Abstract:
Computer-aided Tomography (CT) imaging was utilized to quantify wet mass of coarse roots, rhizomes, and peat in cores collected from organic-rich (Jamaica Bay, NY) and mineral (North Inlet, SC) *Spartina alterniflora* soils. Calibration rods composed of materials with standard densities (i.e., air, water, colloidal silica, and glass) were used to operationally define the specific x-ray attenuations of the coarse roots, rhizomes, and peat in the marsh cores. Image analysis was coupled with the CT images to measure the abundance and diameter of the coarse roots and rhizomes in marsh soils. Significant regression relationships were found between the CT determined wet mass of the coarse roots and rhizomes and the hand sieved dry mass of the coarse roots and rhizomes in both the organic-rich and mineral marsh soils. There was also a significant relationship between the soil percent organic matter and the CT determined peat particle density among organic-rich and mineral soils. In only the mineral soils, there was a significant relationship between the soil percent organic matter and the CT determined peat wet mass. Using CT imaging, significant positive nitrogen fertilization effects on the wet masses of the coarse roots, rhizomes, and peat, and the abundance and diameter of rhizomes were measured in the mineral soils. In contrast, a deteriorating salt marsh island in Jamaica Bay had significantly less mass of coarse roots and rhizomes at depth (10 – 20 cm), and a significantly lower abundance of roots and rhizomes compared with a stable marsh. However, the diameters of the rhizomes in the deteriorating marsh were significantly greater than in the stable marsh. CT imaging is a rapid approach to quantify coarse roots, rhizomes, peat, and soil particle densities in coastal wetlands, but the method is unable at this time to quantify fine roots less than1 mm in diameter.

Keywords: CAT scan, CT imaging, eutrophication, sea level rise, *Spartina alterniflora*, roots, rhizomes, peat, ecosystem services, bulk density, particle density, monitoring program