

# **Lidar for Terrain and Vegetation Mapping**

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## INTERMEDIATE WORKSHOP

This workshop is to introduce the basic concepts of Lidar, the popular and innovative methods for Lidar data processing and information extraction, with a focus on terrain mapping and forest studies. The attendants will learn 1) the principles of Lidar systems, 2) the typical Lidar systems, sensors, software, data, and applications, 3) the general procedure for processing airborne lidar data, 4) the popular and innovative methods for Lidar data filtering and terrain mapping for both urban and vegetated areas, 5) an overview of methods for extracting forest information at the stand and individual-tree levels, 6) an introduction of ground-based Lidar, 7) the application of satellite GLAS data for forest mapping, and 8) the remaining challenges of Lidar data processing and the advices of finishing your Lidar projects.

- I. Introduction:
  - a. Principle of lidar: discrete-return vs. waveform lidar
  - b. LiDAR platforms
  - c. Current developments of lidar and applications.
- II. Airborne LiDAR Systems, Sensors and Data Formats
  - a. Key concepts of airborne LiDAR systems
  - b. ASCII format vs. .LAS binary format
- III. The General Procedure of LiDAR Data Processing and Information Extraction
- IV. Filtering Point Cloud for Bare Earth Generation
  - a. Slope-based methods
  - b. Surface fitting methods
  - c. Morphological methods
- V. Mapping 3D Vegetation Structure
  - a. Individual-tree information extraction
  - b. Stand-level forest information extraction
  - c. Data fusion with optical imagery
  - d. Discussions of airborne LiDAR data for regional forest inventory
- VI. Ground-based LiDAR
- VII. Satellite LiDAR (GLAS: Geoscience Laser Altimeter System)
  - a. Introduction to GLAS
  - b. Elevation retrieval from GLAS
  - c. Regional and global-scale forest mapping with GLAS
- VIII. Tiffs: A Toolbox for LiDAR Data Filtering and Forest Studies
- IX. Case Studies:
  - a. Wildlife-habitat analysis
  - b. Ecological modeling