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The proposed presentation deals with the assessment of coral reef and upperbeach vegetation impact on coastal flooding at Anse Maurice, a reef-fringed pocket beach located at Guadeloupe Island, in the Caribbean region. Several field-monitoring campaigns have been conducted with the aim of characterizing the beach evolution. Upperbeach vegetation evolution and marine inundation was assessed using a fixed video system. In order to highlight the processes induced by the reef and upperbeach vegetation from the front reef to the nearshore focusing on runup levels, a numerical modelling experiment using XBeach in its non-hydrostatic mode was undertaken. Data from coastal ecosystems and morphology were used as inputs. Observations acquired from a hydrodynamic field campaign in September/October 2020 and the above-mentioned video system were used as calibration. The latter is particularly useful to the analyses of swash events occurrence and to identify the overall agitation in the lagoon. Analyses of processes and runup attenuation by the reef and upperbeach vegetation during the distant Hurricane Teddy (September 2020) pointed out the role of reef and upperbeach vegetation ecosystems. Modelling results confirm observations, and clearly indicate that coastal inundation is mostly driven by storm events. During the storm events, the reef acts as a protection by dissipating most of the short wave energy, but also induces the generation of infragravity waves that appear to be the most important factor driving the berm overtopping. In that case, the vegetation acts as another barrier to the flow. To assess the effect of ecosystems health, several simulations on the same storm event were undertaken with varying ecosystem properties. It was concluded that wave runup at the coast is firstly dependent on the reef properties, but the upperbeach vegetation also clearly influences the maximum swash excursion at the beach and the resulting coastal flooding.