Stick in the Mud
Mangrove Loss in South Florida

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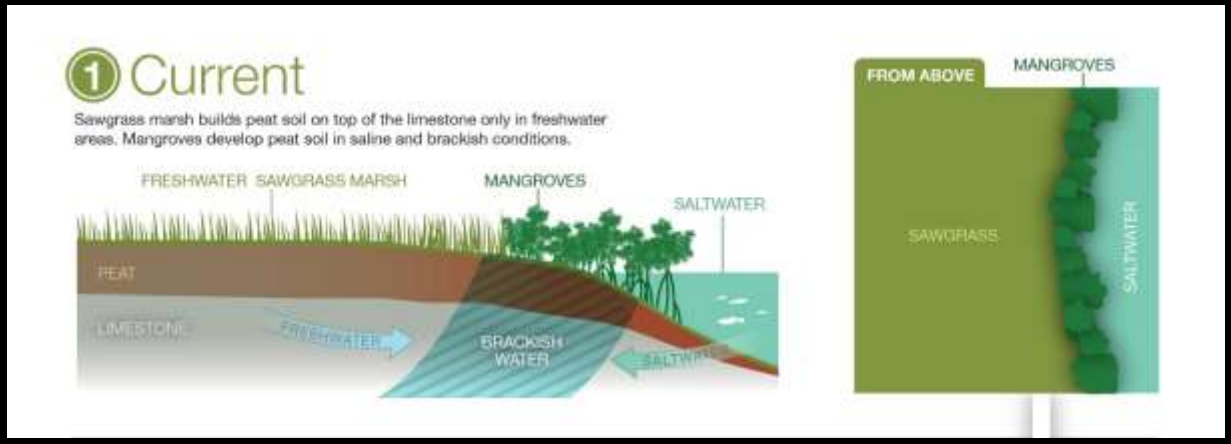
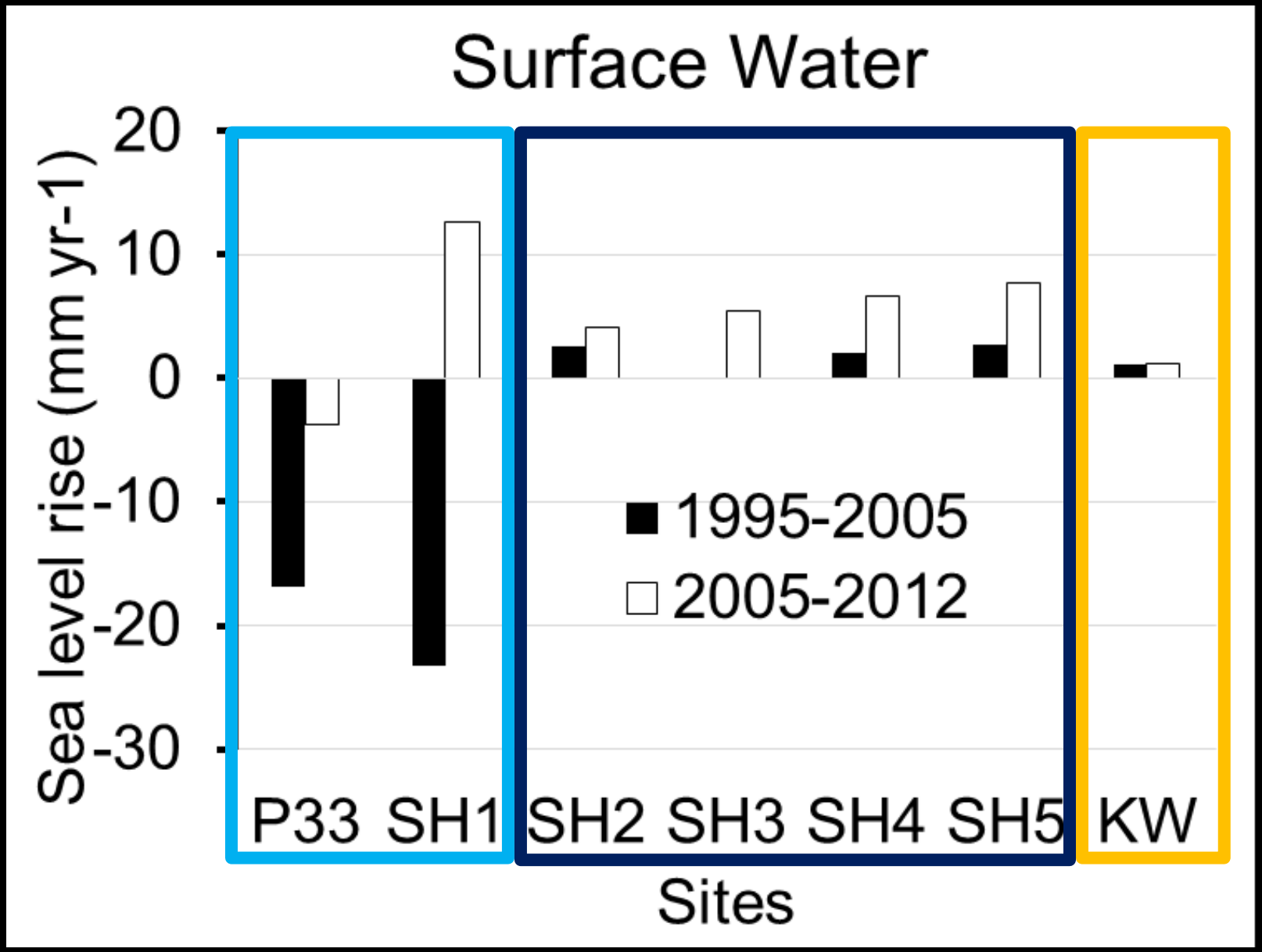
Saltwater intrusion can lead to a rapid collapse of the soil surface



Water levels in ENP have been rising more rapidly in recent years



Lagomasino et al, *in prep*

Objectives

1. ***Synthesize airborne and satellite remote sensing data*** that are currently available for the Everglades in order to develop multi-sensor remote sensing techniques to identify spatiotemporal patterns related to spectral biophysical stress.
2. Investigate the ground, airborne, and spaceborne ***foliar reflectance and fluorescence*** in response to increased salinity and inundation.
3. Generate ***ecosystem vulnerability maps*** of areas susceptible to peat collapse or other rapid environmental changes.
4. Model the ***fate and transport*** of material and emissions from degrading areas into adjacent ecosystems and carbon pools.

