Title: ICESat2VegR: An R Package for Accessing, Handling, and Processing ICESat2 ATL08 and ATL03 Data

Instructors/Affiliation:

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Description:

Several NASA missions periodically collect spatial LiDAR datasets for global vegetation monitoring, particularly the ICESat missions. Among the 23 data products collected and generated by the ICESat-2 mission, the ATL08 product is specifically designed for characterizing ground and canopy surfaces. This hands-on workshop aims to demonstrate how users can effectively leverage these datasets. We introduce the ICESat2VegR package, a novel R-based tool that enables users to download, read, visualize, process, and export NASA's ICESat-2 ATL08 (Land and Vegetation Height) and ATL03 (Global Geolocated Photon Data) products for land and vegetation applications.

Through guided exercises, participants will learn how to: i) download and process ATL08/ATL03 data, ii) access canopy height observations from ATL products, iii) generate data table reference datasets from both ATL products, iv) upscale canopy measurements using Sentinel-2 images. Emphasis will be placed on understanding the strengths and limitations of the package, best practices for segment generation, and practical applications for wall-to-wall canopy mapping. By the end of the workshop, participants will have gained practical skills in spaceborne LiDAR data

processing and analysis, equipping them to apply these methods to canopy monitoring, ecological research, and resource management.

Learning Objectives:

Participants will gain hands-on experience with:

- Introduction to ICESat-2 NASA mission systems and ICESat2VegR packages
- Installing, configuring and downloading ATL03 and ATL08 products
- ATL segment reference dataset generation,
- ATL segment reference dataset aggregation (ATL03 and ATL08),
- Upscaling canopy height from segments to wall-to-wall mapping
- This course is supported by step-by-step tutorials and an example web application to guide participants in learning in-depth analysis.

Target audience:

Students, researchers, and professionals in forestry, ecology, remote sensing, or environmental sciences are interested in local tools for forest monitoring. Only basic R coding knowledge is required.

Format & Activities:

This virtual, hands-on workshop includes short lectures, live demonstrations, step-by-step guided exercises in R, and an ICESat2VegR package tutorial.

Tutorials and example applications for extended practice

Expected outcomes:

Install and download ATL03/ATL08 products with ICESat2VegR.

Extract and prepare canopy height measurements.

Build and aggregate reference datasets from ATL03/ATL08.

Map and upscale canopy height using Sentinel-2 imagery.

Confidently apply ICESat2VegR for global canopy monitoring.

Language: English

Requirements: Computer with R (ICESat2VegR and rgee packages)

Schedule: February 23, 1:00 pm – 6:00 PM (EST)

Duration: 4 hours.

Instructor Biography:

Caio Hamamura is a biologist (Ph.D.) with a background in remote sensing, GIS, data science, and software/package development for scientific computing in R, QGIS, and Python. He previously worked at the SilvaLab at the University of Florida, investigating the synergistic use of ICESat-2 data and Ecosystem Demography models to assess forest recovery following hurricane disturbances in the Southern United States. He is currently with the Federal Institute of Education, Science and Technology of São Paulo (IFSP), Capivari, SP, Brazil.

Cesar Alvites was born in Peru and holds a Ph.D. in Science, Technology, and Biotechnology for Sustainability from the University of Tuscia and the University of Molise, Italy. He earned his first degree at Universidad Católica Sapientiae in Peru. His research interests center on forest monitoring, ecology, silviculture, and advanced remote sensing technologies. Dr. Alvites has extensive experience with terrestrial, airborne, and satellite-based LiDAR (Light Detection and Ranging) systems, integrating these data sources to study forest structure, biomass, and ecosystem dynamics. He is passionate about developing and applying remote sensing methods better to understand forest resources and their changes over time. His work combines field investigation with geospatial analysis to support sustainable forest management, ecological research, and climate-related applications.

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ICESat2VegR: An R Package for NASA's Ice, Cloud, and Elevation Satellite (ICESat-2) Data Processing and Visualization for Land and Vegetation Applications.

Authors: Carlos Alberto Silva and Caio Hamamura

The ICESat2VegR package provides functions for downloading, reading, visualizing, processing and exporting NASA's ICESat-2 ATL03 (Global Geolocated Photon Data) and ATL08 (Land and Vegetation Height) products for Land and Vegetation Applications in R environment.

Agenda

Eastern Time (ET)	Topic	Instructor
13:00 – 13:30	Introduction to ICESat-2 NASA mission and overview of ICESat2VegR package	Caio Hammamura
13:30 – 14:00	Installing, configuring the ICESat2VegR package and other packages	Caio Hammamura
14:00 – 14:30	Initialing and downloading ATL03 and ATL08 products	Cesar Alvites
14:30 – 15:30	**Break**	
15:30 – 16:30	ATL segment reference dataset generation and aggregation (ATL03 & ATL08)	Cesar Alvites
16:30 – 17:00	Upscaling canopy height: from ATL segments to wall-to-wall mapping	Cesar Alvites
17:00 – 18:00	Open Discussion: Feedback and Future Directions	Caio Hammamura & Cesar Alvites