instance, RES has been used for the study of storm surge by typhoons and hurricanes, wintertime abnormal high waves in Japan, dam-made lake circulation, local air-sea interaction under typhoon, summertime heavy rainfall and runoff in Japan, estuarine circulation at a river mouse in Indonesia and wave overtopping in coastal region. Most recently, a project on the impacts of reduced discharge of freshwater and sediment from Yangtze River basin on the adjacent East Asian Seas has been initiated using the RES as a significant tool for the environment assessment.

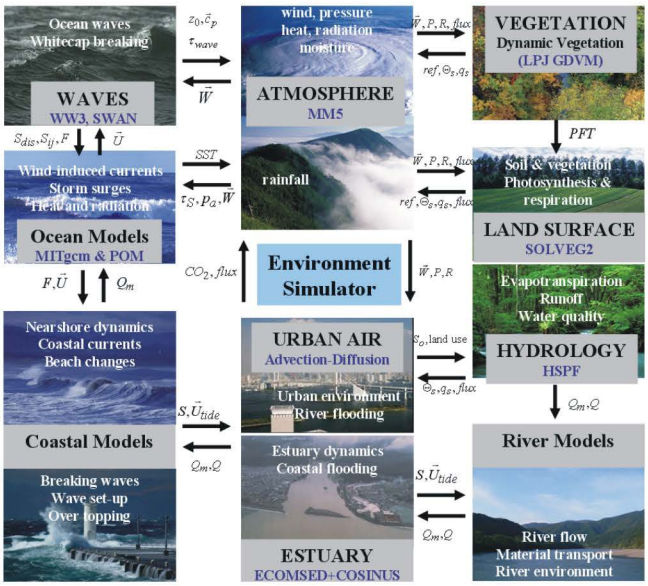

Fig.1 Framework of Regional Environment Simulator

Storm-induced landform changes along the delta front coasts examples from the east coast of India

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The Bay of Bengal is known for the origin of tropical cyclones, a majority of which crosses the east coast of India. About 113 major cyclonic storms had their landfall along the eastern seaboard of India during the last 300 years between 1681 and 2007. Almost 50% of them crossed the coast of Andhra Pradesh State in the central part of the coast of which as many as 22 storms had their landfall over the Krishna-Godavari twin delta region. Similarly, the Mahanadi delta in Orissa is also frequented by the cyclonic storms. These deltas show about 30-km-wide seaward bulge characterized by vast stretches of gently sloping fluvio-marine plains that sustain large populations and intense economic activity. In view of the low-lying nature of these delta plains, the high-energy waves and tidal surges that accompany the cyclonic storms reach several kilometers inland causing serious destruction to life and property. Besides, the storm surges often lead to considerable coastal erosion thereby offsetting several years of prior depositional activity.

Apparently each time a severe storm hits these deltaic regions, some of the coastal depositional landforms are removed, either wholly or partially thereby significantly reversing the regular shoreline behavior. For instance, the 'killer' cyclone that lashed the Krishna delta region in 1977 accompanied by a 4.9 to 5.5 m tidal surge that reached almost 12 km inland lead to erosion of a prominent sand spit, besides causing heavy damage to life and property. Similarly the 1990 storm that was accompanied a 5-6 metre-high surge in the Godavari delta caused erosion of about 2-km-wide coastal land near Biyyaputippa village which was 2 km inland from the coast before the event. Nearly one-half of the built-up area of the village was vanished. Similarly, another devastating cyclone that crossed the Godavari delta coast in 1996 breached the Kakinada spit at its base over a 1.5 km stretch. Further, the 1999 'super cyclone' that hit Mahanadi delta coast was accompanied by a 8-9 metres surge had eroded the coastal spits besides extensively destroying mangrove vegetation as revealed by the satellite images. These examples suggest that the episodic events such as cyclones bring about changes in the coastal configuration and thereby the delta growth. Therefore, it is concluded that studies on the coastal morphodynamics along the delta regions should also consider the impact of episodic events like cyclonic storms as one of the important geomorphic processes.

