

# North American Land Surface Albedo and Nearshore Shallow-Bottom Properties from Landsat and MODIS/VIIRS

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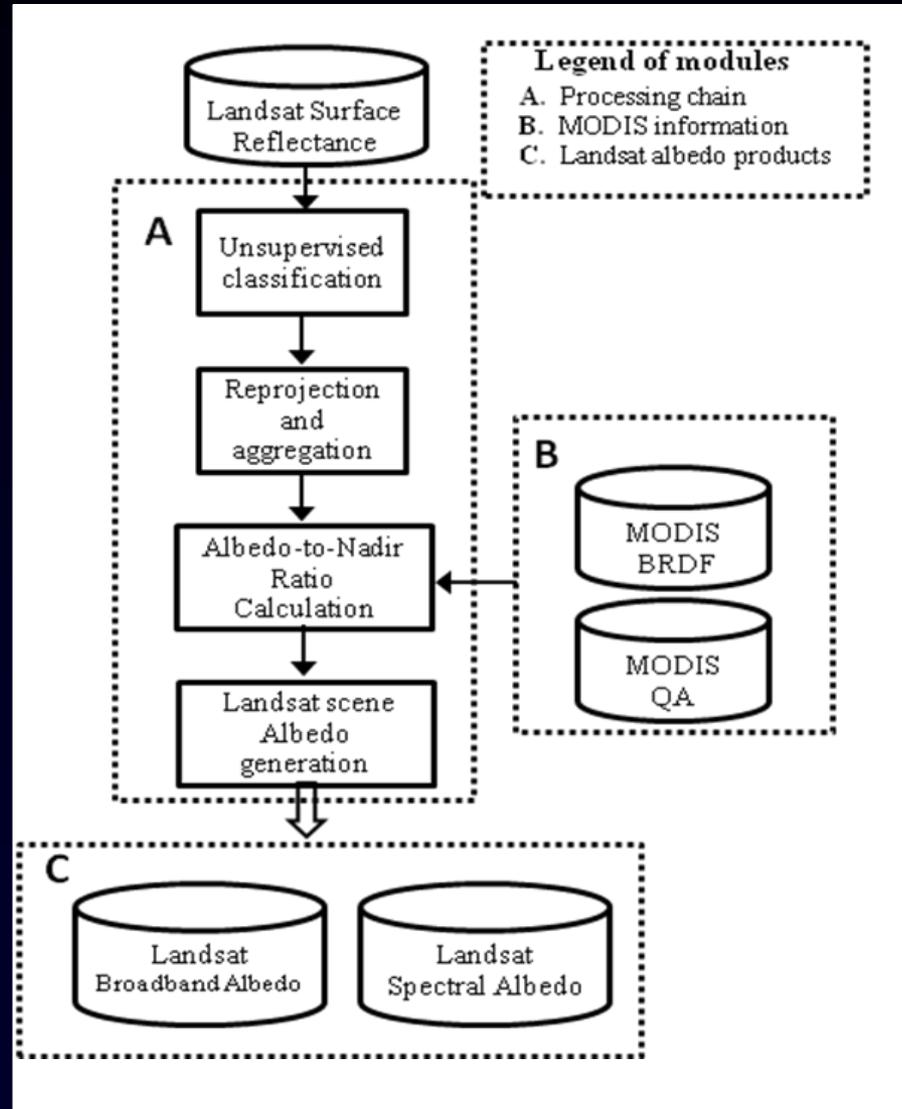


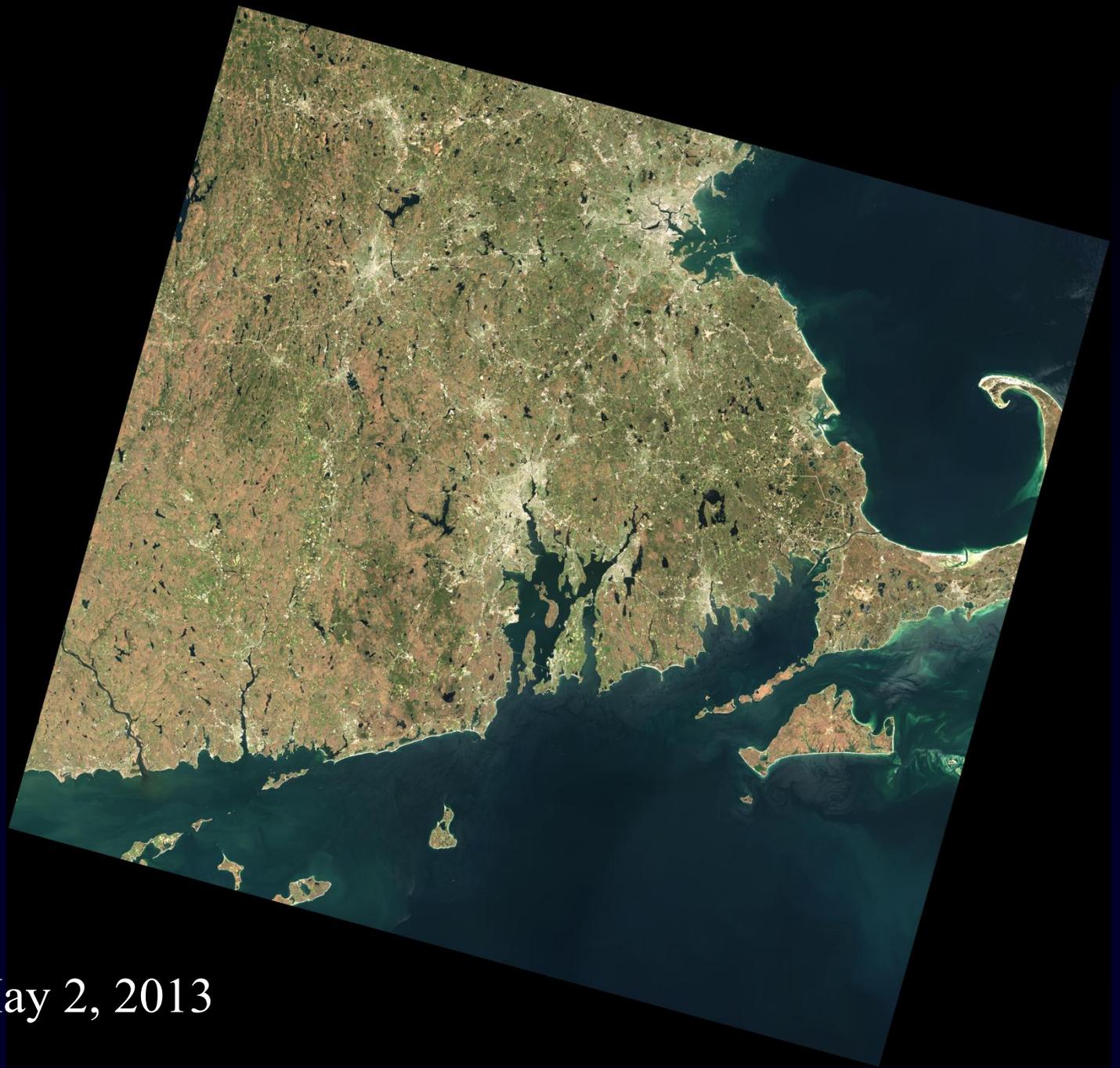
# North American Land Surface Albedo and Nearshore Shallow-Bottom Properties from Landsat and MODIS/VIIRS