G-LiHT: Goddard's Lidar, Hyperspectral, and Thermal airborne imager

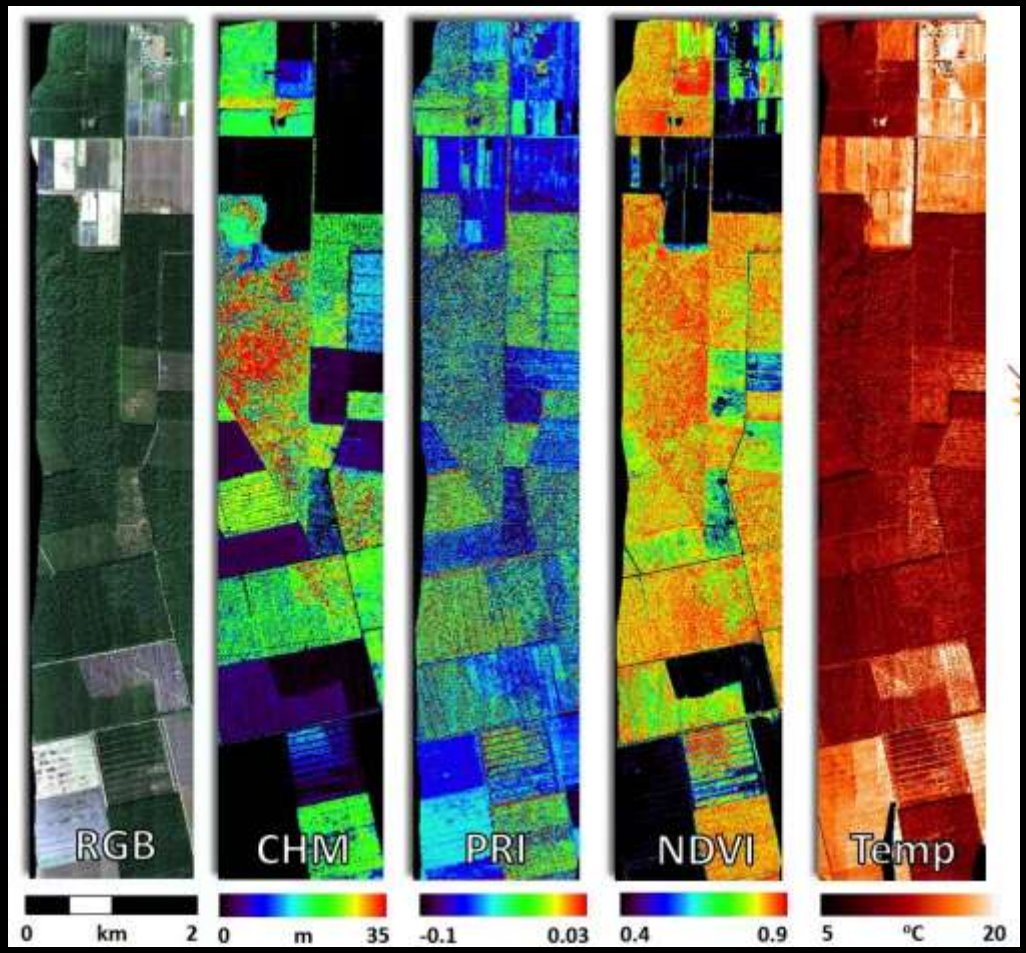
https://gliht.gsfc.nasa.gov/

G-LiHT* is a portable, airborne imaging system that simultaneously ***maps the composition, structure, and function of terrestrial ecosystems* using:

1) lidar to provide 3D information about the spatial distribution of canopy elements;

2) imaging spectroscopy to discern species composition and variations in biophysical variables (e.g., photosynthetic pigments); and

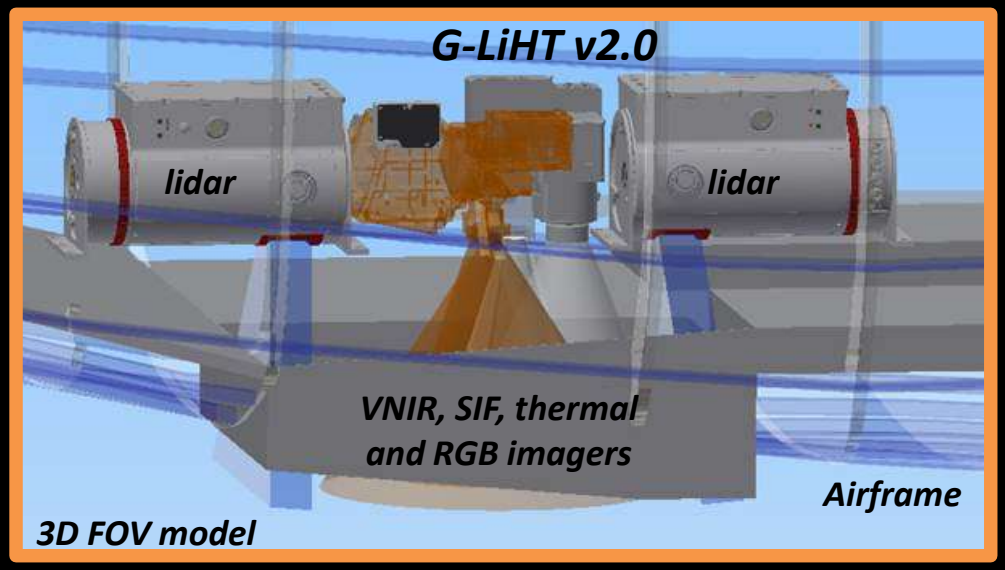
3) thermal data to quantify surface temperatures and detect heat and moisture stress.

