Geophysical Research Abstracts
Vol. 21, EGU2019-928-1, 2019
EGU General Assembly 2019

Environmental Factors as Predictors of Seagrass Soil Carbon Stocks in the Solent, UK.

Mariana do Amaral Camara Lima, Raymond Ward, and Christopher Joyce
University of Brighton, School of Environment and Technology, Brighton, United Kingdom (m.lima@brighton.ac.uk)

Seagrass ecosystems have high carbon storage potential, acting as important global carbon sinks. However, seagrass soils are increasingly under threat from erosion, with meadows experiencing a global estimated decline of 7% per year, potentially leading to CO_2 emissions. This decline has been driven by disturbances related to eutrophication, shading, erosion, warming, and physical removal, particularly over the last 100 years. This study evaluates the relationship between a range of variables and carbon storage potential in seagrass meadows from the Solent, UK. By establishing relationships between parameters, this study provides important information on the main environmental factors impacting seagrass carbon storage potential, providing useful information for restoration projects.

Six fieldwork sites were selected within the Solent region, in southern England. Selected sampling sites encompass seagrass habitats on both muddy and sandy substrates, incorporating *Zostera marina* (Eelgrass), *Zostera noltii*, *Zostera angustifolia*, and *Ruppia spp.* meadows, thus providing comparable environmental data between these habitats. Relationships between soil carbon stocks, edaphic, and ecological factors were examined to determine which factors were correlated with seagrass carbon storage (C_{org}) potential. Environmental factors were grain size, dry bulk density, sorting, %silt, salinity, pH, nutrients, elevation, seagrass species diversity, and shoot density.

A test for analysis of variance showed that, soil C_{org} ($MgCha^{-1}$), Dry bulk density (DBD) (g/cm^3), mean grain size (ϕ), sorting coefficient, %Silt, pH, salinity ($^0/_{00}$) and elevation (m) were significantly different between sites. The relationship between soil C_{org} ($MgCha^{-1}$) and the predictor variables was explained in a Partial least square regression model (PLS). The first five components selected explained 88.7% of the variation in the data, with the most important variables responsible for the variation in soil Corg being DBD, followed in a ranking order by NO_2^- ($\mu molL^-$), SO_4^{-2} ($\mu molL^-$), pH, sorting coefficient (ϕ) and salinity ($\%_,$).

The first five predictors appointed by PLS as main drivers for variation in soil C_{org}, were selected for inclusion in a PCA analysis. Edaphic characteristics showed the largest influences on the model, with sorting (ϕ), and DBD (g/cm^3) closely correlated to soil C_{org} ($MgCHa^{-1}$). PCA also showed that the concentration of nutrients (NO_2^- ($\mu molL^-$) and SO_4^{-2} ($\mu molL^-$), pH, and DBD (g/cm^3), were the main drivers in Ryde (RYST), Cowes (CWST) and Farlington Marshes (FMST), while soil C_{org} ($MgCha^{-1}$) and sorting coefficient (ϕ) were the most influential variables for Creek Rythe (CRST), Hayling Island (LGST) and Porchester (PMST).

Correlation tests to identify individual associations between the main five environmental predictors and soil C_{org} ($MgCha^{-1}$) corroborated PCA's results, with DBD (g/cm^3) presenting a strong negative relationship, and sorting (ϕ) a strong positive relationship, with soil C_{org} ($MgCHa^{-1}$). This shows that edaphic variables, mainly related to grain size and percentage of fine particles, were the most relevant for seagrass carbon storage (C_{org}). However, all 11 parameters presented different degrees of effect in soil Corg stocks across sites, indicating the importance of considering environmental factors when addressing monitoring needs with the aim of conserving and protecting these ecosystems and their role as carbon sinks.