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28. Testing ICESAT2 Data for Supporting Tree Canopy Cover Data

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About Us

Kevin Megown

Program Lead

Resource Mapping Inventory and Monitoring (RMIM).

USDA Forest Service, Geospatial and Technology Applications Center (GTAC)

RMIM Program

Existing Vegetation Data (*Tree Canopy Cover).

Bonnie Ruefenacht PhD - RedCastle Resources, Senior Remote Sensing Specialist

Karen Schleeweis PhD - Forest Inventory and Analysis (FIA) Program, USFS Rocky Mountain Research Station

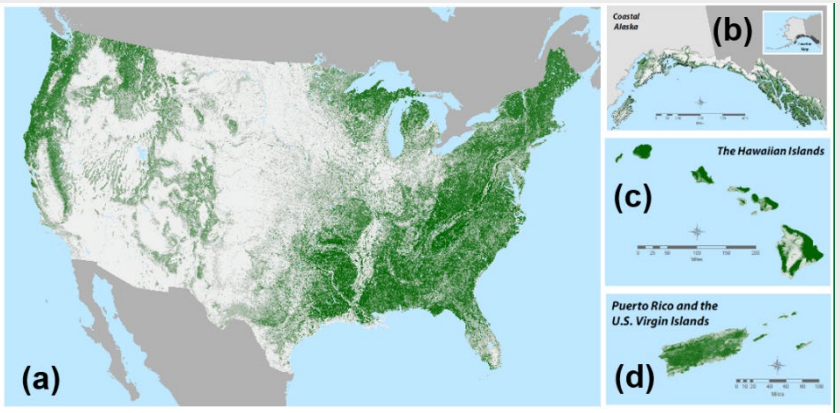
Mark Finco, PhD - RedCastle Resources, Principle Investigator

Stacie Bender - GTAC Program Assistant, Geospatial Specialist

The Idea

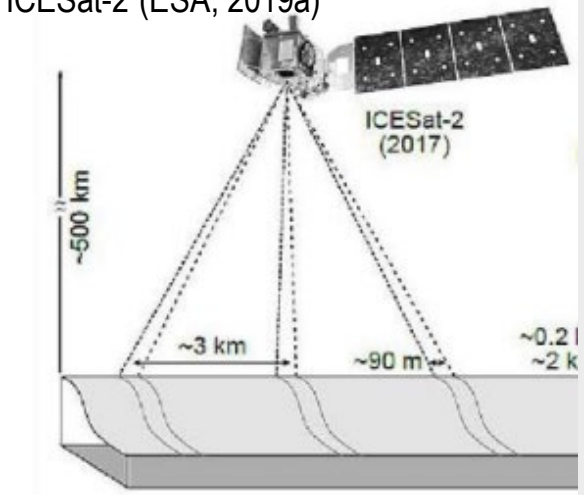
28. Testing ICESAT2 Data for Supporting Tree Canopy Cover Data

- TCC data for:
  - CONUS, coastal Alaska, U.S. Virgin Islands, and Puerto Rico
- Research for:
  - Advancing science for National “Tree” data
  - Improvements to the processing of 9 billion pixels
  - Interior Alaska
  - Improving reference data



2011 NLCD-TCC products for (a) CONUS, (b) coastal Alaska, (c) Hawaii, (d) Puerto Rico, and the U.S. Virgin Islands (Credit: USFS/GTAC)

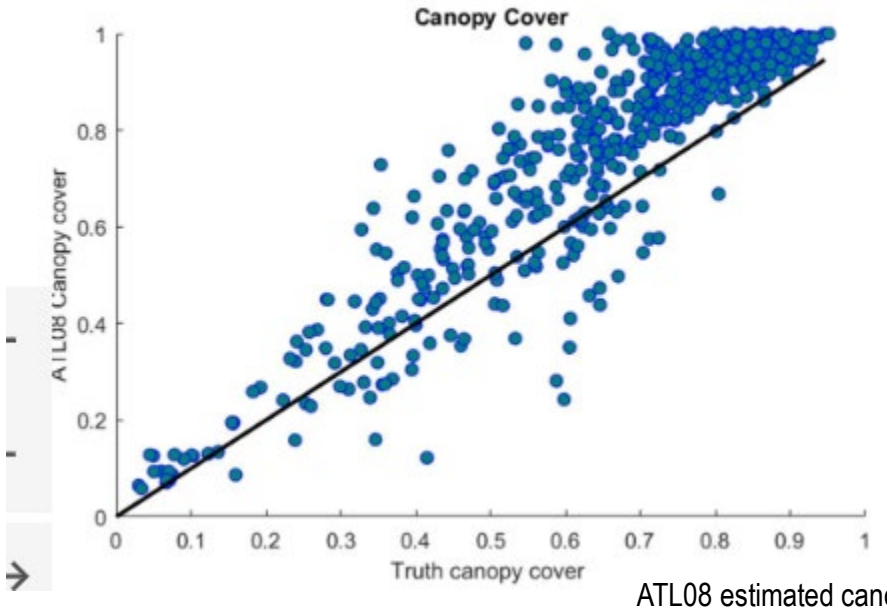
ICESat-2 (ESA, 2019a)