- Produce Land Surface Albedo over North America by coupling Landsat with MODIS daily BRDF/Albedo retrievals
- Extend through the Landsat-8 era with both MODIS and VIIRS BRDF/Albedo retrievals
- Extend to Nearshore Substrates (albedo and bathymetry) through the use of the extra OLI ocean channel (427-459nm) and improved signal-to-noise.
- Establish a framework for producing spectral albedo from future Landsat and moderate resolution missions

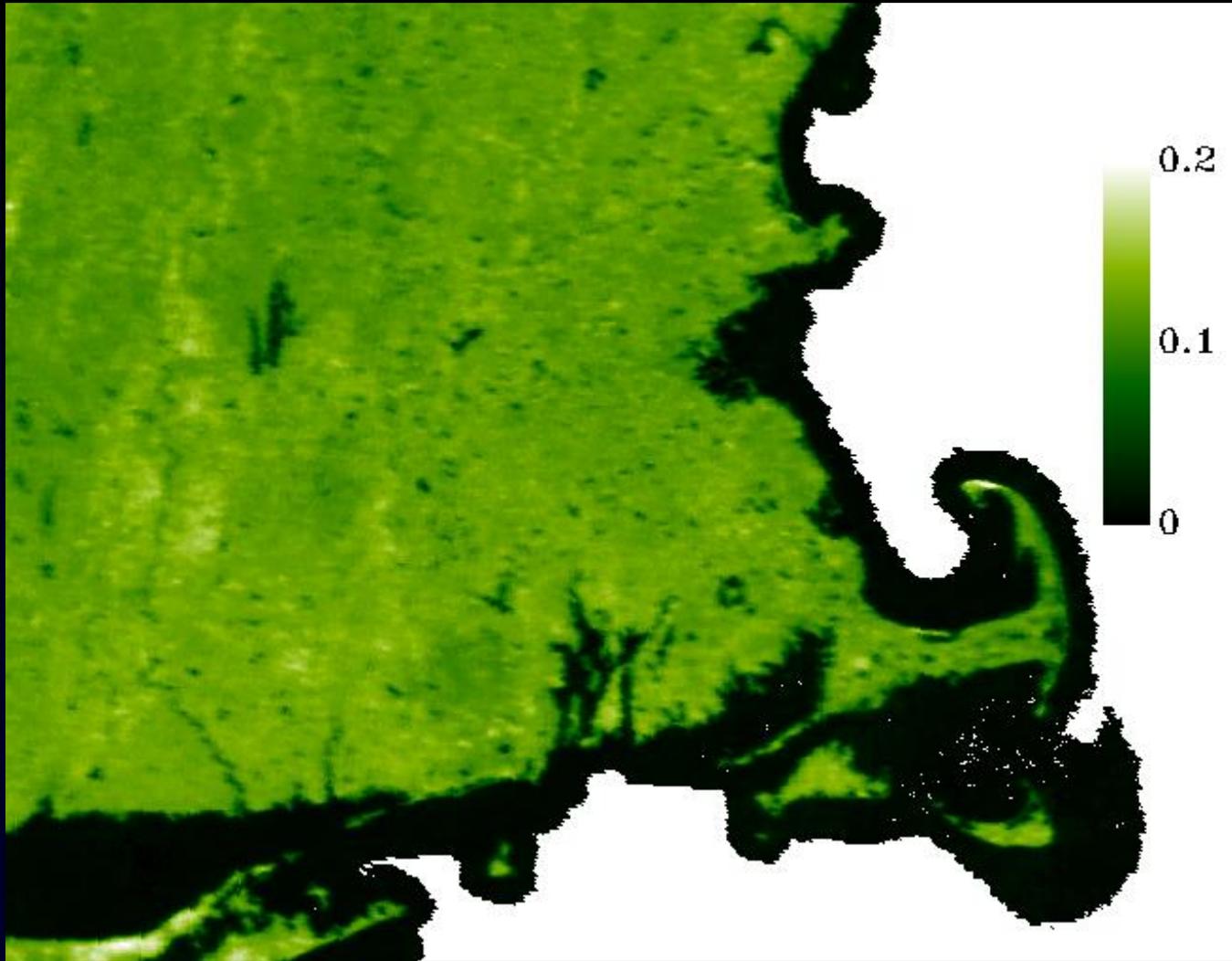
# North American Land Surface Albedo

*Data processing flow chart for the Concurrent Landsat Land Albedo, Shuai et al., 2011*

