An Advanced Imaging Lidar for Forest Carbon Studies

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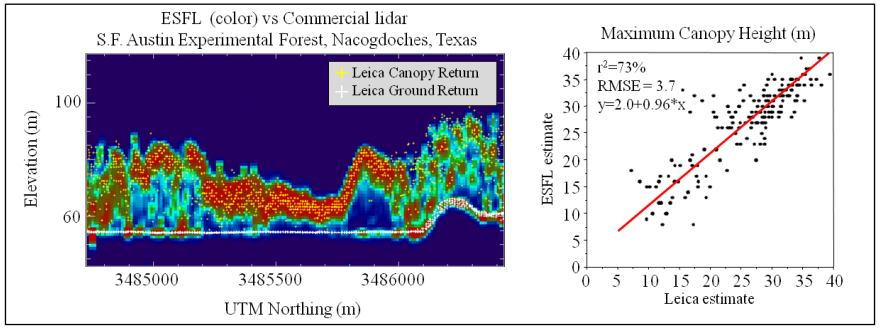
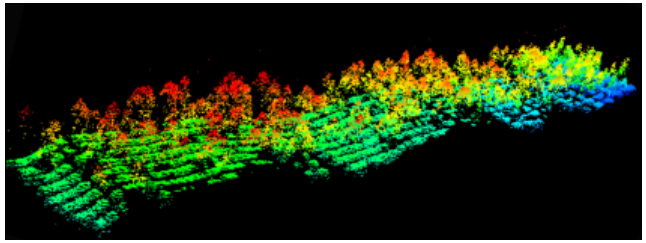
Objective

- Develop, evaluate and demonstrate new technologies, subsystems, and measurement techniques to characterize the Earth's forest and ecosystems
- Expand and transition the Electronically Steerable Flash Lidar (ESFL) to an operational tool for NASA science studies from aircraft
- Expand on 3D volume visualization methods for diverse forest scenes
- Support Carbon Cycle and Terrestrial Ecology through improving methods in forest canopy measurements
- Expand on adaptive control modes for use in forest mapping





Above: ESFL Validation Analysis

Left: ESFL data taken in 2010 over Manitou Forest, CO

Accomplishments

- The reliability of ESFL was upgraded with the addition of new housekeeping telemetry with limit checking, a higher reliability acousto-optic crystal with improved heat sinking, and a linux-based processor with higher data throughput
- The performance of ESFL was upgraded with new receiver optic and a lower noise flash focal plane array to provide higher signal-to-noise which enabled higher altitude flights with larger ground footprints which were imaged in 3-D
- The static (undeflected) part of the laser was shaped into a spatial line that could be aligned and imaged alongtrack or crosstrack
- Digital Elevation Maps were integrated into the control system which allowed the lidar data collects to be optimized by ensuring that only data from the ground through the canopy was collected, independent of terrain complexity
- New adaptive control algorithms were implemented that allowed the user multiple ways to optimize the data collection using inputs from an integrated forward looking camera, GPS/IMU, and from the lidar itself
- Two weeks of flight testing were done to prove out the engineering upgrades and to collect data for focused science studies including for forest fire carbon studies and old tree identification for ecological health

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