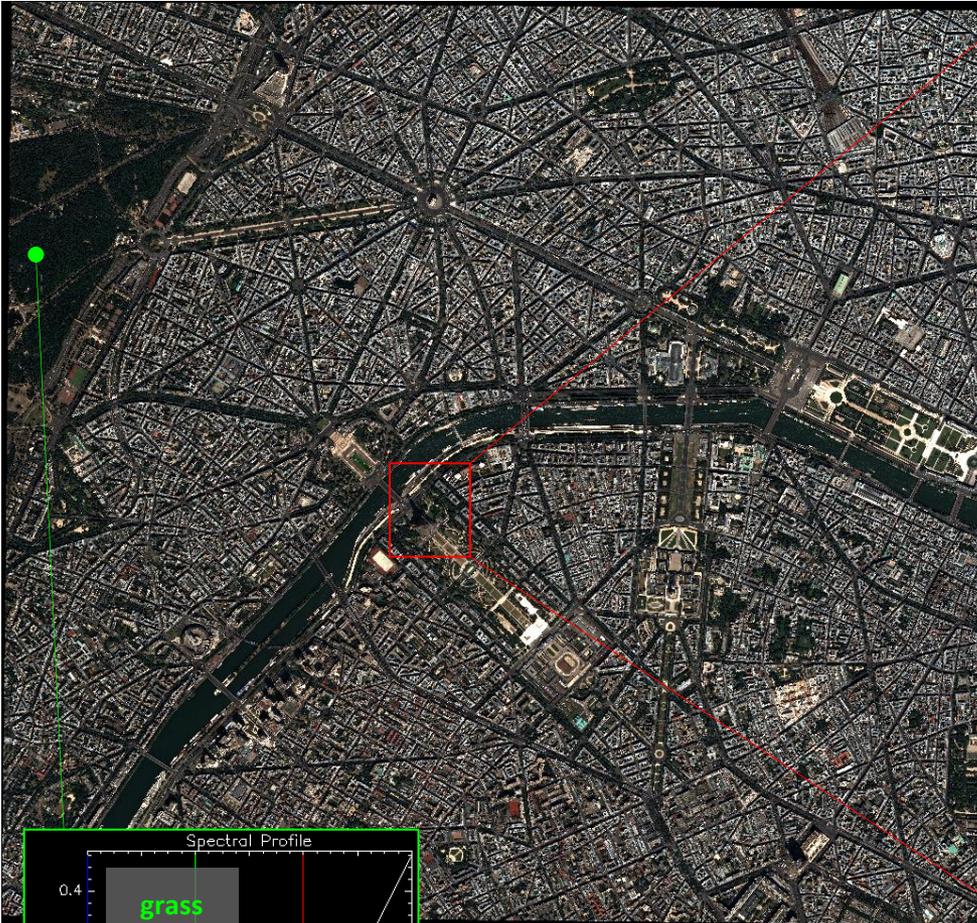


Pleiades 1A (original)



Paris, France – July 21, 2013

Pleiades 1A (AComp)



Paris, France – July 21, 2013

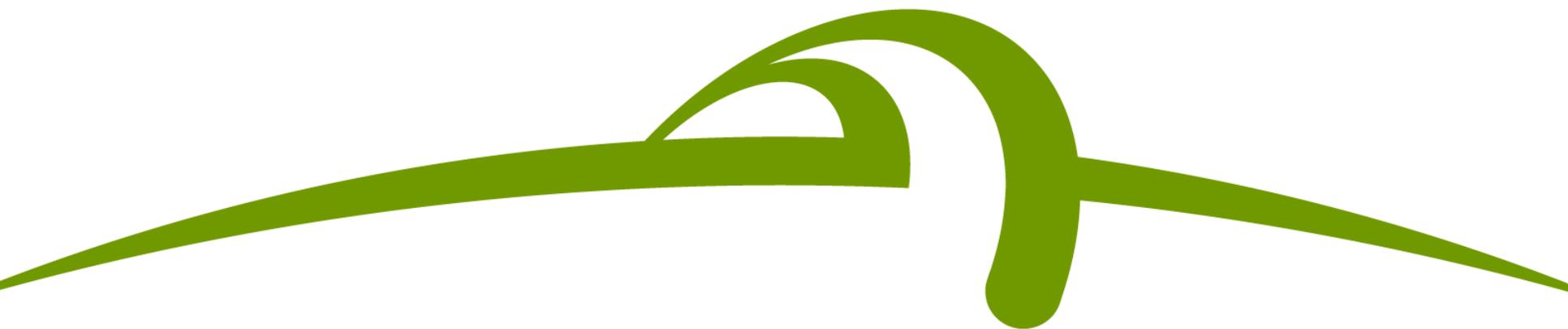
Surface reflectance is a foundation technology that is necessary for extracting information from imagery reliably over a large area and with imagery collected over a period of time.

Its applications are countless, including:

- environmental studies (NDVI, LAI, biomass)
- target detection, species identification
- large-scale land use/land cover
- large-scale mosaics

Surface reflectance is a beta product available to selected DigitalGlobe customers. With the addition of the 8 SWIR bands on WorldView-3, DG-AComp will provide a powerful tool to scientists, governments, and the commercial realm for remote sensing science and applications.

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