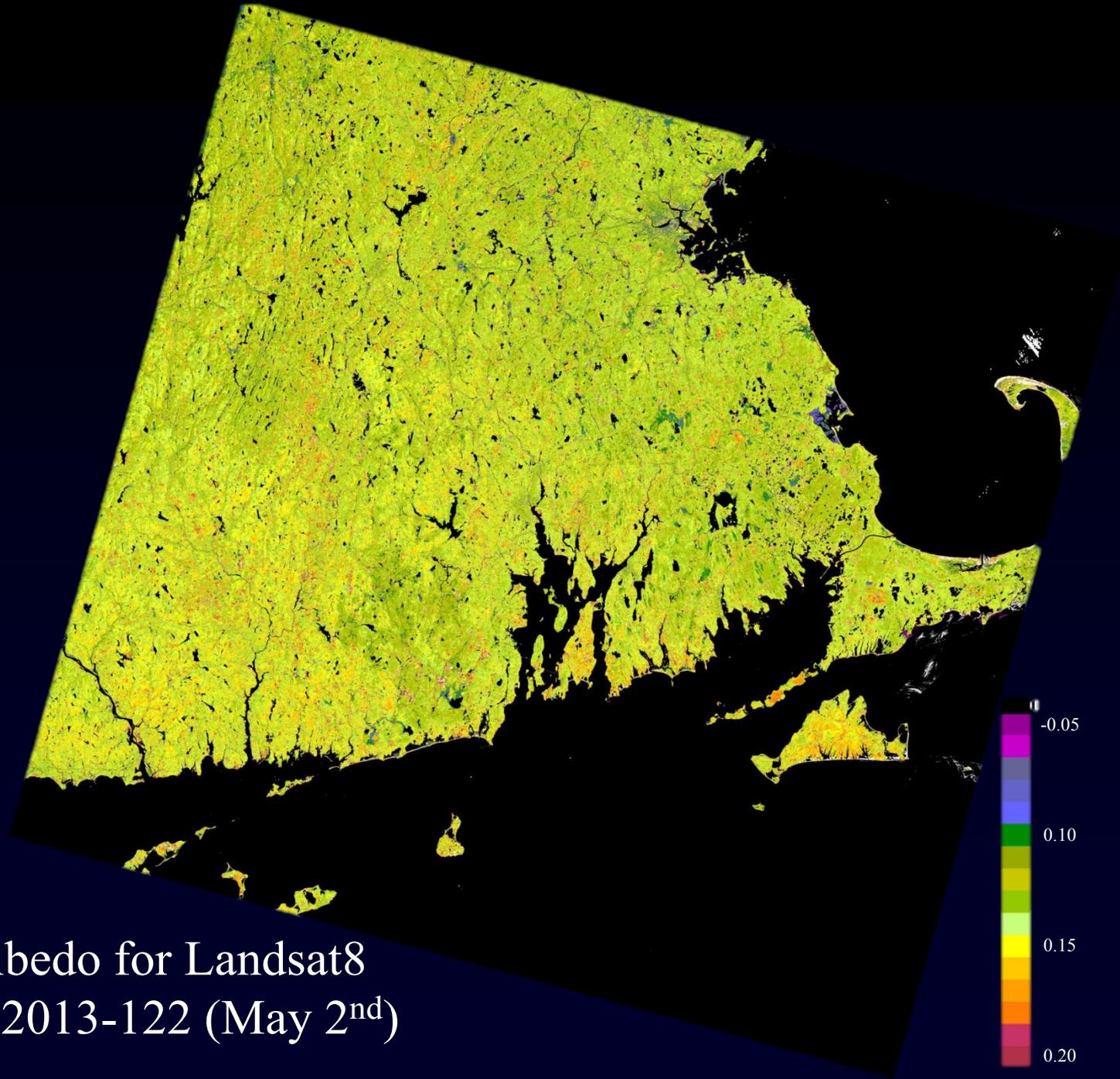




Landsat-8 May 2, 2013



MCD43A3 MODIS WSA May 2013



White Sky Albedo for Landsat8  
p12r31 on day 2013-122 (May 2<sup>nd</sup>)

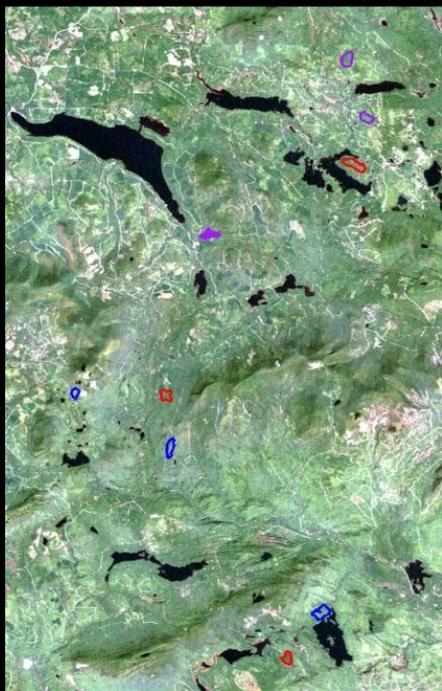
# Landsat Derived Albedo:

Landsat 5

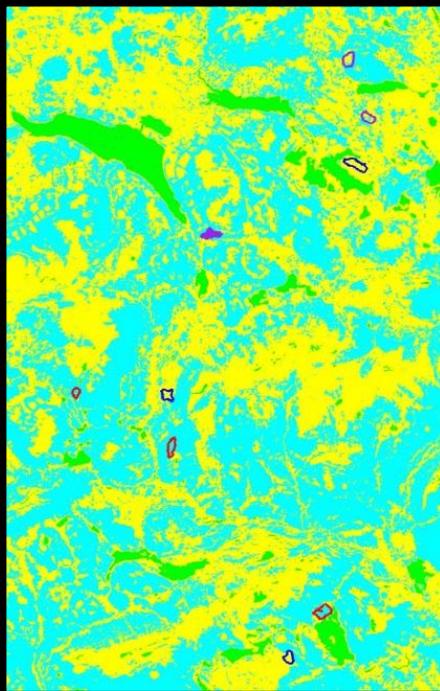
2011

Day: 254 (Leaf On)

