

Both intense storms and sea level rise are exerting an unprecedented strain on the thirty-four islands and peninsulas of Boston Harbor. While these drumlin islands have experienced tropical and extratropical storms since formation, such storm events are occurring more often and are more intense under present climate conditions. This is leading to increased coastal erosion, particularly along north-northeast facing shores. Understanding the dynamics of coastal erosion is of paramount importance in guiding the design of coastal shoreline protections. However, the episodic nature of these storms makes associated erosion events particularly difficult to quantify and to distinguish from more gradual and continuous incremental erosion caused by seasonal wind and rain, freezing and thawing. Therefore, in order to continually monitor the impact of episodic storms on the coastal bluffs and shores of Rainsford Island, a fixed scanning terrestrial lidar (CBL) will be situated above the bluff on the north shore of the island. A higher resolution terrestrial lidar (Riegl VZ400i) will be deployed, whenever an erosion event has been identified, for more detailed characterization.



## Riegl VZ400i

**Commercial Terrestrial Lidar** Integrated Nikon SLR camera 1550nm laser (eye-safe) Portable, heavier (9.7kg) Horizontal Scan (2 min) 0.35mrad resolution Range 800m Accuracy 5mm



CBL point cloud (with operator)

**Compact Biomass Lidar (CBL) Robust Terrestrial Lidar** Designed by F. Peri, at SFE, UMB 905nm laser (eye-safe) Light, portable (3.9 kg) Fast-scanning Full hemisphere (33s) 0.25° resolution Range 45-60m Although hurricanes Henri and Ida did not inflict significant damage on Rainsford Island, these storms were Accuracy 2-3cm First & 2<sup>nd</sup> returns accompanied with torrential rain that did affect the overhanging vegetation and the bluff face. Deployment of a 2 Million points stationary CBL on the cliff top, will allow assessment of post storm effects, and a decision on whether to deploy Time-of-flight, intensity a team to obtain more rigorous, finer resolution, Riegl VZ400i lidar data for detailed measurement of damage and a better understanding of the geological processes that contribute to erosion on Boston Harbor Islands. Onboard Linux computer (Beaglebone blk) iPhone/iPod remote • Maio, C.V, Gontz, A.M, Tennenbaum, D.E, and Berland, E.P, 2012, Coastal Hazard Vulnerability Assessment of Sensitive Historical Sites on Rainsford Island, Boston Harbor, Massachusetts. Journal of Coastal Research, 28(1A), 20–33. West Palm Beach (Florida), ISSN 0749-0208. WiFi data download • Paynter, I., Saenz, E., Genest, D., Peri, F., Erb, A., Li, Z., Wiggin, K., Muir, J., Raumonen, P., Schaaf, C. 2016. Observing Ecosystems with Lightweight, Rapid-Scanning Terrestrial Lidar Scanners. Remote Sensing in Ecology and <u>Conservation</u>, 1–16. <u>doi: 10.1002/rse2.26</u>

## Lidar Characterization of Rainsford Island Bluff, pre- and post-Hurricanes Henri and Ida

Francesco Peri<sup>1</sup>, Alan Bartels<sup>1</sup>, Ian Paynter<sup>2</sup>, Nyla Husain<sup>1</sup>, and Crystal Schaaf<sup>1</sup> 1) School for the Environment (SFE), University of Massachusetts Boston, MA USA 2) Earth from Space Institute (EfSI), Universities Space Research Association (USRA), Columbia, MD, USA