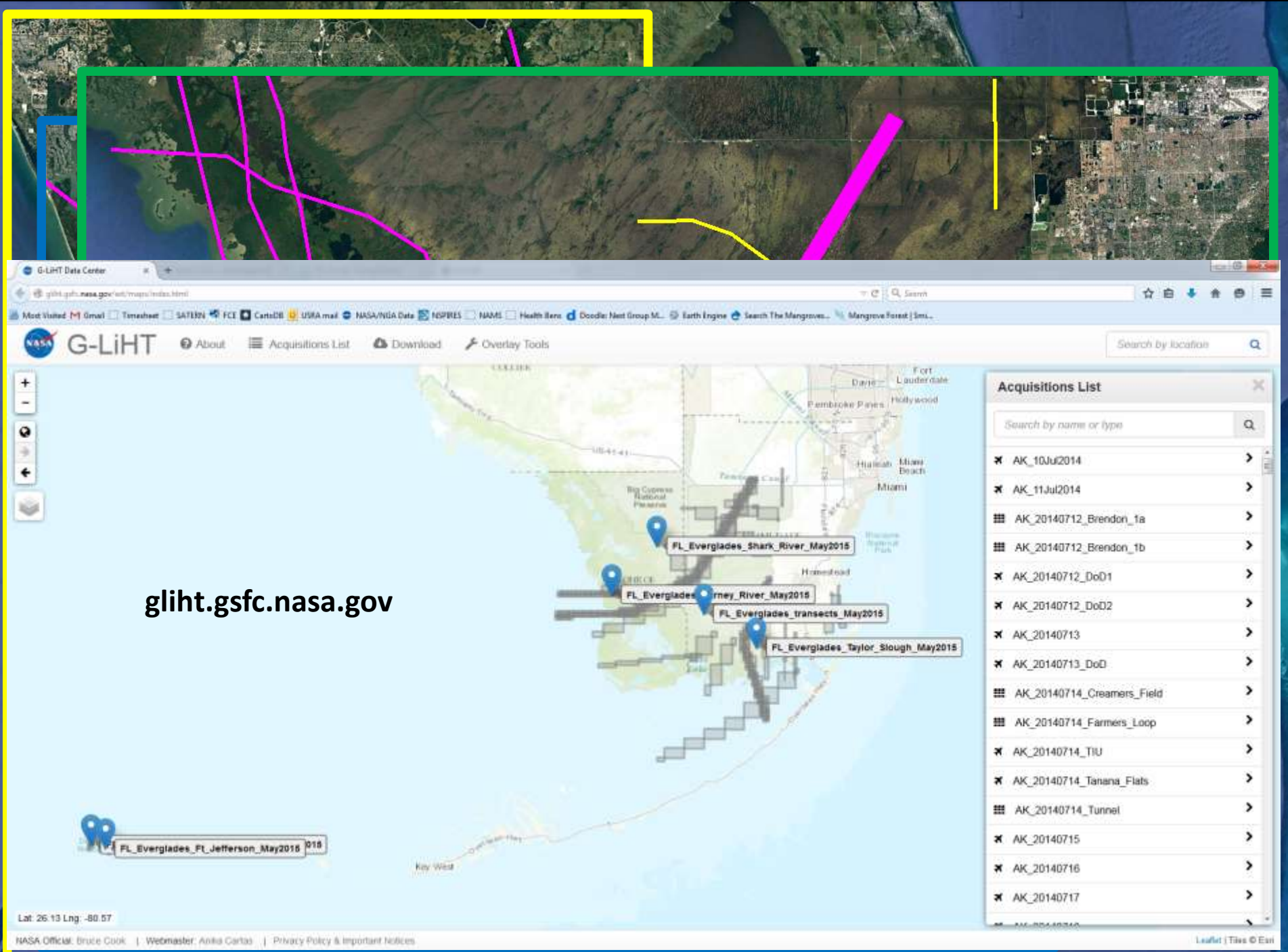


Loblolly pine plantation in lower coastal plan near Plymouth, NC

G-LiHT v2.0 with FIREFLY

1. ***LiDAR*** – longer ranging, higher PRF and sampling density
2. ***VNIR Imaging spectrometer*** – 10x SNR, temp-controlled focal plane
3. ***VNIR Irradiance spectrometer*** – thermally stabilized detector
4. ***Thermal camera*** – 2x greater spatial resolution, 2x greater frame rate
5. ***Fine-resolution RGB camera*** – stereo images at ~4 cm GSD
6. ***FIREFLY imaging spectrometer*** (Headwall Photonics) and ***fine-resolution irradiance spectrometer*** (Ocean Optics QE Pro) for SIF retrievals




G-LiHT Data Center
G-LiHT
About
Acquisitions List
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AK_11Jul2014
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gliht.gsfc.nasa.gov
Lat: 26.13 Lng: -80.57
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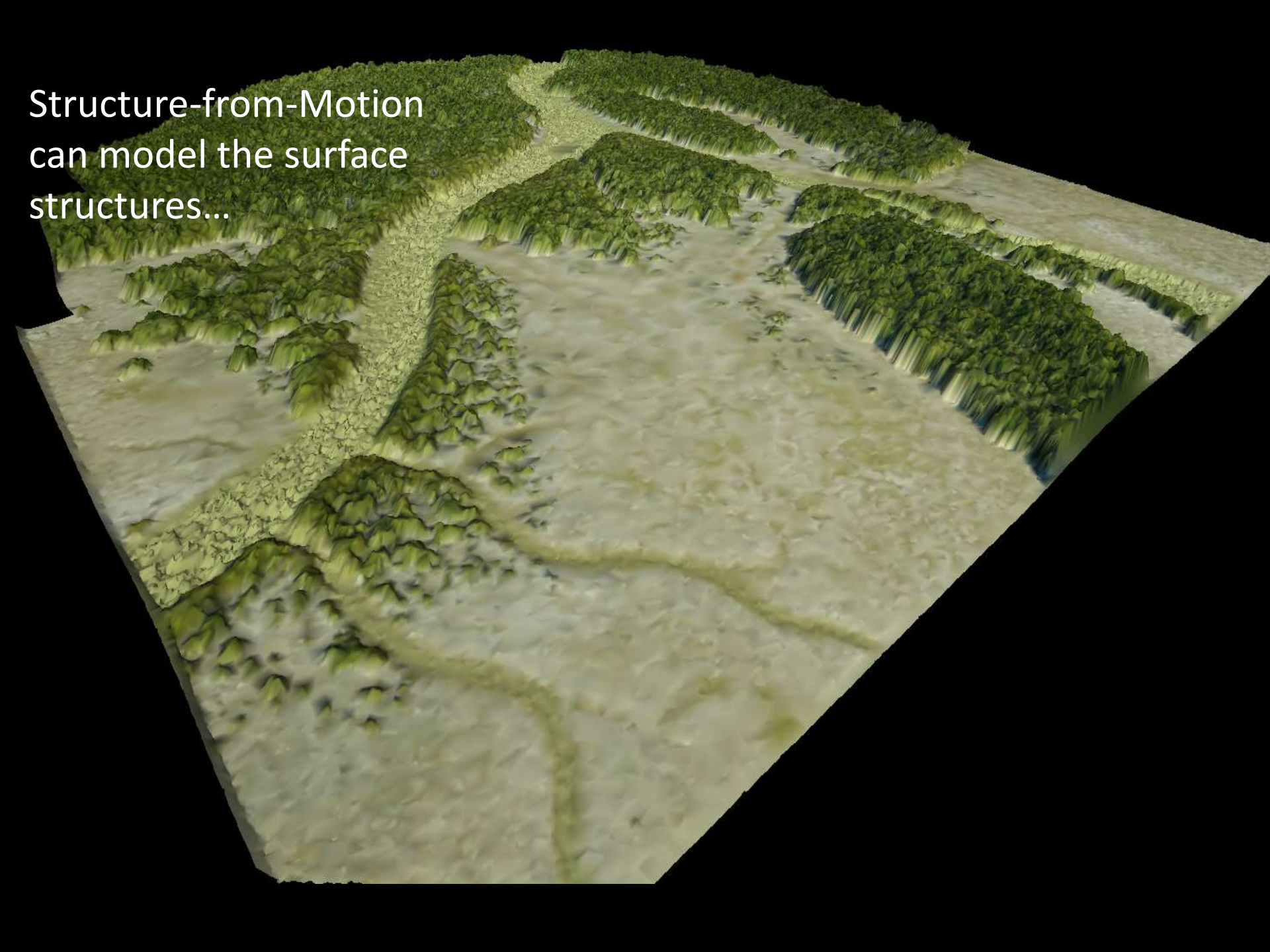
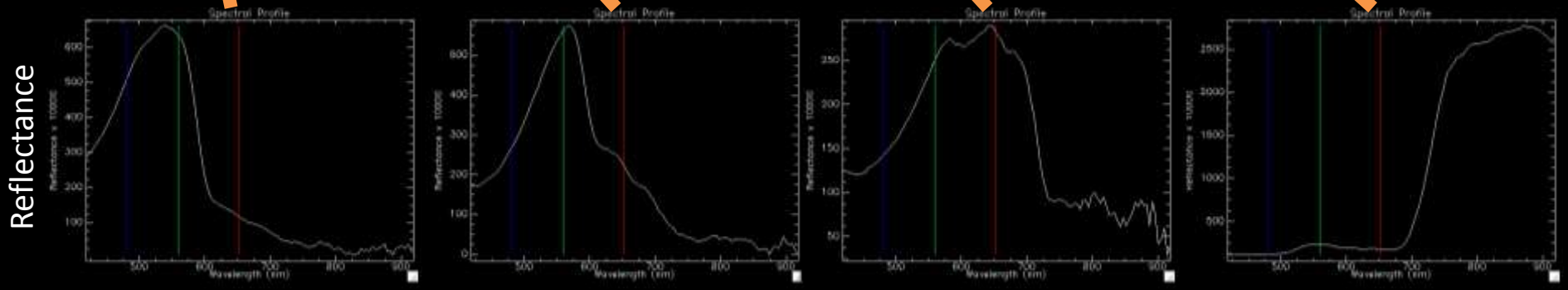
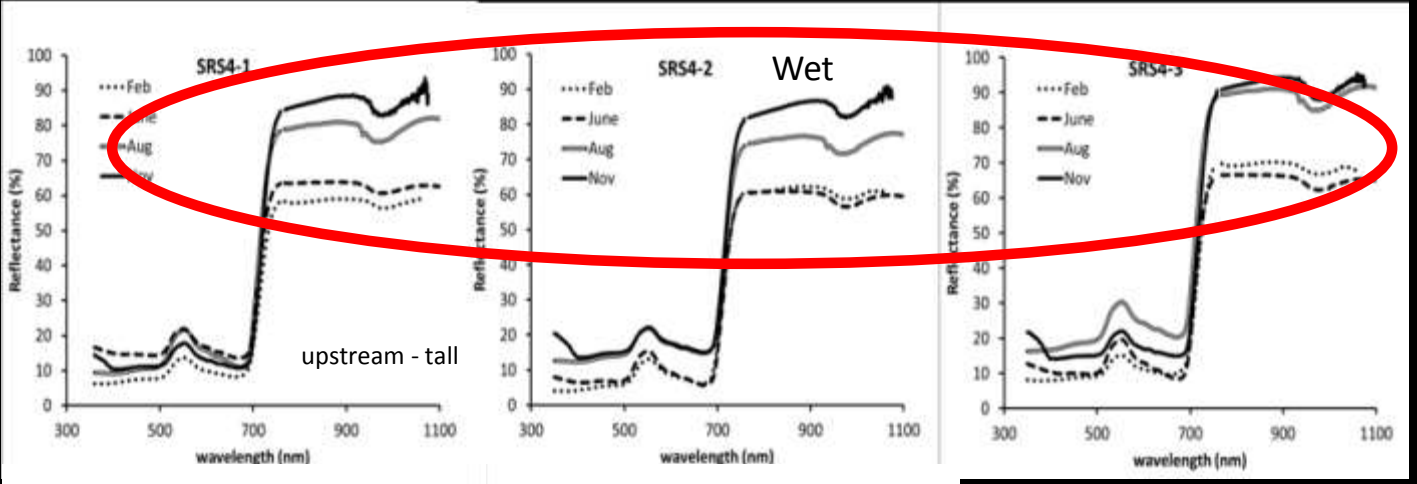
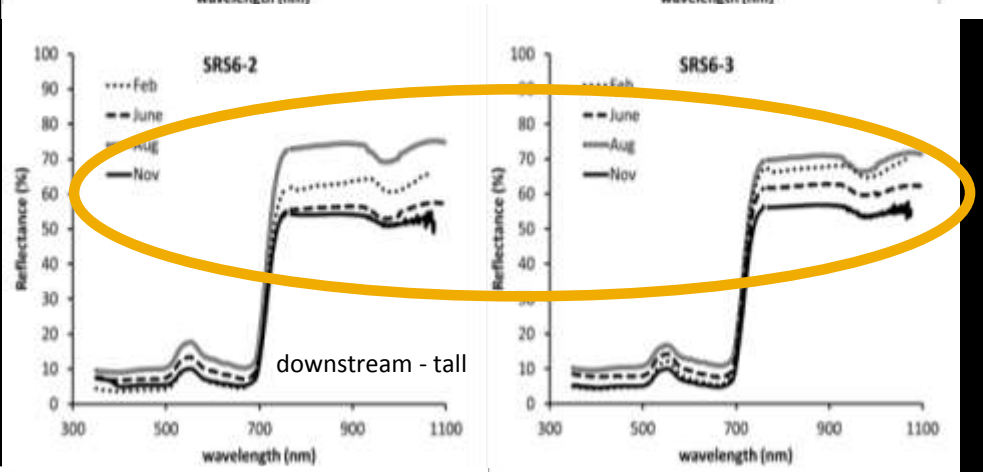

