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CIR photo of G-LiHT platform over Schoodic Peninsula, Acadia National Park, ME

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Today's Talk:

- Provide a conceptual framework for G-LiHT
- Describe how the multi-sensor system evolved over time
- Identify projects important to TE program goals
- Discuss open-access data products and distribution

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

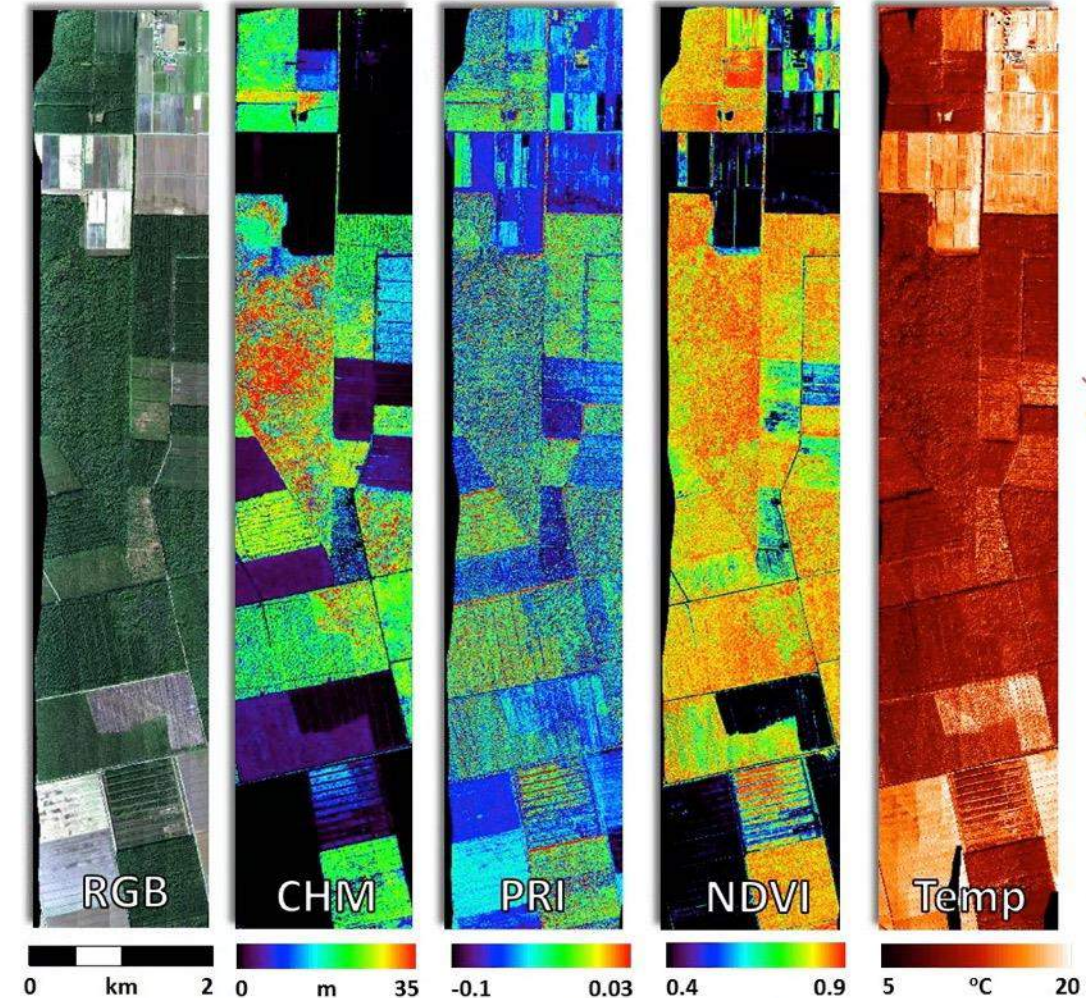
G-LiHT is a portable, multi-sensor airborne imaging system that simultaneously *maps the composition, structure, and function of terrestrial ecosystems* using:

- *lidar* to provide 3D information about the spatial distribution of canopy elements;
- *VNIR and SWIR Imaging spectroscopy* to discern species composition and variations in biophysical variables (e.g., photosynthetic pigments);
- *thermal measurements* to delineate wetlands and detect heat and moisture stress in vegetation; and
- *stereo RGB photographs* to identify fine-scale (~3 cm) canopy features and provide context for coarser data.