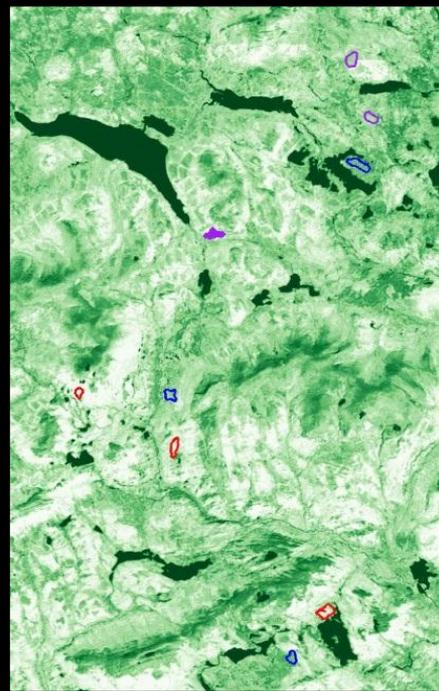
Land Surface  
Reflectance



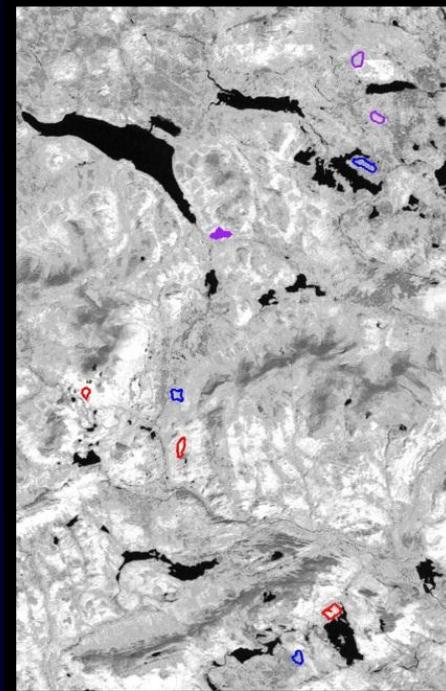
K-means  
Unsupervised  
Classification



Shortwave  
Black Sky  
Albedo



Shortwave  
White Sky  
Albedo



SW, HW, MW

# Landsat Derived Albedo:

Landsat 5

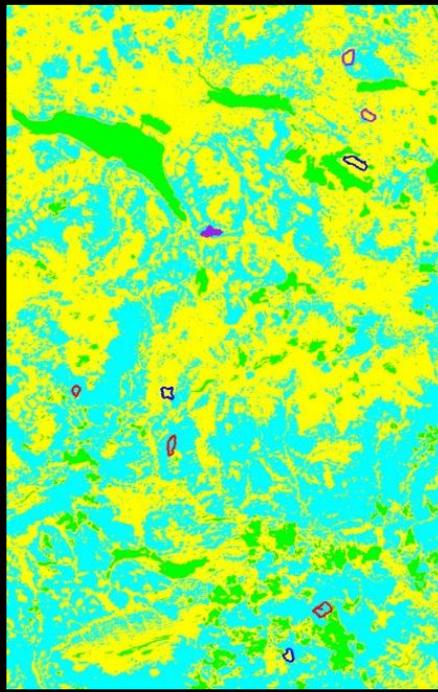
2011

Day: 270

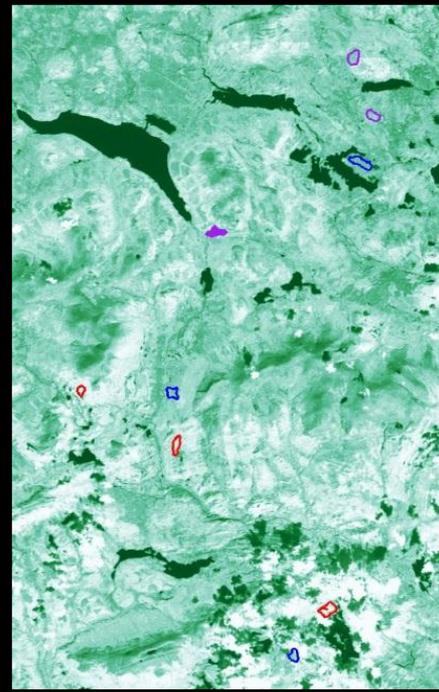
Land Surface  
Reflectance



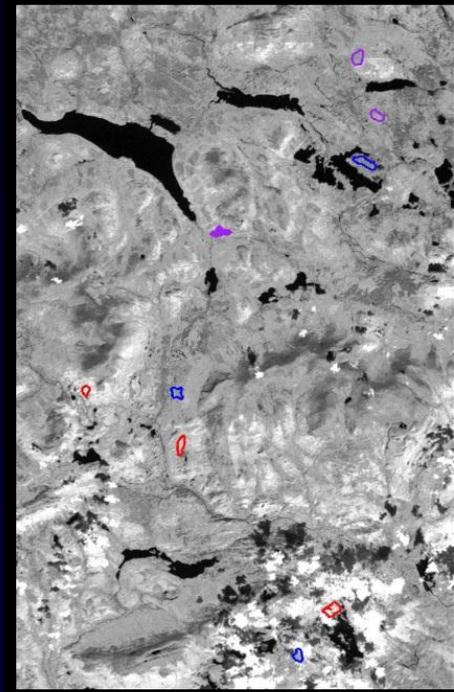
K-means  
Unsupervised  
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Shortwave  
Black Sky  
Albedo



Shortwave  
White Sky  
Albedo



SW, HW, MW

# Landsat Derived Albedo:

Landsat 5

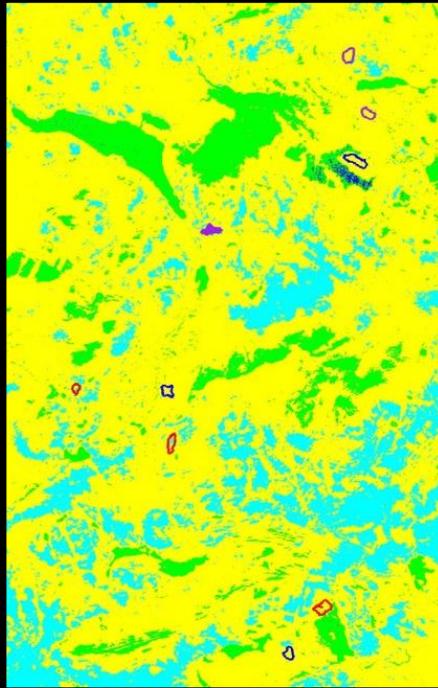
2011

Day: 302 (Leaf-off)