Structure-from-Motion
can model the surface
structures…

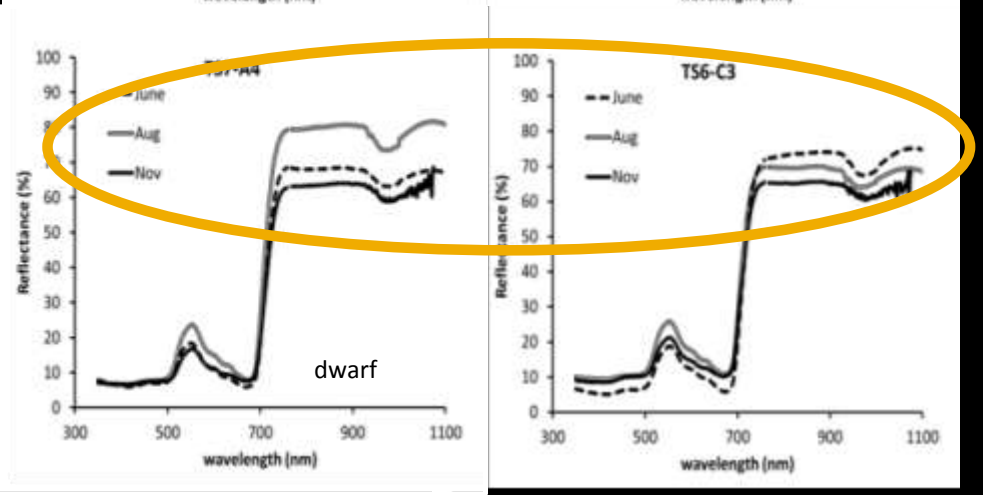
…and below canopy structures.

