Geophysical Research Abstracts
Vol. 20, EGU2018-11470, 2018
EGU General Assembly 2018

Conceptualising and quantifying eco-geomorphic processes, rates and feedbacks in coastal wetlands

Jose Rodriguez (1), Patricia Saco (1), Steven Sandi (1), Neil Saintilan (2), and Gerardo Riccardi (3)

(1) School of Engineering, University of Newcastle, Callaghan, Australia (jose.rodriguez@newcastle.edu.au), (2) Department of Environmental Sciences, Macquarie University, North Ryde, Australia, (3) Department of Hydraulics and Research Council of National University of Rosario, Rosario, Argentina

Models of vegetation evolution on coastal wetlands responding to expected sea-level rise scenarios are common in landscape simulation studies and coastal management plans. These modelling tools consider that wetland vegetation depends on the prevailing hydrodynamic conditions based on empirical evidence collected both on saltmarsh and mangrove studies. Accordingly, vegetation will establish itself and migrate landwards following the rising water levels. Some models consider feedbacks on the geomorphology, as increased flow promotes erosion on tidal channels, and vegetation produces soil accretion on the tidal flats. The hydrodynamic simulation of the flooding attenuation effects in most current models is extremely simplified. A very common modelling simplification is to neglect flow attenuation mechanisms altogether by assuming that the water levels at a given time are the same over the entire wetland. Vegetation roughness in tidal flats reduces depth and maximum inundation extent but increases ponding, so it affects both inundation depth and hydroperiod. Local man-made flow restrictions in tidal flats and channels also contribute to flood attenuation in a similar way. Hydrodynamic attenuation effects due to levies, culverts and other man-made tidal modifications are not considered in any of the existing models.
Our simulation approach couples a hydrodynamic model with vegetation rules based on preference to hydrodynamic conditions. It also includes soil accretion in vegetated areas for the long-term simulations. Feedbacks from the changing landscape and vegetation distribution are incorporated into the hydrodynamic model on decadal timescales. We analise several scenarios of sea-level rise and man-made flow restrictions for timescales ranging from decades to a century. We assess and quantify wetland resilience and provision of ecosystem services including blue carbon sequestration.