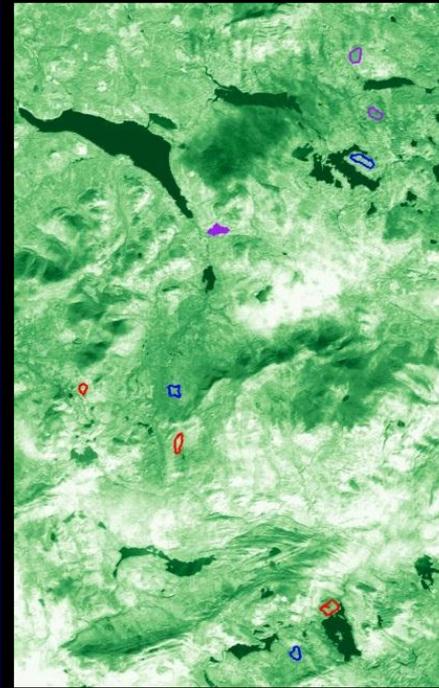
Land Surface  
Reflectance



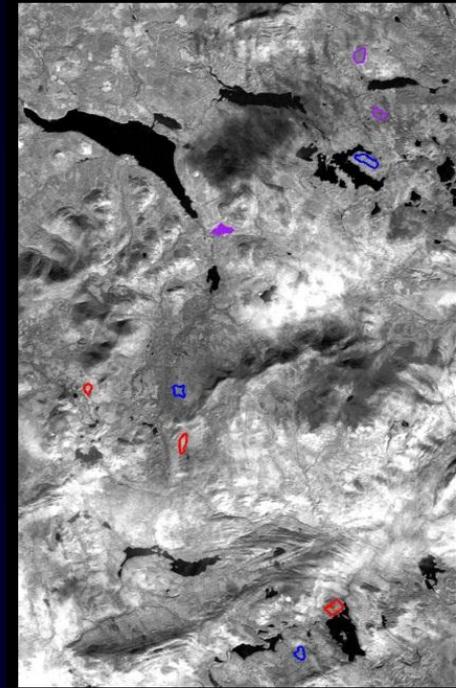
K-means  
Unsupervised  
Classification



Shortwave  
Black Sky  
Albedo

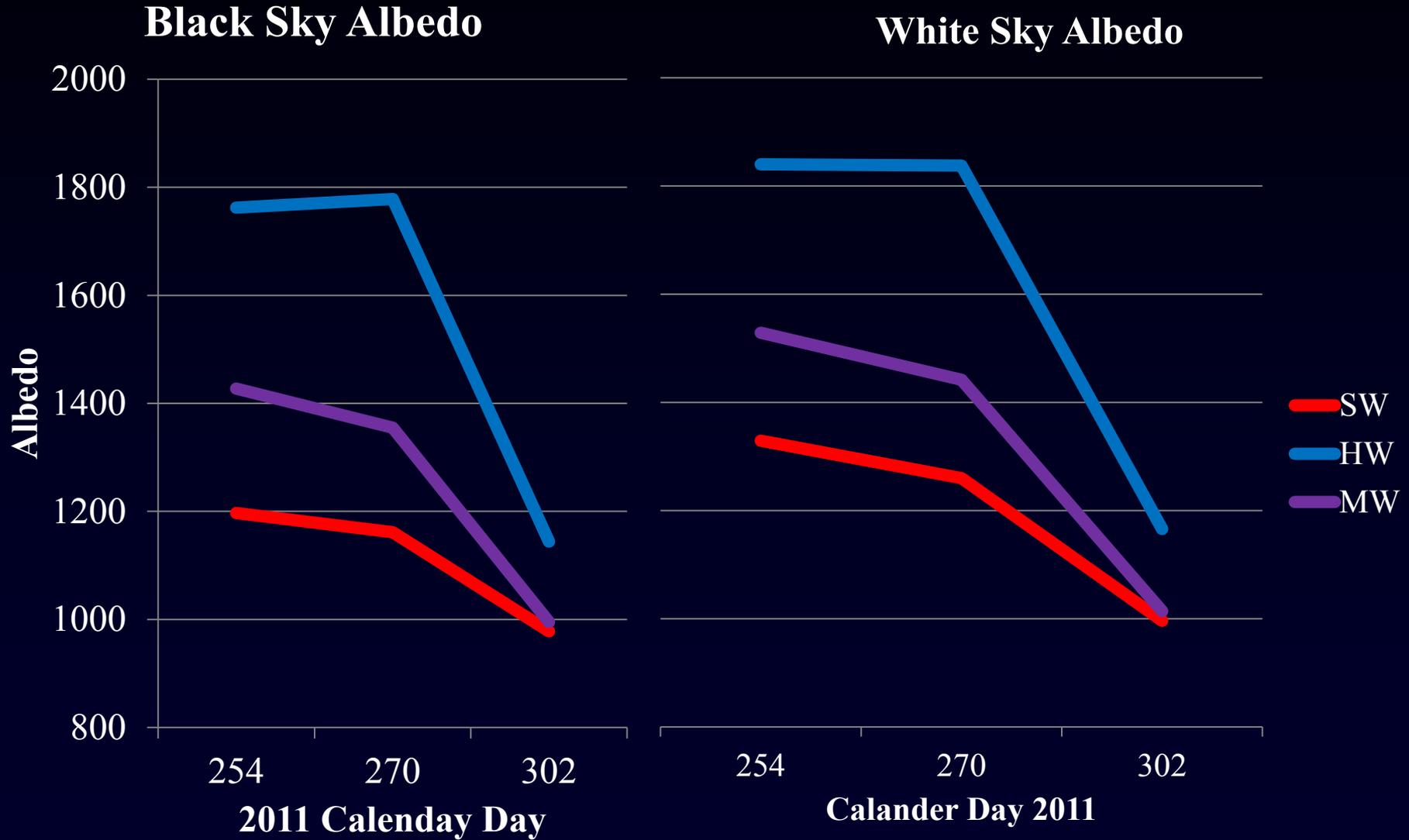


