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Coevolution of landscape and vegetation in sea-level affected coastal wetlands with man-made flow interventions

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On a global scale, the sustainability and resilience of coastal wetlands to sea-level rise depends on the slope of the landscape and a balance between the rates of soil accretion (due to eco-geomorphic feedbacks) and the sea-level rise. However, local man-made flow interventions can have comparable effects. Coastal infrastructure controlling flow in wetlands can pose an additional constraint on the adaptive capacity of these ecosystems, but can also present opportunities for targeted flow management to increase their resilience. We explore in this contribution the effect of different flow control interventions that either enhance or attenuate tidal inputs, on the long term eco-geomorphic response of coastal wetlands under sea-level rise. We use the case of wetlands in SE Australia, many of which are managed for habitat conservation, agriculture, mosquito control, etc. and typically present infrastructure including flow control devices like floodgates, culverts and drainage ditches.
We use a spatially-distributed dynamic wetland eco-geomorphic model that not only incorporates the effects of flow modifications due to culverts, gates, drainage ditches, but also considers that vegetation changes as a consequence of changing inundation patterns. We also consider the ability of vegetation to capture sediment and produce accretion, so we can produce a constantly evolving landscape. All these feedbacks are regularly incorporated in the model in order to modify the inundation patterns. We test a number of different flow control interventions on a tidal flat with conditions typical of SE Australian coastal wetlands.