Co-registered, fine-scale (<1 m) observations covering *large areas* and environmental gradients are used to understand *tree-scale ecosystem interactions* with atmosphere, hydrosphere and climate.

Multi-temporal acquisitions with *high radiometric and geographic accuracy* are key to scaling between ground-satellite observations, and understanding *ecosystem responses to disturbances and global environmental change*.

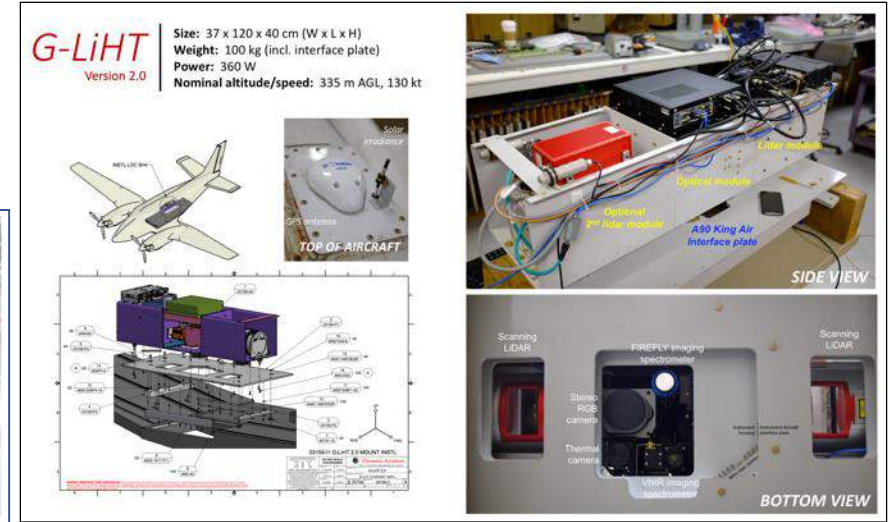
<https://gliht.gsfc.nasa.gov/>



Loblolly pine plantation in lower coastal plan near Plymouth, NC

G-LiHT Instrument System has Evolved Since 2011

- Improved **spectral** range & resolution; radiometric accuracy
- Improved **spatial** accuracy & resolution
- Improved **instrument stability, design-life and redundancy**

