Soil Organic Matter in salt-marsh soils: a case study from the Venice Lagoon (Italy)

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Salt marshes are intertidal ecosystems characterized by mostly herbaceous halophytic vegetation and shaped by complex feedbacks between hydrodynamic, morphological, and biological processes. These crucial yet endangered environments support a diverse range of ecosystem services, including coastal protection and biodiversity increase, and they are among the most carbon-rich ecosystems on Earth. Their primary production coupled with rapid surface accretion results in the ability to sequester and store atmospheric carbon at high rates. Organic matter in salt-marsh soils has also a structural role, as it may contribute to vertical accretion necessary for marshes to keep up with relative sea level rise. A better understanding of the processes regulating soil organic matter (SOM) in tidal environments is a critical step to predict salt-marsh evolution in the face of climate change and anthropogenic disturbances and to further elucidate carbon sink potential of salt marshes, to the benefit of management and conservation strategies. Toward this goal, we analysed organic matter content in salt-marsh soils of the Venice Lagoon (Italy) from about 40 sediment cores to the depth of 1 m. Vegetation and soil data were collected across elevation and zonation gradients in different areas. Organic matter percentage in each sample was evaluated using Loss On Ignition (LOI) and carbon stock and accumulation were estimated. We observed that soil organic matter tends to increase when moving away from the marsh edge and decrease with depth, but sites with higher organic content show irregular vertical profiles with buried organic-rich layers. However, estimated carbon stocks are highly variable in different marshes, with higher values in sites affected, today or in the past, by fluvial water inputs. Preliminary results suggest that SOM accumulation primarily varies depending on organic source and conservation conditions, mostly affected by vegetation, sedimentation characteristics and environmental factors, which are in fact interrelated.