AGU 100 FALL MEETING
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B33D-06: Hydro-geomechanical feedback on tidal marsh resilience

Wednesday, 12 December 2018
14:55 - 15:10
Walter E Washington Convention Center - 149AB

Tidal marshes are morphological forms developed during the last millennia. They are dynamic environments, rapidly responding to anthropogenic pressures and natural disturbances such as variations in water sediment concentration, sea level rise, and land subsidence. Their resilience has been usually investigated over the last decades by bio-morphological models, which account for deposition of clastic sediments and biological processes controlling organic sediment productivity. These approaches lump the hydro-geomechanical processes occurring below the marsh surface into a unique subsidence rate representing an external term forcing the system. However, this is a strong over-simplification that totally neglect processes occurring at the shallow depth. In this contribution we present an innovative 2D numerical model consisting of a bio-morphological module coupled to a groundwater flow and geomechanical module: i) bio-morphological model provides the deposition rates, which depend on topography and availability of organic/inorganic sediments; ii) the outcome is then used as forcing term for the geomechanical model, that simulates the consolidation process properly accounting for large deformations typical of shallow soft deposits; iii) this latter, in turn, influences the sediment deposition fluxes by acting on the surface elevation. The model is applied using a dataset typical of the Venice Lagoon, Italy. The model results clearly show that the hydro-geomechanical properties of a wetland soil and the subsurface processes can affect significantly the resilience degree of a tidal marsh to relative sea level rise.

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