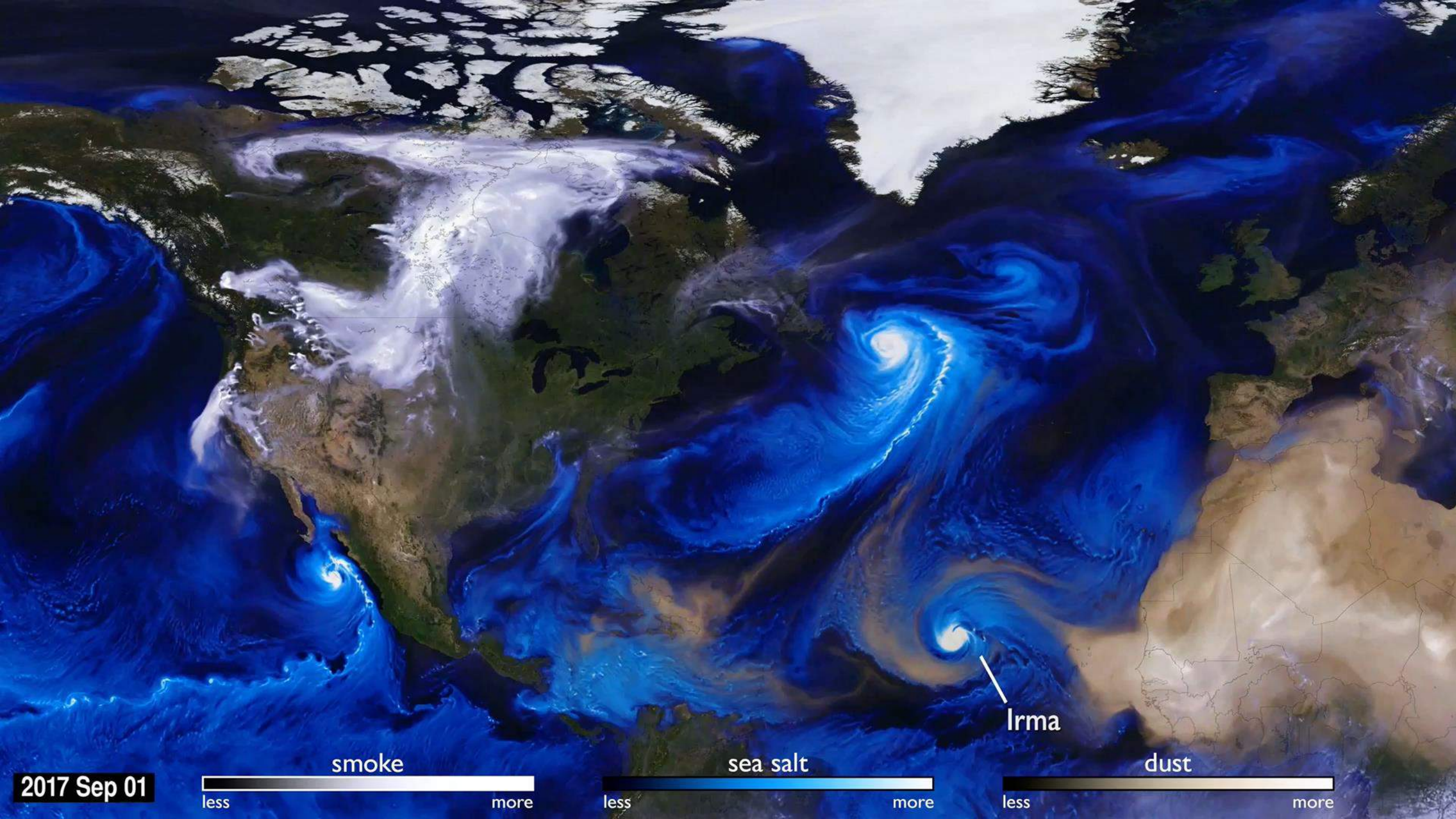


G-LiHT Version	v1.0	v1.5	v2.0	v2.5
Years	2011-13	2014-16	2017-18	2019-Present
Platform(s)	Cessna 206 (wing pod) King Air UC-12B	Piper Cherokee Cessna 206 (interior port)	King Air A90 Cessna 206 (interior port)	King Air A90
GPS-INS	Oxford RT-4041		Applanix POS AV v6	
Lidar(s)	Riegl VQ-480		2 @ Riegl VQ-480i	
Headwall imaging spectrometer(s)	Hyperspec VNIR (A Series)		Micro-Hyperspec VNIR (E Series) FIREFLY (red-edge for SIF)	SWIR
Solar irradiance spectrometer(s)	Ocean Optics USB-4000 VNIR		Ocean Optics FLAME VNIR Ocean Optics QE-Pro red-edge	Spectral Evolution VSWIR
Thermal camera	Xenics Gobi-384		Xenics Gobi-640-GigE	
Fine-res RGB camera	None	Nikon D7100	Phase One IXU-R 1000	
Calibration	NASA GLAMR (tunable laser) Pseudo-invariant cal sites & tarps		NASA GLAMR (tunable laser) Labsphere HELIOS D-Series	

G-LiHT TE Projects & Funding Partnerships

- 1) Regional forest carbon stocks in CONUS & Mexico (*NASA CCS; ICESat*)
- 2) Inventory of forest carbon stocks & ecosystem dynamics in interior Alaska (*USFS FIA; NASA CMS, ABoVE*)
- 3) Earlier detection of forest insect & disease outbreaks (*USFS FHP; NASA FLARE*)
- 4) Nutrient & land-use interactions in tropical forests (*US-DOE NGEE-Tropics*)
- 5) Coastal ecosystem dynamics and biogeochemistry (*NASA NIP, NASA-USDA CCS*)
- 6) Post-hurricane damage and recovery assessments in Puerto Rico and South FL (*NASA TE, USDA NIFA, DOI, FEMA*)
- 7) Cross-calibration of NASA Earth Observing Satellites (*NASA-USGS; Landsat, EOS*)
- 8) Modeling of LiDAR and Solar-Induced Fluorescence (SIF) signals from space (*NASA FLARE; ICESat-2, ESA FLEX*)



