



Process-mechanism information contained in typhoon deposits, Hainan Island, South China

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Typhoons hit Hainan Island, southern China, 6-8 times every year. These storms are formed either in the western Pacific Ocean, or within the South China Sea. As a result, typhoon deposits are widely distributed along the eastern-southeastern coastlines of the island, in the form of coastal lagoon storm layers, overwash layers on the top of coastal dunes, or storm boulders. In order to understand the mechanisms for the formation of these three types of storm deposits, sedimentary cores are collected from coastal embayments where the seabed sediment is dominated with fine-grained materials, sediment samples are taken from transections across the coastal dunes, and spatial distribution patterns of the storm boulders are recorded by aerial imagery and in situ measurements. Numerical models are established to simulate the storm events that are capable of generating the observed storm deposits. Under extreme conditions, coral reef boulders of more than 30 t have been transported to the reef platform top, storm sand layers are found at the coastal dune top of more than 20 m in elevation, and thick shell debris layers are found in the muddy lagoon deposits. Numerical modeling, in combination with historical records, reveals that the extreme events are equivalent to a return period of 100 to 1000 years. Long sediment cores, with a potential of deriving a storm intensity – return period relationship with a time scale of 1000 years, show that the intensity-frequency of occurrence relationship differs not only with the time scale, but it also varies within the different periods of time, indicating regime shifts in the climate system during the Holocene times.

Keywords: typhoon deposits, storm boulders, intensity-frequency of occurrence relationships, numerical modeling, regime shifts, Hainan Island