G-LiHT Spectra in FL Everglades







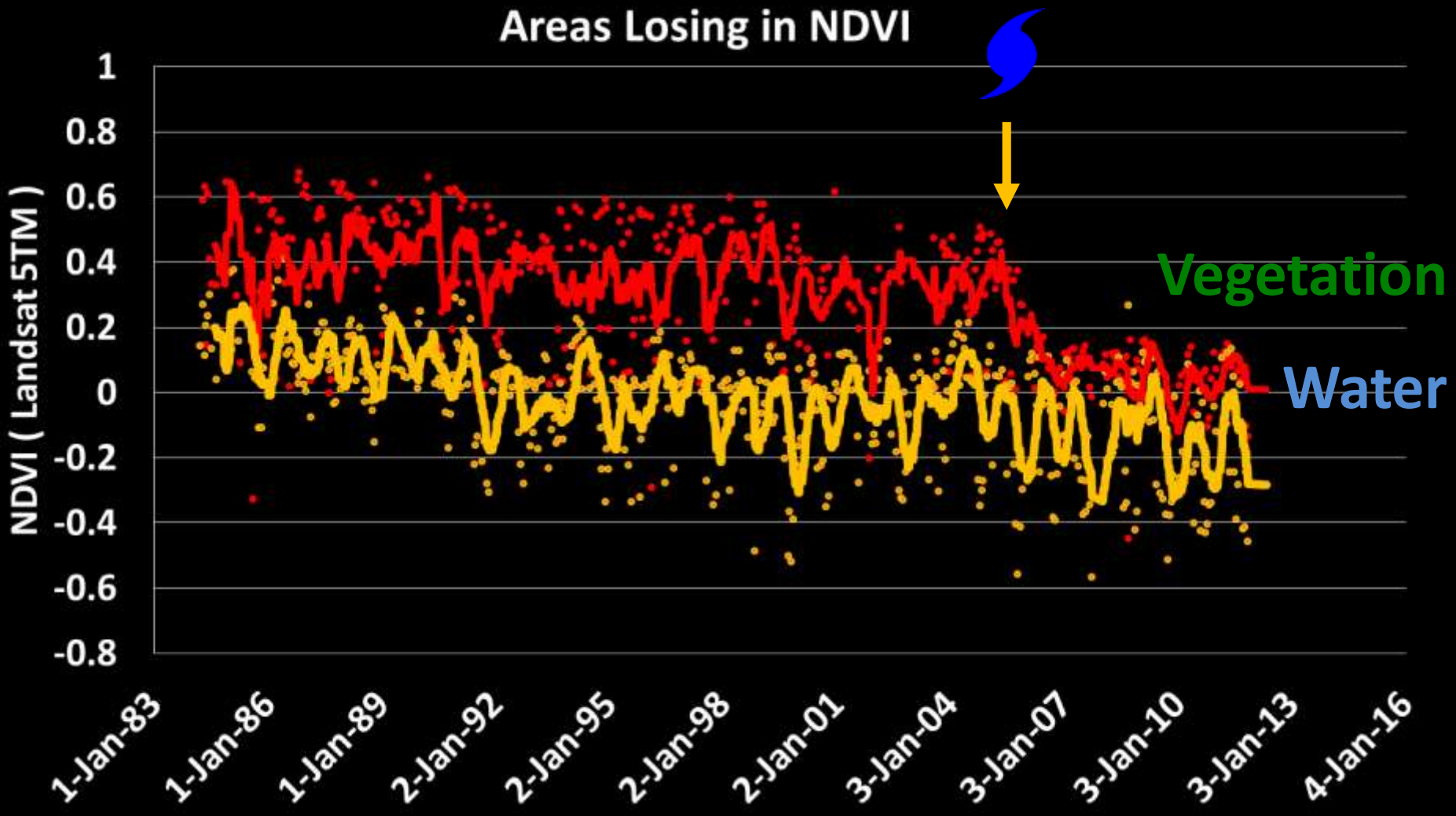


Spectral reflectance can provide information about the conditions of the vegetation

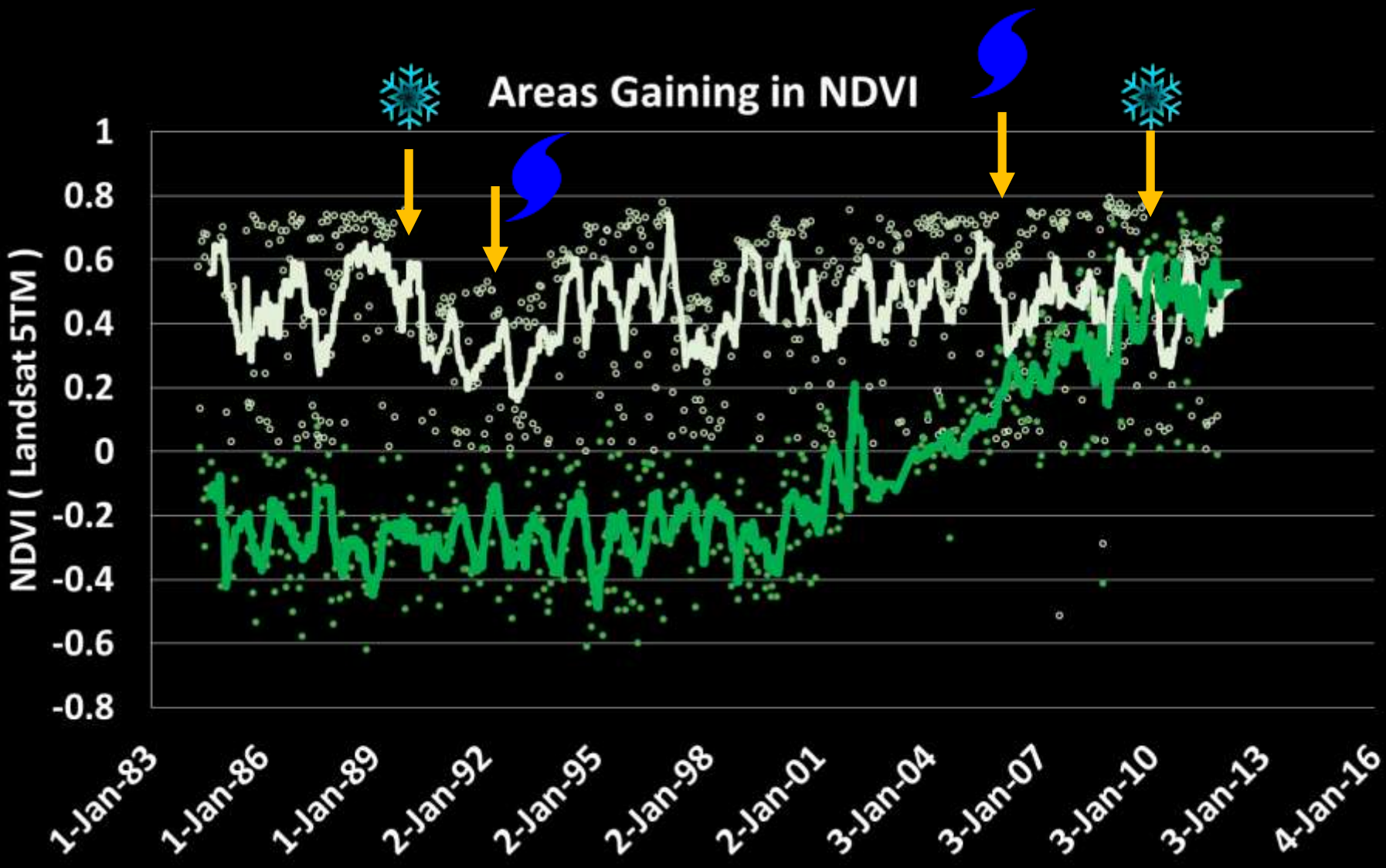
- Seasonal variability associated with salinity
- Little variability when soils are perpetually saline