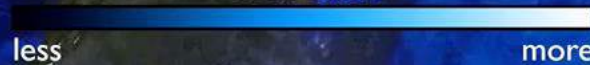


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smoke



sea salt



Irma

dust





National Aeronautics & Space Administration
Goddard Space Flight Center

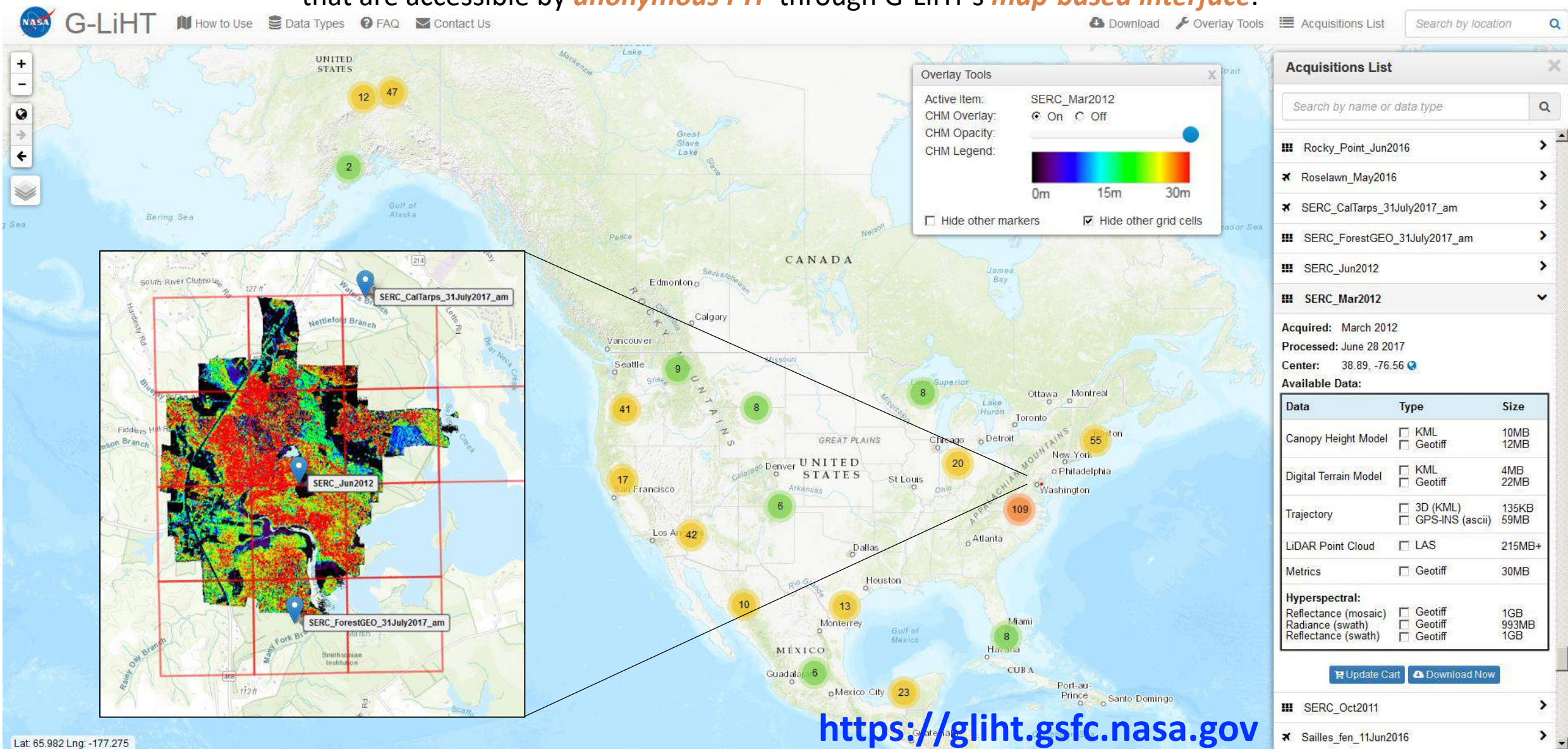
Flight Projects | Sciences and Exploration

