

THE CLIMATIC CHANGE AND THE RESPONSE IN THE COASTAL ZONE AND CONTINENTAL SHELF EVOLUTIONAL TREND

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The South China Sea Institute of Oceanology (Chinese Academy of Sciences –China) and l'Istituto di Scienze del Mare (National Research Council-Italy) have a mutual interest in the research on the coast-shelf system of the oceans, which is a critical environmental interface- a fundamental earth discontinuity where terrestrial; atmospheric processes converge and mutually influence one another across a spectrum of spatial and temporal scales. These fundamental questions can only be answered with multi-disciplinary and multi-scale investigations of sedimentary dynamics and resulting environmental and stratigraphic imprints, across the land-sea interface of the continental and insular margin.

Human alteration of the coastal in fact, constitutes a series of large-scale experiments that are disturbing the natural variability of the environment mainly considering the interference of climate changes with human activity. Unfortunately, we take these actions without full understanding of the fundamental processes that provide for the natural health and variability of that afflicted system.

Our collaborative will be carrying out with the common goal of protecting the marine environment and achieving sustainable development of coastal and marine areas even considering the future economic development of the coastal zone.

THE STUDY AREA.

The South China Sea coastal zone from the Pearl RiveZhujiang) delta up to the Hainan Island in China and the Northern Adriatic Sea in Italy from the Po river delta up to the Ancona promontory Southwards.

The Adriatic Sea coastal zone

The upper Adriatic coast of Italy, from the Po river delta up to the Ancona promontory, is a good example of high grade of environment destabilization.

Going from North to South, one first meets, the Po river delta, continuously developing into the sea. From here to the Gabicce promontory a continuous shallow littoral, with the Po plain at its back, extends.

From Gabicce to the promontory of Ancona the coast is a narrow, sandy and gravely strip which in some places lies at the foot of a cliff belonging to the Apennine Mountains, very often close to the sea.

The only factor common to such a morphologically diverse coast is erosion. To make up for the increasing erosive processes, many kinds of defence works have been put into operation. The sea walls ("Murazzi") associated with groins to protect the Venice lagoon; dikes to defend the lowland behind the shoreline and longard tubes in the Po river delta; breakwaters from the Po delta to South lie here and there along coastal stretches mainly protected by groins, or star-shaped concrete elements established on piles or by underwater barriers, constructed of synthetic sacks filled with sand and laid down in a cell, like system where cell is artificially replenished with sand.

All these protective works, constructed at different times and impelled by necessity, involve the coast without guaranteeing its future stability. Moreover, since they were built in the course of erosive process, their cost was astronomical.

If one considers the evolutionary trend of the whole Adriatic coastal area, it is evident how it was possible predict and subsequently prevent the present shore decay.

The dynamic of this coastal zone is quite simple. The sources of sediments, reworked by the waves and distributed along the shore by the long shore current from south to North, are the material transported by the rivers to the sea and the material derived from the landslides of the cliff from Gabicce to Southwards.

In the past time, the large sediments yield, mainly during the "little ice age", from the rivers to the sea indicates a general advancing of the shoreline in the Northern sandy littoral up to Gabicce with the maximum values corresponding to the rivers outlets.

The diminished sediment yield by the rivers after the end of the "little ice

age” (1600-1820) and the dangerous interference caused by the massive occupation of the coastal zone by the uncontrolled man activity during the last 60 years, produced the present general decay of the coastal zone.

The South China Sea coastal zone

South China Sea coastal zone, located at the tropical and subtropical region, includes coastal areas and coastal islands of three provinces (Guangdong, Guangxi and Hainan) in the South China, with long coastal line and diverse coastal geomorphological and sedimentary patterns. Along the coastal zone from the Pearl River delta to the southwest, the main coastal patterns consist of estuarine delta (Pearl River delta), bar-lagoon, promontory-bay, muddy plain, sandy coast, mangrove and coral reef in the Guangdong coastal zone; submerged valley, river delta, bar-lagoon, coral reef and mangrove in the Guangxi coastal zone, river delta, bar-lagoon, sandy coast, rocky cliff-bay, submerged valley, coral reef and mangrove around the Hainan island coastal zone.

The modern geomorphological and sedimentary patterns of the South China Sea coastal zone have been formed since the end of post-glacial period, geological structure background and sea level change played an important base for the development of the coastal zone. Influenced by the sea level rise during the early Holocene and sea level fluctuations during the mid-late Holocene, the South China Sea coastal zone experienced largely change since Holocene. At present, the coastal zone is faced with rather complicated environmental impacts from modern sea level change, coastal dynamic condition and the increasing human activities.

Coastal erosion and retreat occurred distinctly in some areas of the South China Sea coastal zone, responding to the recent sea level rise. These coastal areas changed from silting to scouring because of the present sea level rise, and decreased sediment source from the continent and the strengthened actions of wave and tide occurring along the nearshore zone.

In addition, some coastal erosion and retreat is strongly related to the direct effect of strong wave attack and the large amount of sediment losses after the uncontrolled human activities, such as coast engineering, sand dredging and mining, and the damage of coral reefs and mangrove, etc.

Otherwise, the coastal zone and the coast line show a marked seaward

extension inside the Pearl River (Zhujiang) estuary, resulting from the sedimentation and reclamation of land from the sea and the construction of the harbour and dyke-pond system around the western coast and eastern coast of the Pearl River estuary, respectively.

Since the diverse geomorphological and sedimentary patterns and complicated sea level change and coastal hydrodynamic condition, the South China Sea coastal zone is an ideal region to research on the coastal zone evolution, land-sea interaction and human activity impacts.