Measuring Small Changes in a Big Way

Coastal wetlands are special places where the sea infuses the shore, creating an environment supportive of abundant plant and animal life. They are also fragile places, where a small change in the balance of marine and terrestrial systems can have a large impact on the health of the ecosystem. LiDAR technology is proving an efficient tool for measuring change in these dynamic areas.<P>

On a warm April day in 2008, Dr Nishanthi Wijekoon was up to her waist in marsh mud, painstakingly measuring the lengths of individual stems of the common reed grass, *Phragmites australis*, while this wise, elder surveyor kept a keen eye out for the indigenous poisonous water moccasins, *Agkistrodon piscivorus*. What brought Nishanthi out to this remote site, far from her GIS workstation at the National Oceanic and Atmospheric Administration?

By measuring stem heights of this dominant coastal wetland plant, in addition to a number of other environmental parameters, Dr Wijekoon was ground-truthing recently obtained LiDAR data that would allow her to develop new and better models to measure wetland topography, and track its evolution and persistence in the face of sea level rise and environmental change.

As you will read in this month's feature article, "Multi-sensor Mapping: Integrating Data Streams for Coastal Science and Management", Dr Wijekoon and her co-authors describe how new data-processing techniques increase the precision and accuracy of LiDAR technology in distinguishing very small changes in elevation.

The knowledge of precise and accurate elevation is vital in monitoring and characterising changes occurring in coastal wetlands, as even slight changes in elevation can mean the difference between a healthy, vegetated marsh and open water. In addition, since vertical changes in both sea level and marsh elevation occur on the scale of millimetres per year, the ability to measure small changes is paramount. However, the soft ground surfaces of wetlands make it difficult to perform conventional high-precision field elevation surveys on a regular basis. This is where LiDAR systems are being increasingly used to collect coastal elevation data because of the efficiency they afford in challenging terrain such as wetlands. This is true not only for airborne LiDAR, with its capability of data capture at a significant spatial resolution over large areas, but also for terrestrial LiDAR, with its capability of detecting very small changes in elevation over a localised area such as a tidal flat.

LiDAR is proving to be an efficient tool in measuring surface elevations in coastal wetlands. The combination of LiDAR together with other data streams in a multi-sensory data fusion approach, as described in the article, will provide coastal researchers and managers with powerful tools to understand, predict and protect the future of our vital, dynamic coastal resources.