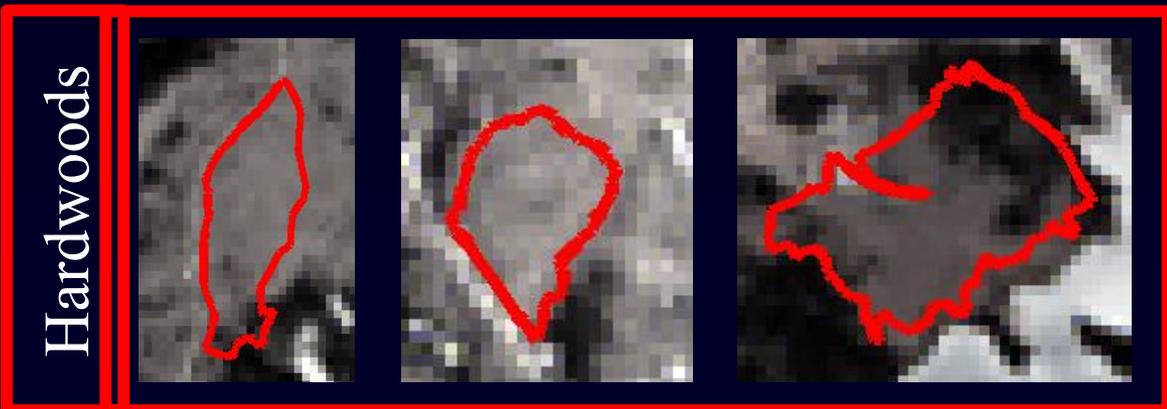
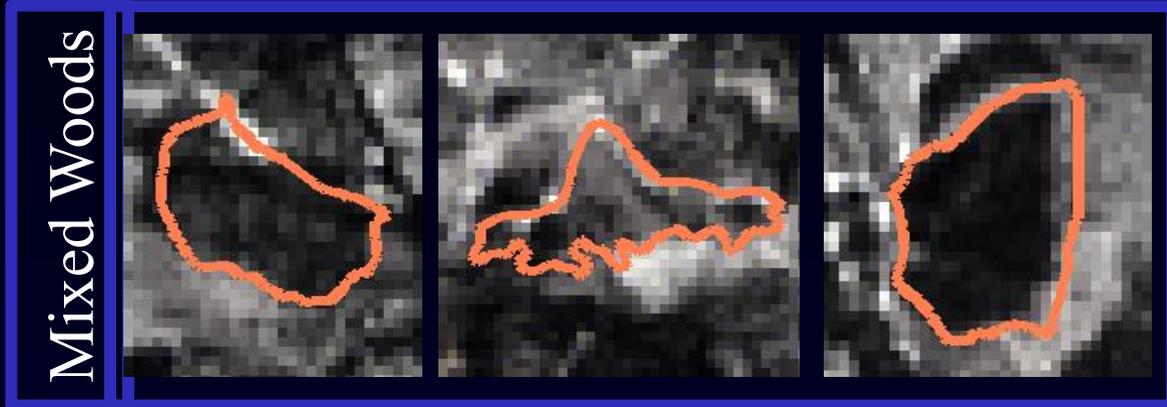
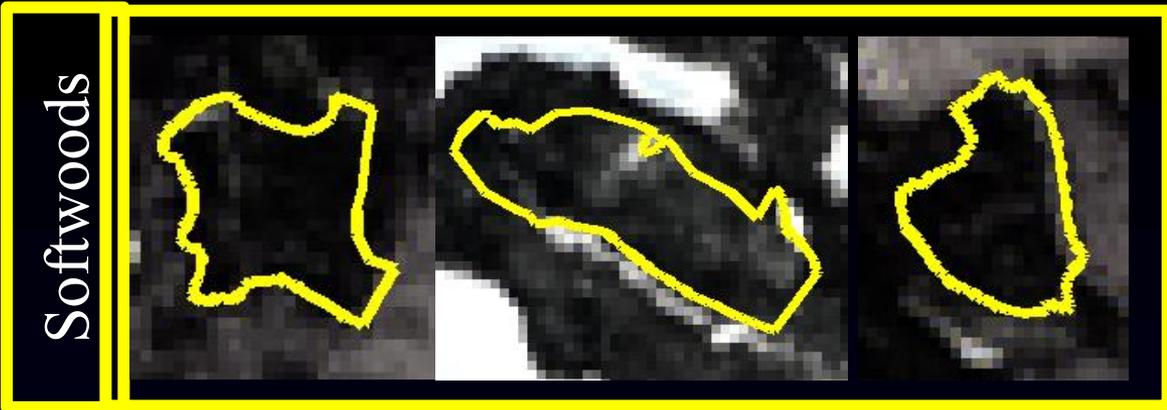
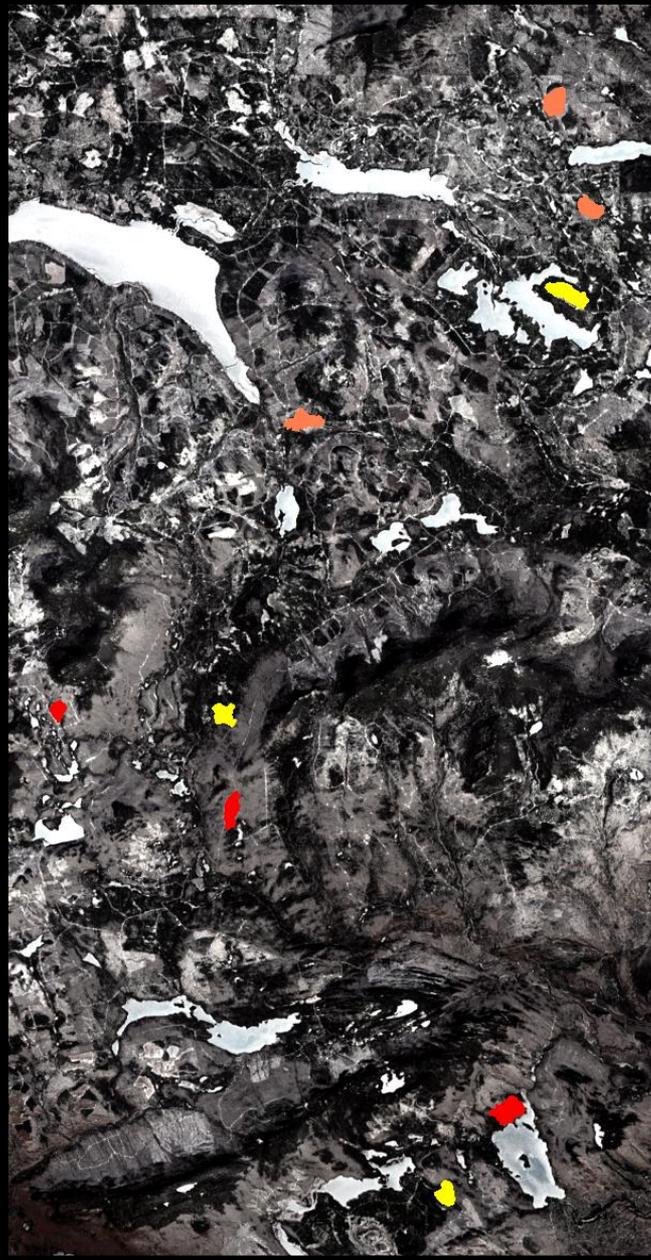
Shortwave  
White Sky  
Albedo