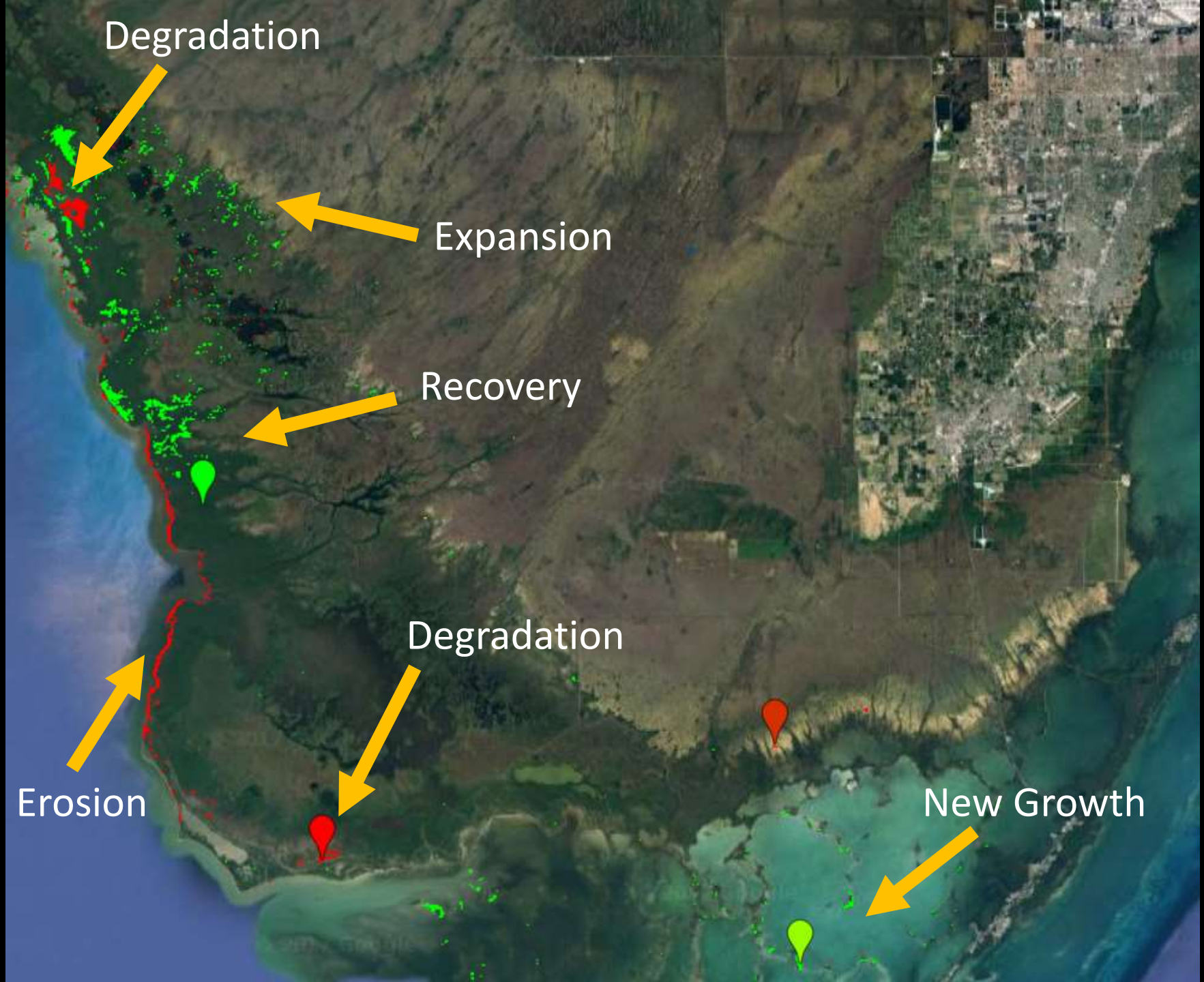
Lagomasino et al, 2014
Remote Sensing of Environment

Example of degraded mangrove areas

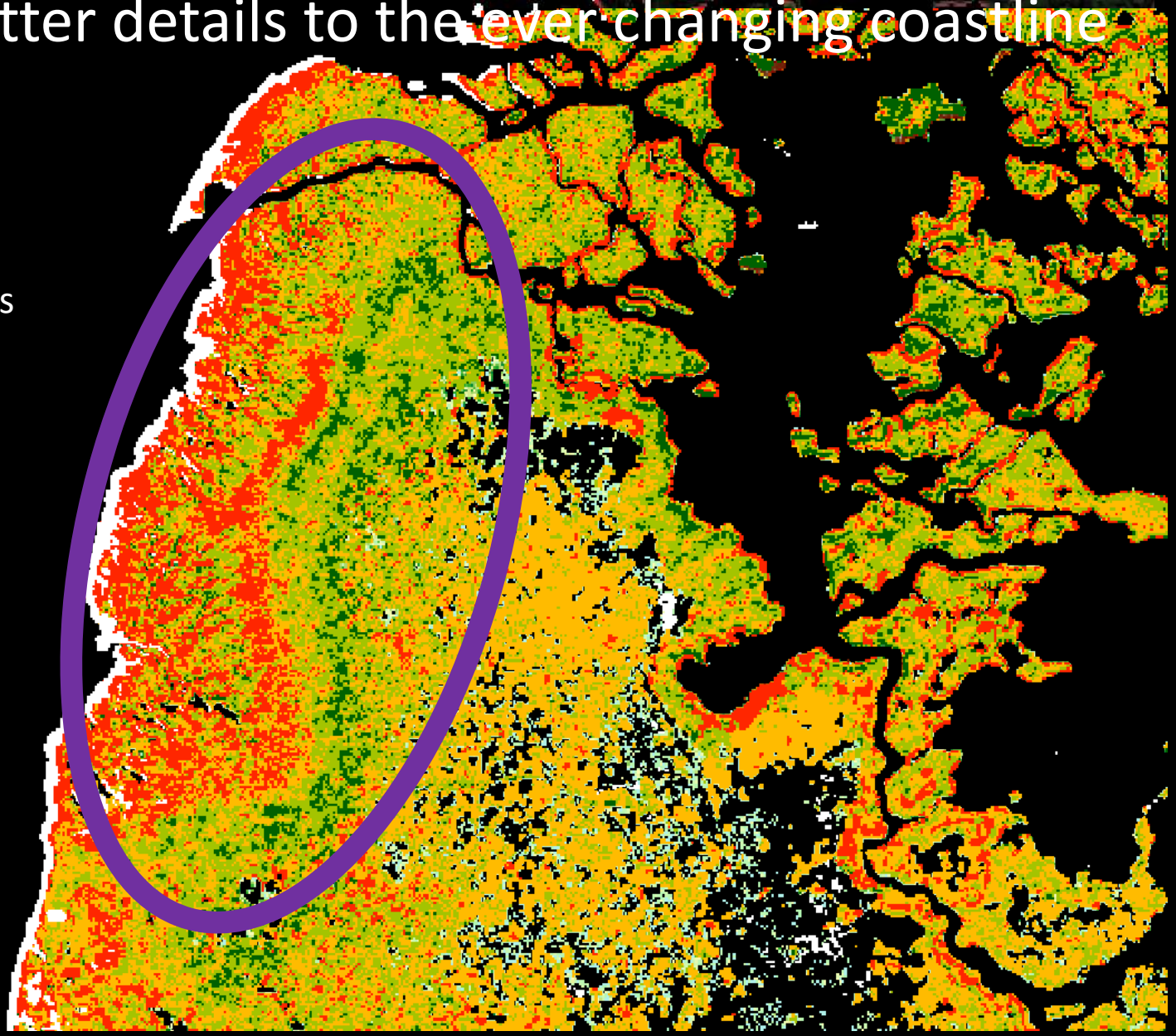


Examples of gained mangrove areas




Degradation
Expansion
Recovery
Degradation
Erosion
New Growth

Combining the forest function and structure can provide better details to the ever changing coastline