G-LiHT Data Products & Distribution

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

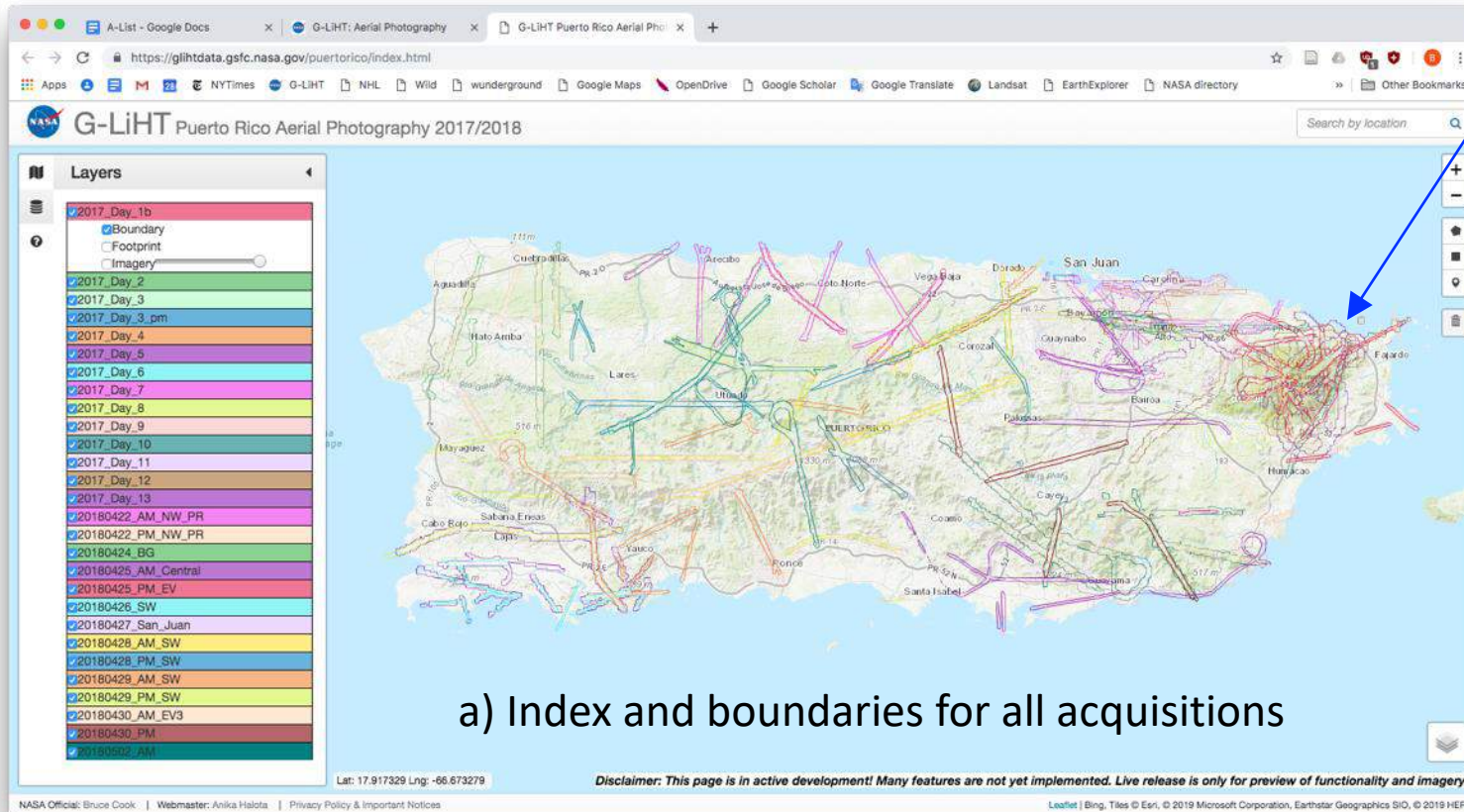
G-LiHT Open Access Data Server

L1 through L3 data products shared with the science community in *user friendly formats* that are accessible by *anonymous FTP* through G-LiHT's *map-based interface*.