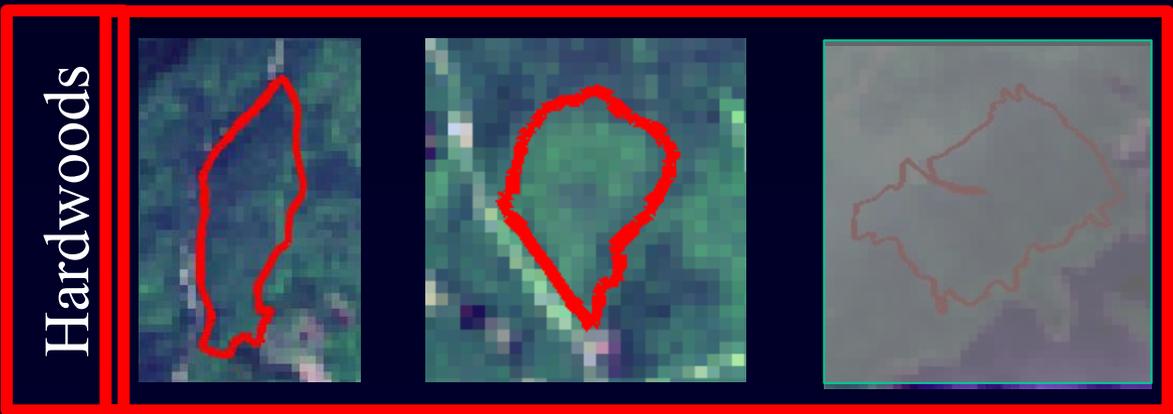
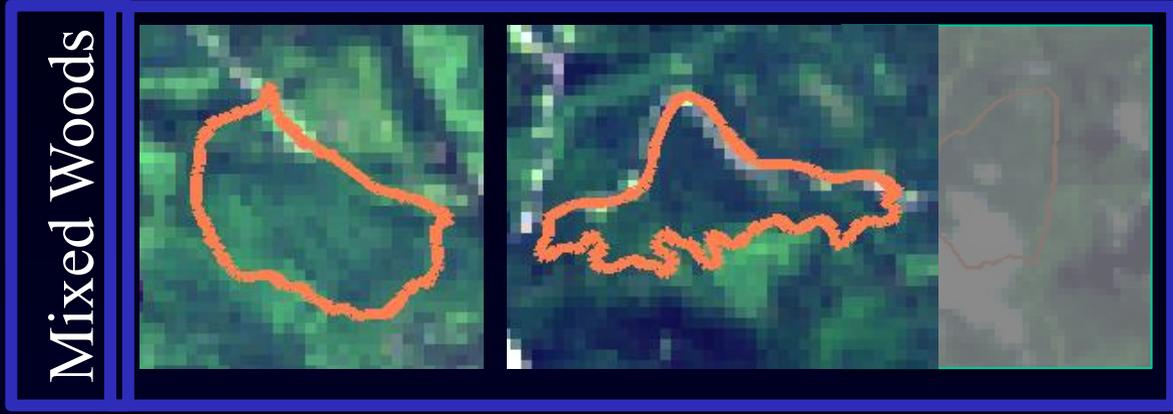
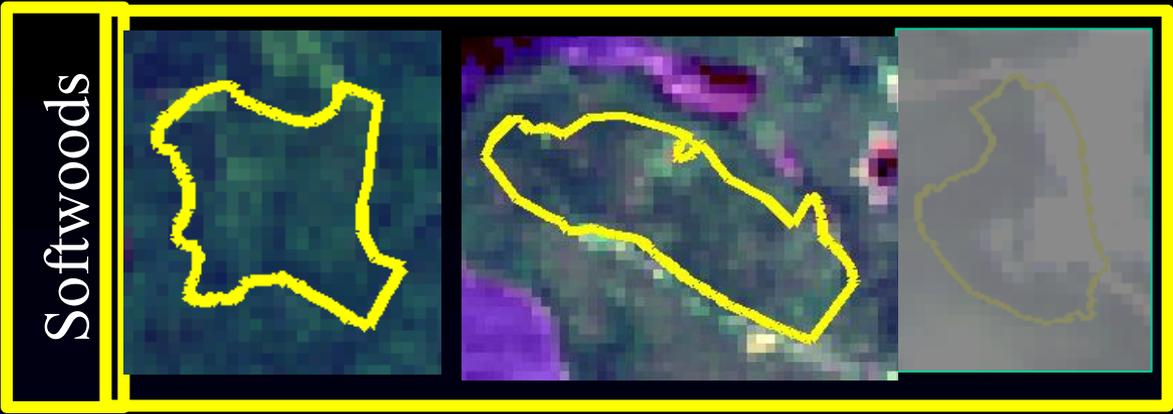
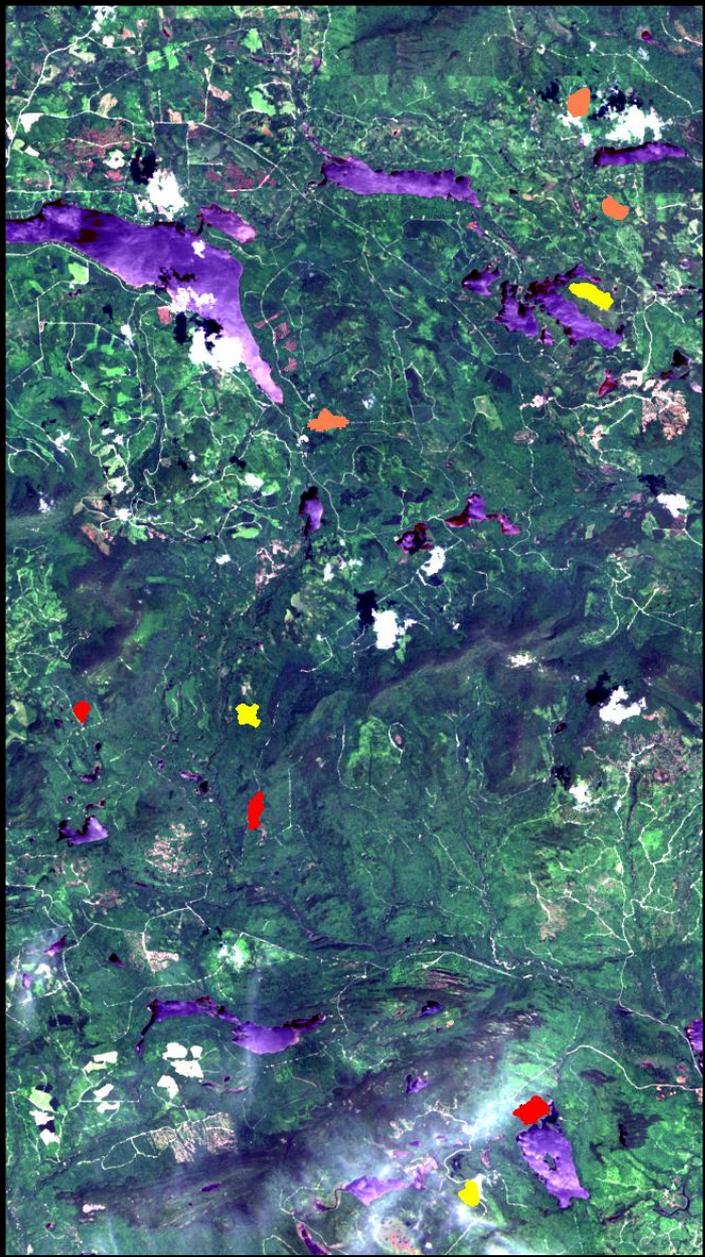
SW, HW, MW

# Albedo Seasonal Progression





Landsat8 April 4, 2013 (pre-WRS-2)