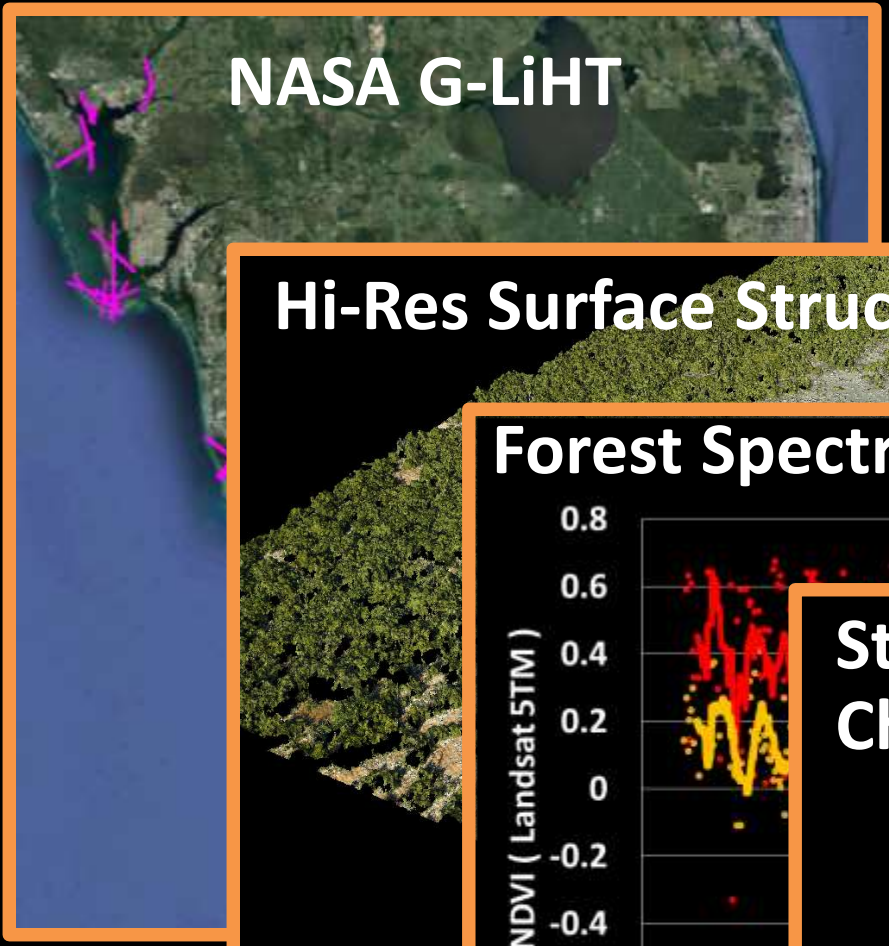
Changes in NDVI

- Complete Loss
- Degrading/Loss
- Regeneration

Changes in Structure

- Loss > 4 m
- Gain > 4 m
- No Change

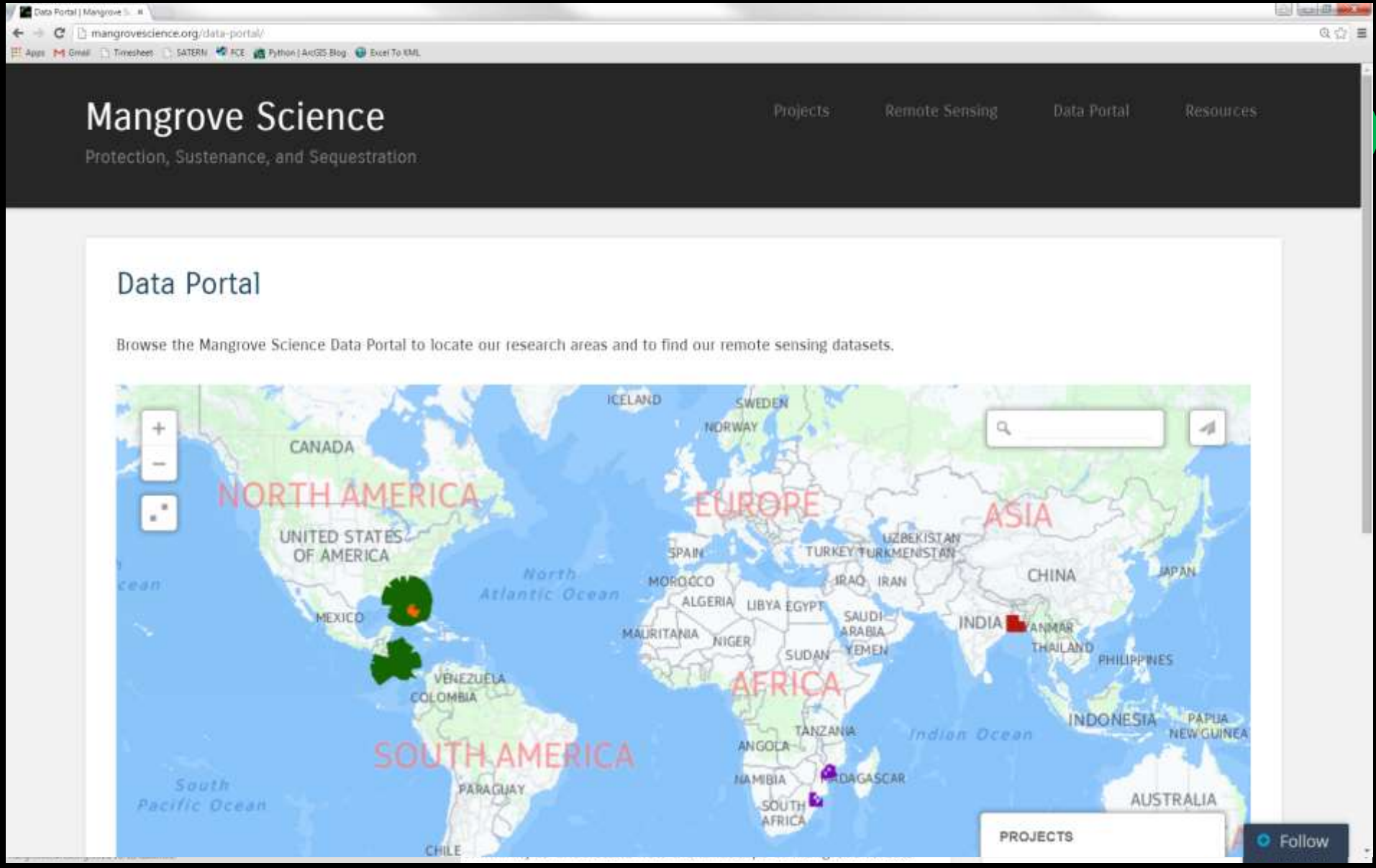
Summary


NASA G-LiHT

Hi-Res Surface Structure

Forest Spectra
Areas Losing in NDVI
NDVI (Landsat 5TM)
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1-Jan-83
1-Jan-86

