



LOICZ SNAPSHOTS



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Coastal research of SKLEC in the Yangtze estuary, China

Located in the eastern coast of China, the Yangtze estuary serves as a huge ecological breadbasket, which supports more than hundreds of millions of habitants for their daily activities. The river mouth is about 50 km wide and 60 km extended from the river coast inland. There has been a large amount of sediments load (470 million tons/a, before damming) transported into the seas, through the estuary, and annual runoff reaches >900 billion cubic meters. There are three large-scale estuarine islands that have been silted since last 2000 years; the biggest Chongming Island is about 120 km long and 30-40 km wide. To meet the challenge of climate warming and human interferences in the recent years, the State Key Laboratory of Estuarine and Coastal Research (SKLEC), East China Normal University, Shanghai, has been actively involved in depth the ecological and sedimentological researches. Research results have been extensively applied to the coastal integrated management, and policy modification. Key orientations can be given below:

Photo 1a – the Yangtze estuary, where located are the three large estuarine islands.

Photo – 1b rapidly growing Chongming Island of the Yangtze estuary

Coastline erosion monitoring

To monitor the processes of sediment transport and sediment flux/load in the estuary is the major focus, given the situation of upstream damming, such as 3-Gorges dam recently, and climate variability. In the last half century, there were numerous dams (>30,000) emplaced on the upstream of the Yangtze basin. This has largely cut down annual sediment load into the seas from >470 million tons to <150 million tons presently. To understand the coastal sedimentation in response to the damming effect becomes urgent, because megacity of Shanghai stands on the coast. Shanghai coast has been long beneficial from the Yangtze siltation. For instance, the new airport of Shanghai is built on the reclaimed coast in the light of substantial efforts from SKLEC contribution. Also, coastal reclamation has made Chongming island enlarged by 50% in the past half century. Now the island has been protected solely for the purpose of 'green base' for the metropolitan city of Shanghai. To mitigate potential risks from coastal erosion induced from reduced sediment budget and Typhoon storm, staffs of SKLEC has taken painstaking tasks from national and local governments through insistent monitoring on the fluvial input and also the attributes from seas.



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Photo 2 – Dykes along the Yangtze coast, to prevent from coastal erosion being raised from reducing sediment budget, typhoon and high tides.

Saltwater intrusion study

Active research of SKLEC includes intensive monitoring on saltwater intrusion in the estuary, especially during the winter season, every year. Major concern is particularly given to the extremely lower discharge to the estuary, when dry climate occurs with basin-wide scale. The case of saltwater intrusion in 2006-2007 in the Yangtze estuary was of representative. The long-time duration (~8 days) of saltwater intrusion occurred in the estuary, due to basin-wide climate drought that lasted about 3 months, from the late 2006 to the early 2007. This has come nearly to the bottom-line of freshwater supplement to the megacity of Shanghai, where there are 10 days of freshwater supplement available for Drinking Water Company. Staffs of SKLEC have simulated, on the basis of intensive on-site field observation, freshwater circulation in the estuary under various physical settings. Modeling results have been extremely useful in helping the local government for integrated coastal management, now and in the future.

Photo 3. Distributions of the tidally averaged surface salinity for the model runs under the wet (left panels) and dry (right panels) season conditions (cited from Xue et al., 2009; JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 114,)

Basin-estuary ecological health

Like most world estuaries, environmental degradation has occurred in the Yangtze estuary primarily due to booming industry in the early of last century. Vast natural coastal land has been used for industrial development. Staffs of SKLEC have placed their great efforts on ecological restoration by the means of physical and biochemical study since 1980s. New-methods of GIS-related skills incorporated with remote sensing approaches have been widely applied to the Yangtze estuary, aiming at: 1) investigating spatial distribution of vegetation along the coast, 2) monitoring nutrient flux into the estuary as a function of terrestrial input, and 3) understanding changes of bio-ecological diversity in the estuary in response to climate warming and human impact. The recent research results of SKLEC have testified the dissolved nutrient fixation in the upstream dams, which has intensified occurrence of red tides in the estuary. Increasing *Prorocentrum dentatum* (non-siliceous alga) tends to be dominant species of the red tides in and off the Yangtze estuary. The number of big dams in the Yangtze River basin will double in the next 30-50 years and climate warming is foreseeable. These will significantly influence the variations of nutrient fluxes in the river basin and estuary, in relation to eco-health management of river-coast ecosystem.



