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TITLE: Coastal Applications of the Canopy Biomass Lidar (CBL)

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ABSTRACT BODY: Airborne discrete and full waveform lidars have increasingly been utilized to augment multispectral and hyperspectral imaging of coastal ecosystems. While these data provide important landscape assessments of the shore and nearshore environment, they often lack the frequency that is really needed to monitor complex vegetative systems such as salt marshes and mangroves and provide rapid evaluations in the aftermath of severe storms. One solution is to augment the sparse airborne and satellite acquisitions with terrestrial laser scanning (TLS) information. However, most institutions with fine resolution discrete or full waveform TLS instruments are unwilling to risk these expensive (and often heavy) lidar in marine or estuarine environments. The Canopy Biomass Lidar (CBL) is an inexpensive, highly portable, fast-scanning, time-of-flight, TLS instrument, originally conceived by the Katholieke Universiteit Leuven (KUL) and refined by the Rochester Institute of Technology (RIT). Two new CBLs, constructed by the University of Massachusetts Boston (UMB), have been successfully deployed in deciduous and conifer forests at Long Term Ecological Research (LTER) and National Ecological Observatory Network (NEON) sites in Massachusetts (Harvard Forest) and California (Sierra National Forest), and in eucalypt forests at long-term and Terrestrial Ecosystem Research Network (TERN) sites in Queensland, Australia. Both the UMB and RIT CBLs have also been deployed in savanna systems at the San Joaquin Rangeland (and NEON site) in California. The UMB CBLs are now being deployed in salt marsh systems in Massachusetts with plans underway to deploy them in mangrove forests later in the year. In particular, they are being used to characterize the water facing edge of saltmarsh at UMB's Nantucket Island field station and remnant salt marshes on the highly urbanized Neponset estuary draining into Boston Harbor. While CBL's 905nm nearIR wavelength is of little use in nearshore inundated systems (such as eel grass and kelp), it is excellent for characterizing 3D foliage structure via multiple scan point clouds. The system is light and the scanning is rapid enough (30seconds for a full hemispherical scan) to be deployed manually or in small watercraft. The portability also means that it can be used frequently to monitor vegetation dynamics throughout the growing season and assess marsh damage and erosion after severe storms. While airborne lidar and hyperspectral data and high resolution satellite imagery (and indeed even the more frequently available coarser resolution multispectral satellite imagery from the newly launched Landsat 8) will provide the most expansive views of such environments, tools such as the CBL can provide important ancillary information to augment the remote sensing data and provide rapid and fine scale shore level details to improve modeling and monitoring of these coastal vegetation ecosystems.

KEYWORDS: 0442 BIOGEOSCIENCES Estuarine and nearshore processes, 0439

BIOGEOSCIENCES Ecosystems, structure and dynamics , 0480 BIOGEOSCIENCES Remote sensing, 1855 HYDROLOGY Remote sensing.

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