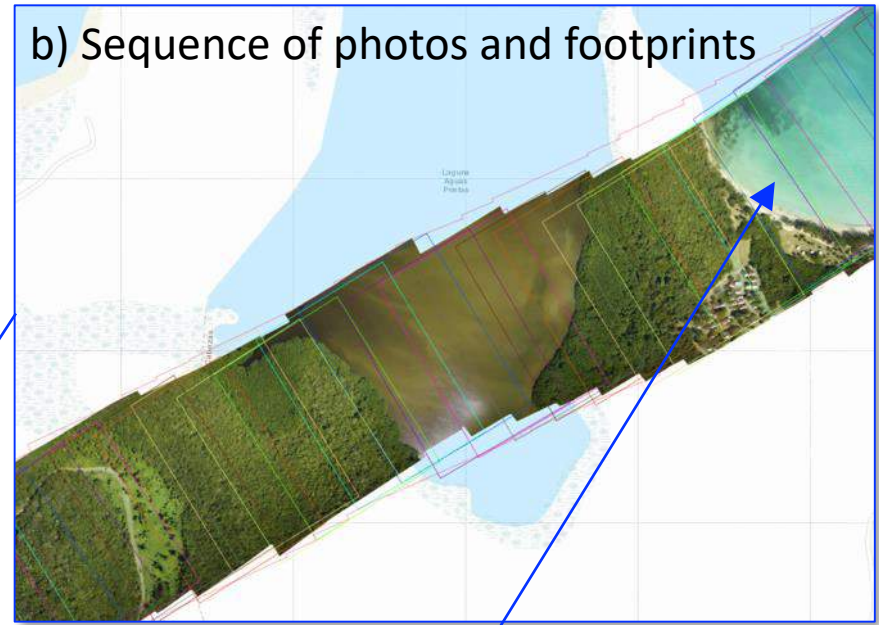


G-LiHT Fine-Res Stereo Images

1) View and download photographs as sequence of individually



b) Sequence of photos and footprints



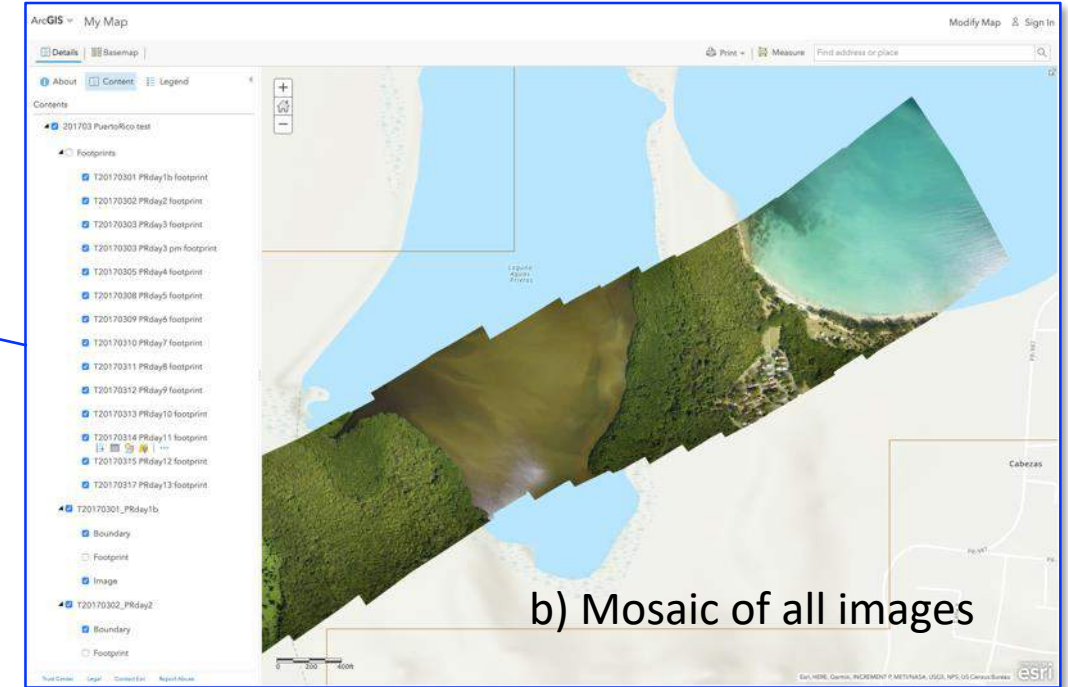
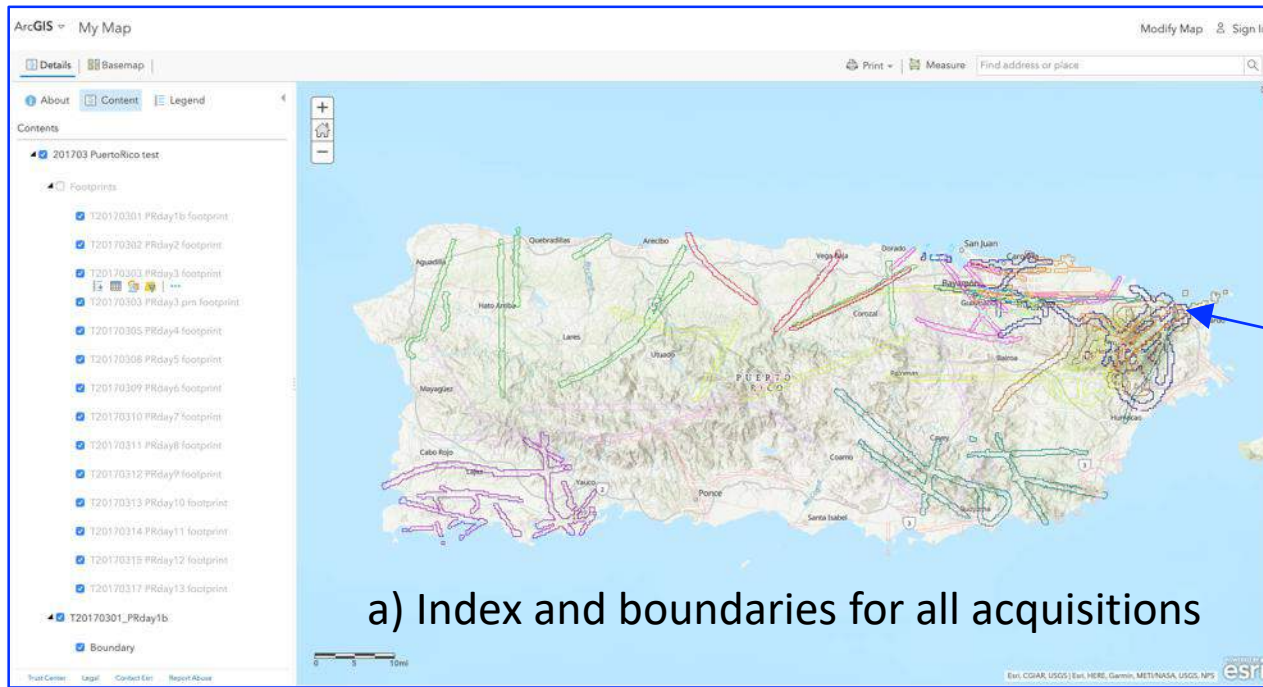
c) Full-res image



<https://glihtdata.gsfc.nasa.gov/puertorico/index.html>

G-LiHT Fine-Res Stereo Images

2) View and download mosaicked images in ArcGIS



https://maps.nccs.nasa.gov/image02/rest/services/gliht/201703_PuertoRico_test/MapServer

For more information:

<http://gliht.gsfc.nasa.gov>



Poster Session I, Monday (9/23), 4-5 pm, Poster #25

*“NASA Goddard’s G-LiHT Airborne Remote Sensing System for Applications in Terrestrial Ecology”
Lawrence Corp, Bruce Cook, Douglas Morton, Temilola Fatoyinbo, Hank Margolis*