Landsat8 July 21, 2013

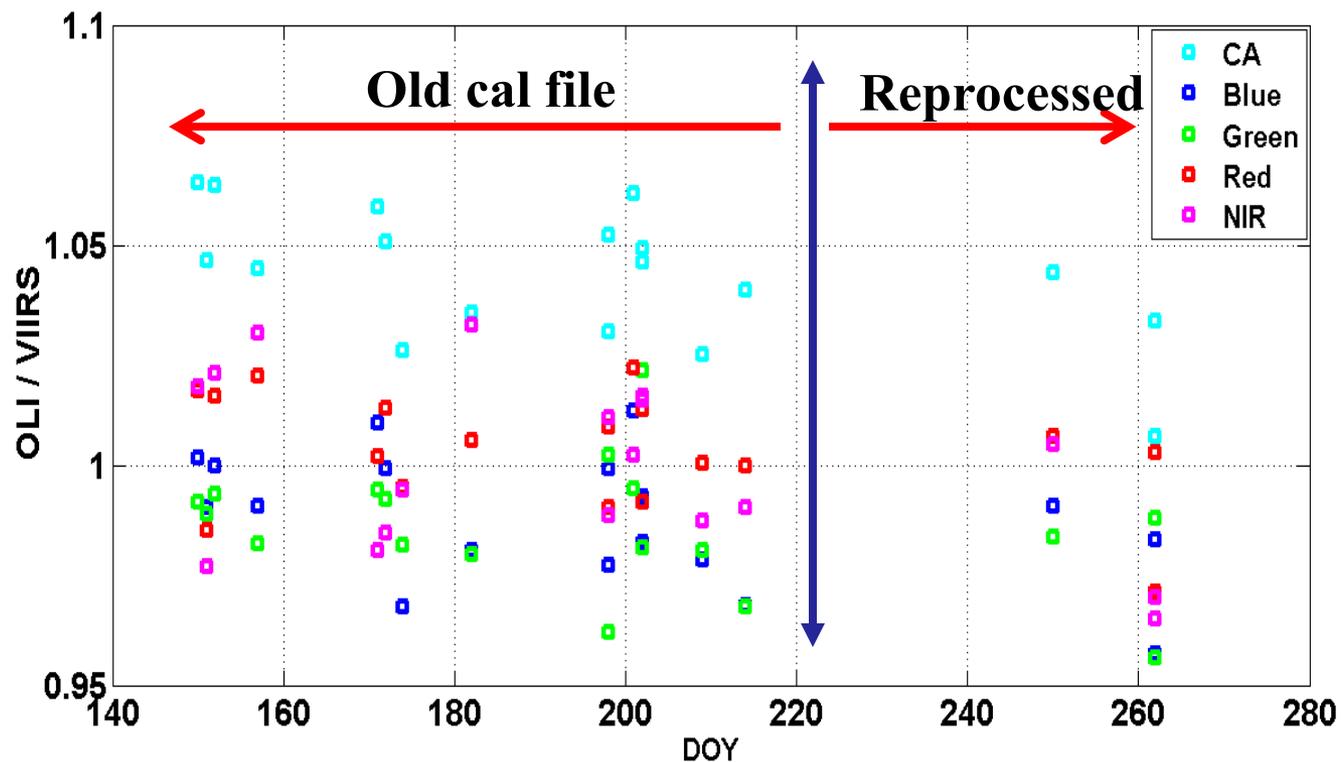
# Land Albedo Efforts Underway

- Group meeting last spring (Yanmin Shuai)
  - Transition concurrent algorithm to UMB team
- Group meeting Nov (delayed due to shutdown)
  - Work on operational processing strategies
- Utilize sample VIIRs BRDFs
  - BRDFs generated at LandPeate
  - Concurrent algorithm

# Over-water Cross-validation of OLI with VIIRS/MODIS

- Motivation
  - Science-quality products over aquatic environments require accurate knowledge of **sensor radiometric performance**
- Objective
  - To obtain **TOA gains**. When applied, surface reflectances derived from OLI would be comparable to those produced from VIIRS/MODIS
- Procedure
  - Near-nadir/simultaneous L8 and SNPP scenes over high-latitude coastal (spatially uniform) waters
  - Comparison domain: normalized TOA radiance
  - RTM-based corrections for RSR and viewing geometry
  - VIIRS TOA observations are further adjusted using:
    - MODIS TOA
    - VIIRS surface products

# VNIR: Gains

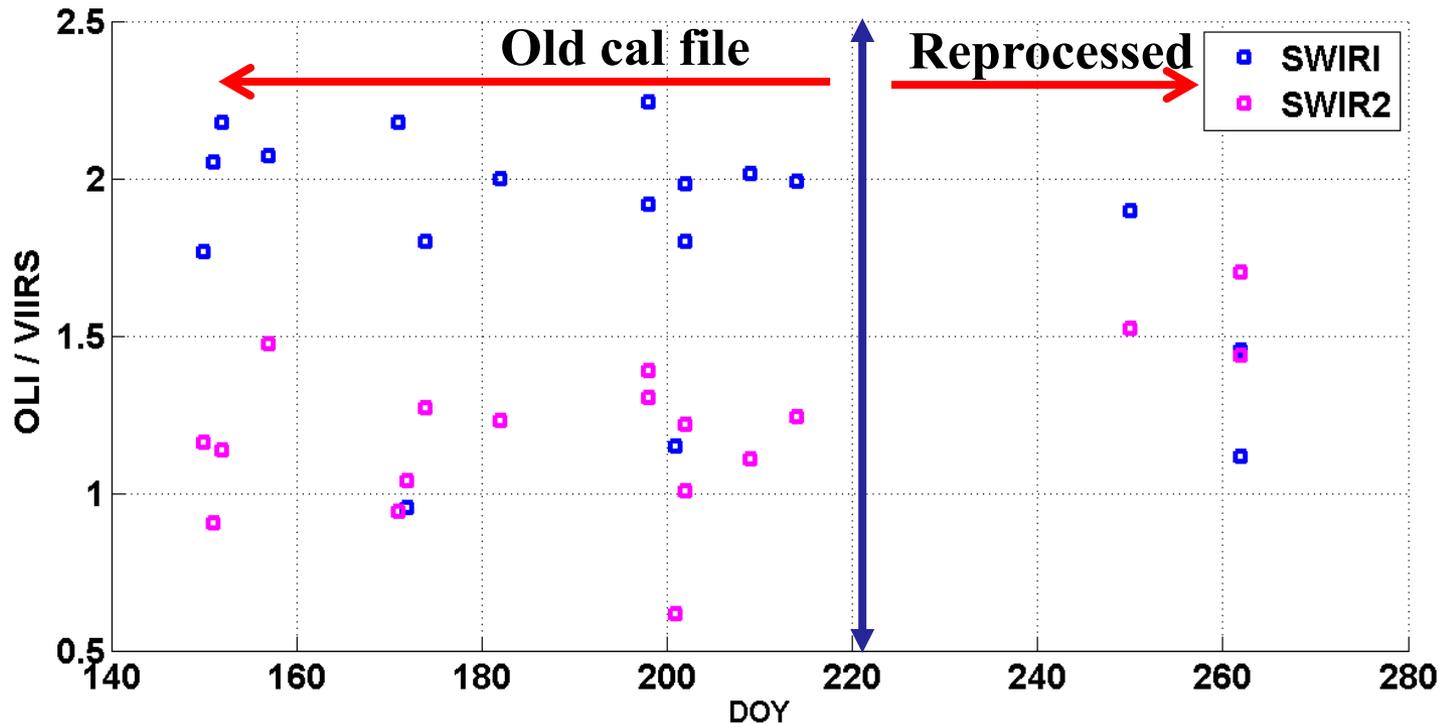


**Temporal average**

**+4.5 % (CA)**  
**-1.1 % (Blue)**  
**-1 % (green)**  
**+0.5% (red)**  
**+ 0.1% (NIR)**

- VNIR relative performances are within the specs.
- It is anticipated that the updated calibration would improve consistencies with VIIRS/MODIS.

# SWIR: Gains



- SWIR bands are ideal bands for atmospheric correction
- VIIRS-MODIS responses are consistent within  $< \pm 10\%$  in TOA
- Note that OLI SWIR radiances (over water) are  $> 40$  times lower than the typical radiances (for which SNR is defined)

# Current Water Efforts Underway

- The OLI-VIIRS cross-validations will be further supported by insitu measurements made at AERONET-OC stations (vicarious calibration)
- Further scene-based over-water radiometric analysis (striping, uncertainties, etc.)
- Upcoming field campaign next month in Puerto Rico (nearshore)

# North American Land and Nearshore Albedo

- Implementing concurrent algorithm for land
  - With MODIS
- Testing concurrent algorithm
  - With Landsat8 (both growing season and snow)
  - With VIIRS
- Continue over-water radiometric analysis Testing nearshore substrate scenes with Landsat8
- Participate in future Landsat planning



Landsat-8 May 2, 2013