The Idea

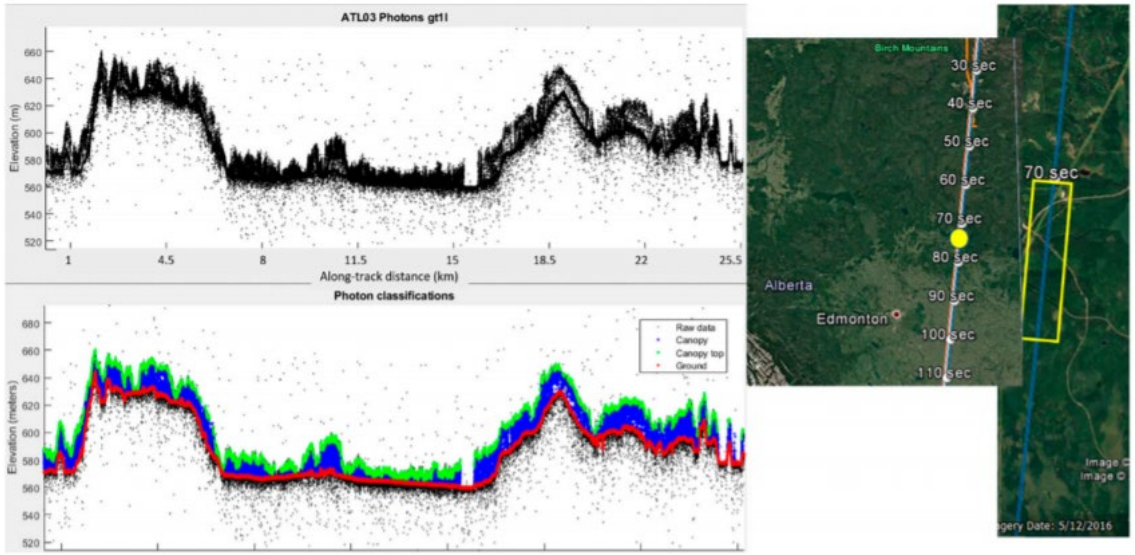
28. Testing ICESat-2 ATL8 and ATL18 data for Supporting Production of Tree Canopy Cover Data

- Canopy Cover measurements
  - Sampling in the ATL08 algorithm leads to over-estimation of canopy cover as canopy cover increases (compared to the airborne lidar truth of what was produced for each footprint) (Neuenschwander &Pitts, 2019).
- Vegetation Height
  - Photon counting to create height histograms
  - Ability to capture true canopy top, vertical sampling error, will vary by forest type.
- Potential to increase TCC Product Resolution & Consistency
  - 17 - 20m laser return footprint over 3 year mission.
  - Repeat measurements
  - Atlas spatial interpolation is similar to GLAS which has proven useful for broad scale mapping.
- Test footprint returns in different forest landscapes
- Create and test gridded products to support TCC time-series modeling



ATL08 estimated canopy cover (Fig11 from Neuenschwander &Pitts, 2019)

Neuenschwander and Magruder 2019



Issue(s) being addressed




The Idea

- Wildfire hazard
- Fuel loading
- Wildfire impacts
- Forest health
- ~~Water and aquatic resources~~
- Climate and drought
- ~~Soil moisture~~
- Vegetation mapping
- Carbon emissions and flux
- Rangeland management
- Other

Issues Addressed

What EO data does your idea utilize?

- Landsat
- Sentinel-1
- Sentinel-2
- ~~MODIS~~
- ~~VIIRS~~
- ~~ECOSTRESS~~
- ~~SMAP~~
- ICESat-2
- ~~GOES-R~~
- ~~JPSS~~
- ~~SRTM~~
- High spatial resolution R-G-B-NIR
- ~~LiDAR~~
- ~~Imaging Spectroscopy~~
- ~~UAVSAR~~
- ~~Uncertain - looking for guidance~~

The Idea

Earth Observation Tools

The Idea – Outcomes / Societal Benefits

- Expected management and/or decision support outcomes
  - Utilize ICESat-2 data in production of TCC data
    - consistency and timeliness of the TCC product
  - Advance science towards higher resolution TCC products
  - Advance science towards multiple metrics of structure for TCC products
  - Advance product to account for temporal vegetation cover change

- How does this idea benefit the Forest Service and other land management agencies?
  - Freely available
  - Part of NLCD supported by MRLC (more than 700 public downloads a month)
  - All lands data
  - Improved stratification layer (Tree Canopy Cover) using National inventory data

Thank You!