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Integrated coastal management – socio-economical assessment

Except for basic theoretic researches, SKLEC has been also actively involved into the recent development of metropolitan city of Shanghai, in terms of socio-economical assessment for estuarine and coastal management. This key lab has taken many national key projects during the past decades. Consultation has been given to the local governments and stakeholders for sustainable usage and planning of natural resources and exploitation. Strategic freshwater resource that has remained as the most priority in the estuary is the future challenge, particularly while meeting the extreme climate and marine hazards. Policy modification is also proposed, which has been effectively helpful for improving the coastal management. In order to do better, SKLEC has set up long-term international exchange program for through institutional collaboration.

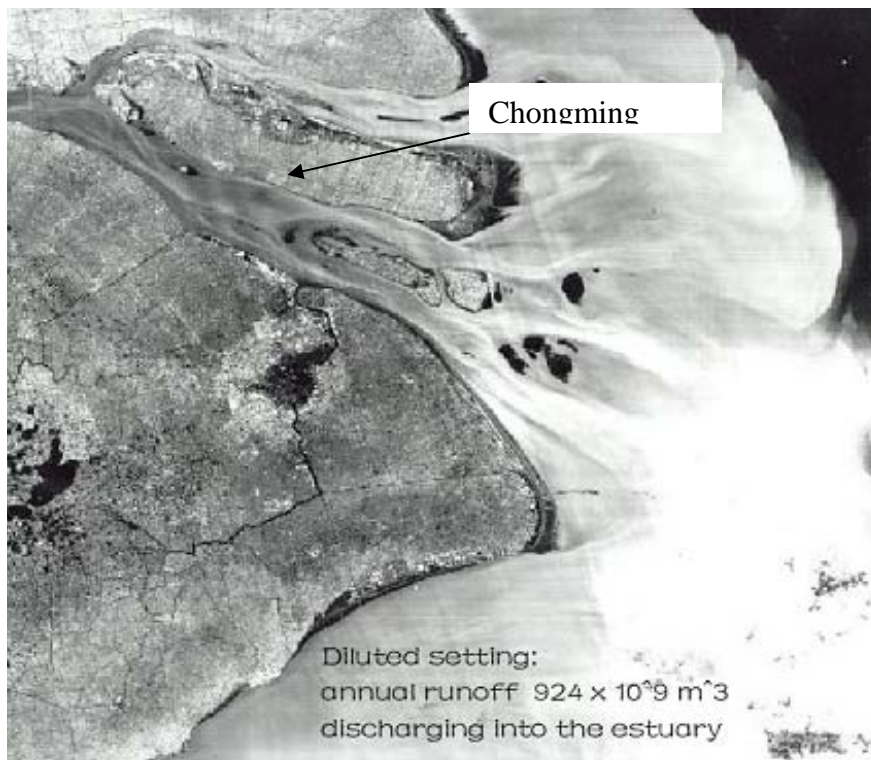


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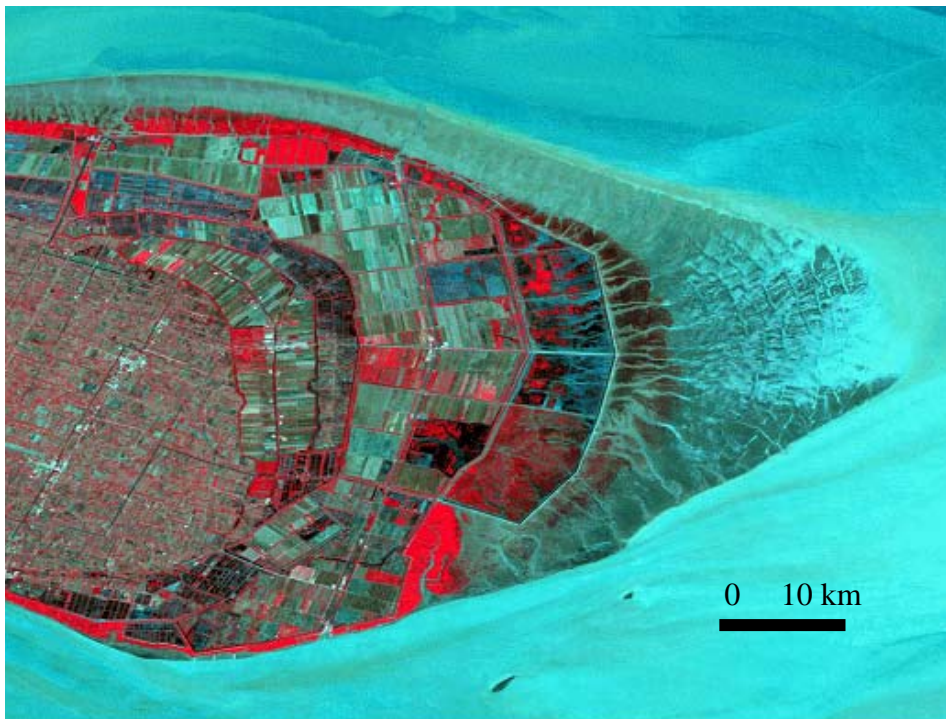


Photo – 1b rapidly growing Chongming island of the Yangtze estuary



Photo 2 – Dykes along the Yangtze coast, to prevent from coastal erosion being raised from reducing sediment budget, typhoon and high tides.



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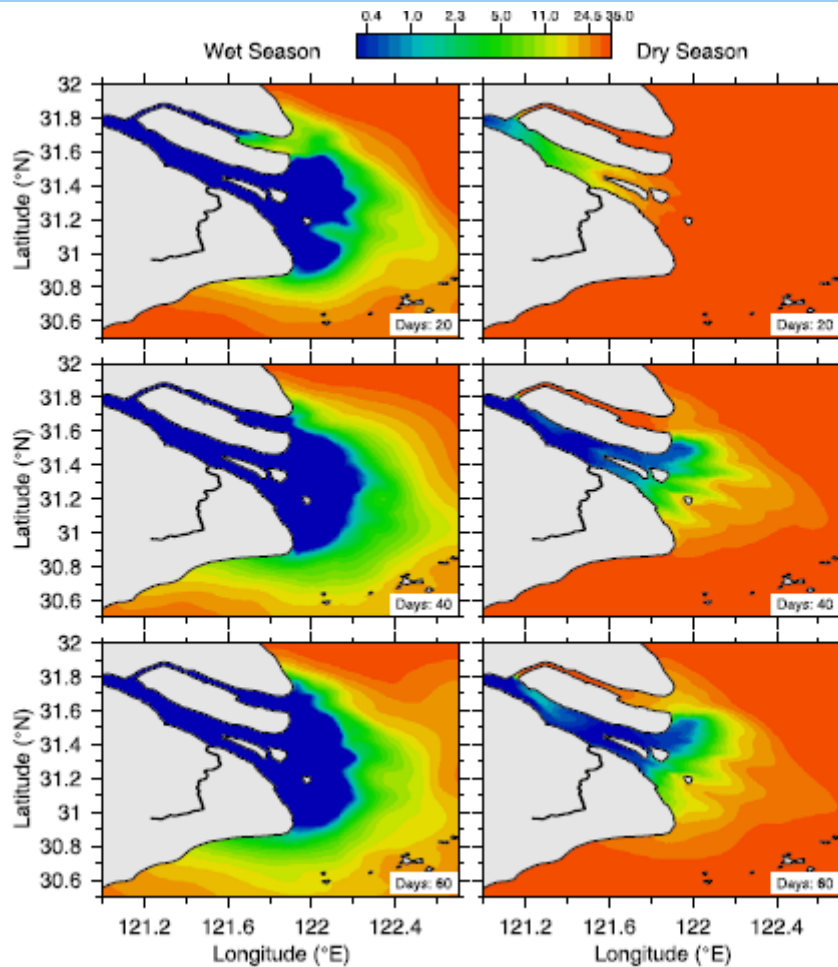


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