A passive spaceborne concept for remote sensing of forest structure and biomass

David J. Diner and John V. Martonchik
Jet Propulsion Laboratory, California Institute of Technology

ABSTRACT

Summary: The need for global vegetation structure and biomass measurements is motivated by the role of forests as atmospheric carbon sinks, habitats for wildlife, fuel for wildfires, and source materials for the wood and paper industries. This paper introduces a spaceborne Structure and Inventory of Vegetated Ecosystems (STRIVE) mission concept for the generation of such data. One component of this concept is the use of a very high resolution (1 m pixels, 8 km swath) targeted stereoscopic imager along with sub-pixel stereo image matchers to provide detailed characterization of vegetation canopy 3-D structure at the scene element scale. The second component of STRIVE takes advantage of the sensitivity of moderate resolution multi-angle observations to canopy structure at the sub-pixel scale, and synergistically couples the high-resolution stereo imager with a global coverage moderate resolution multiangle instrument (100 m pixels, 200 km swath, 5-9 angles) to transfer canopy structure characterizations to global scale. Solar reflectance imagery would be acquired at red and near-IR wavelengths. A precessing orbit is envisioned to enable global inventory of above-ground biomass over a several-year mission lifetime. Because of the highly conceptual nature of the STRIVE approach, experiments to explore its potential for biomass retrieval and to compare and contrast its capabilities and challenges with those of active techniques are needed. We suggest the organization of one or more field campaigns involving ground-based measurements, airborne lidar, IKONOS stereo imagery, and AirMISR/MISR multiangle imagery over selected sites in order to test the concept.