The post-glacial sedimentary characters and environmental evolutions in the muddy area off the Yangtze River estuary

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A 35.6 m-long core (ECS-0702) was recovered at a water depth of 22 m in the muddy area off the Yangtze River estuary, and was analyzed to document the sedimentary characters, provenance, and environmental evolutions during the post-glacial period in the study area. Based on lithology and AMS ^{14}C data, the core can be divided into four depositional units (DU_1 to DU_4 in descending order) with a general fining-upwards trend in grain size. DU 4 corresponds to tidal flat facies formed during about 13.0-11.6 cal kyr BP; DU 3, to subtidal nearshore facies during the Holocene sea-level rising from about 11.6 to 6.5 cal kyr BP; DU 2, to shallow-sea facies during the sea-level highstand from about 6.50 to 0.54 cal kyr BP; and DU 1, to shallow-sea facies from ~0.54 cal kyr BP to present. Analyses of clay minerals, detrital minerals, and element geochemistry for the uppermost 25.9 m core suggest that the sediments were derived jointly from the Yangtze River and Yellow River. In particular, the content of calcium carbonate and sedimentation rates are much higher above 9.70 m depth in the core than below, in accordance with the intrusion of Yellow River into the South Yellow Sea from 1128 to 1850 AD since the 9.70 m depth in the core corresponds to about 822 cal yr BP based on AMS^{14}C data. The initial development of DU 1 roughly corresponds to the onset of the Little Ice Age (ca. 1400-1900 AD). The finer grain sizes of sediments in DU 1 than in DU 2 are interpreted to be due to combined impacts of human and climate (the Little Ice Age), which led to the decreased water dischage of the both major rivers and thus finer sediment input into the study area. Our research on the core highlights the contribution of Yellow River-derived sediments to the post-glacial strata development of the muddy area off the Yangtze River estuary and climatic and human impacts on coastal sedimentation.

Early diagenetic processes of Fe and Mn in Yangtze Estuary

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The vertical distributions of iron and manganese in pore water and solid sediments, collected from Yangtze Estuary, were determined. The results showed that the iron and manganese oxides or hydroxides were reduced in early diagenetic processes. The manganese prior to iron participates in the organic matter degradation. Both Slomp's and Berger's models were used to fit the interstitial Mn and Fe profiles. The fitted curves of both models for interstitial Mn^{2+} are very well, whereas for interstitial Fe^{2+} are mediocre. Adsorption process has great effect on the distribution of interstitial Fe and Mn. The greater the adsorption coefficient is, the smaller the concentration of interstitial Mn and Fe in the upper sediments is. Compared to Mn^{2+}, Fe^{2+} is more sensitive to the change of adsorption coefficient. Calculations with Fick's first law showed higher fluxes of manganese into the overlying water while the fluxes of iron were much lower.

Heavy mineral distribution and its provenance implication in late Cenozoic sediments in western and eastern area of the Yangtze delta

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Two Cenozoic boreholes Pd and Sk10 were recovered respectively from the estuary and inland plain area in the Yangtze delta. 118 and 310 sediment samples were taken from the boreholes Pd and Sk10 for heavy mineral analysis to discuss the provenance difference between the two regions. The results showed that five zones were identified from the borehole Pd and four zones from the borehole Sk10, and these zones upwards had a good relation with Pliocene, Early, Mid-, Late Pleistocene and Holocene.

During Pliocene both regions were characterized of Rutile, Zircon and Tourmaline derived from andesitic-granitic igneous rocks, accompanying with many oxidant autogenetic minerals such as Hematite, Limonite and Leucoxene. This heavy mineral assemblage implied local and/or near west highlands sediments provenance and a strong chemical weathering environment.

However there was a great difference in heavy mineral assemblage between the estuary and inland plain region during Quaternary, which implied the different provenances between the two regions. Inland plain area kept the same characteristic minerals as those during Pliocene. Rutile, Zircon and Tourmaline derived from andesitic-granitic origin still remained a certain