Structure
Change



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Acknowledgements

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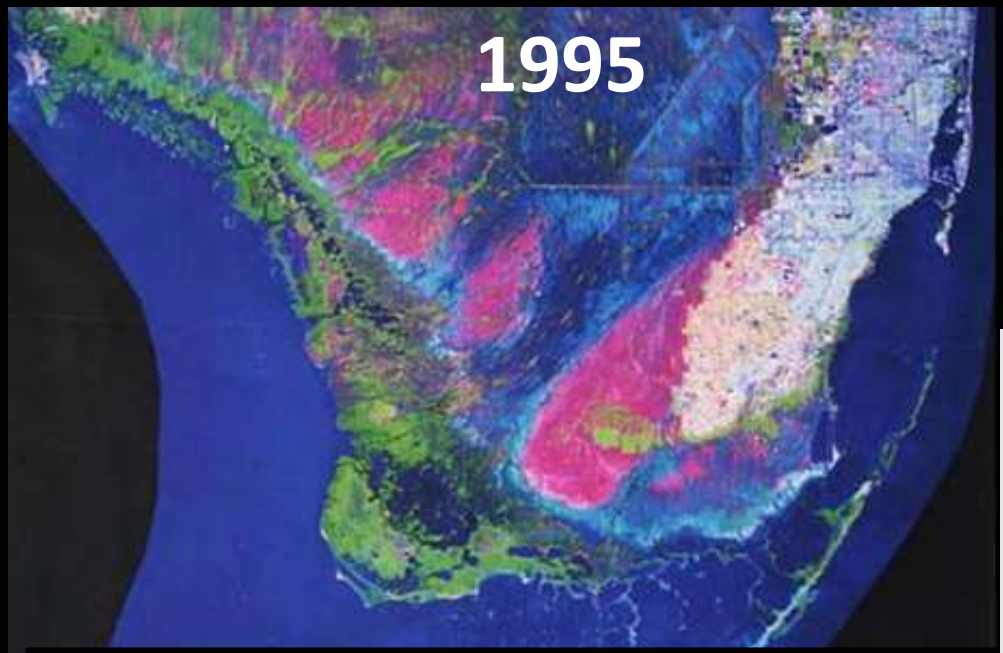
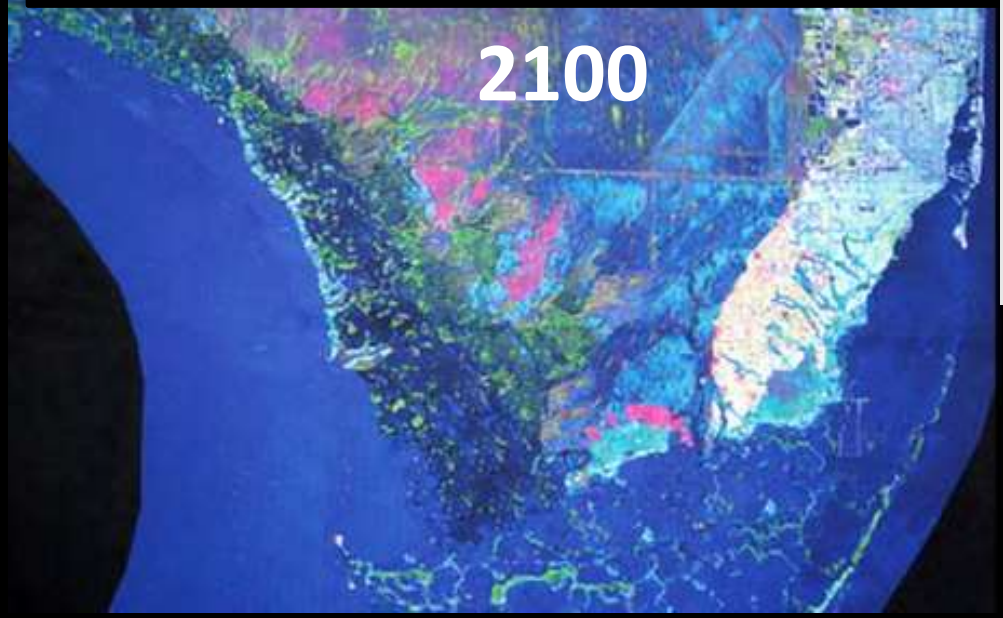
Liza Goldberg (intern)

Special Thanks

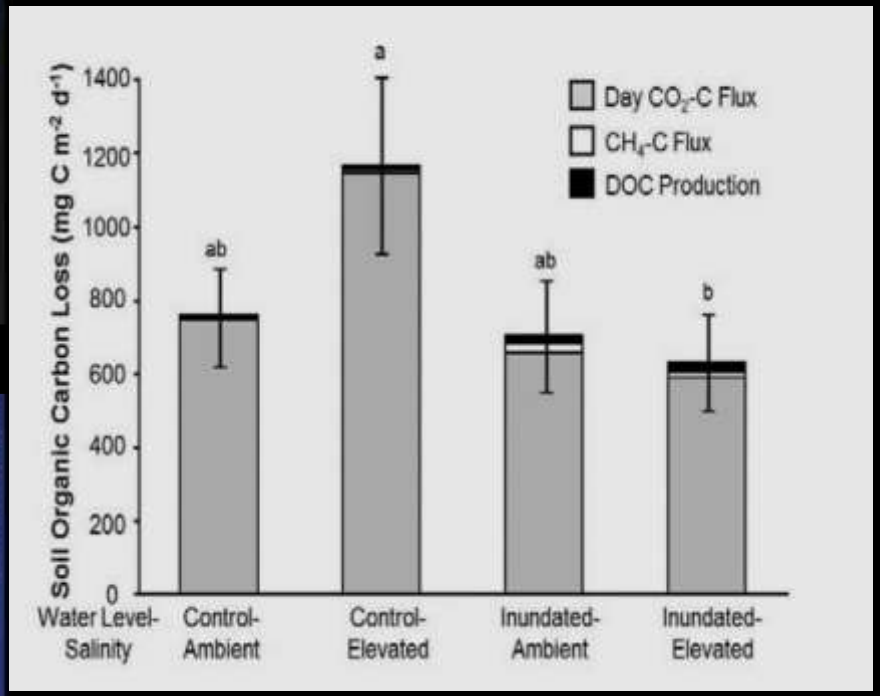
Jon Ranson
Doug Morton
Anika Halota

South Florida is susceptible to SLR and saltwater intrusion





Wanless, 2005



Chambers et al, 2014

G-LiHT targeted key locations in ENP