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STUDY ON THE CURRENT SITUATION OF CHANGES IN QUATERNARY SEDIMENTARY ENVIRONMENT IN COASTAL AREAS

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Abstract: The study of sedimentary environment changes in offshore waters is an important part of marine sedimentation research. This article analyzes and compiles the research results of the sedimentary environment in coastal waters in my country in the past 20 years, mainly including Bohai Bay-Yellow River Estuary, Yangtze River Estuary-Hangzhou Bay, Taiwan Strait, Pearl River Estuary and East China Sea and South China Sea areas. From different regions across the country, the research results include 4 sedimentary types in the Bohai Bay and 4 stages of the formation of the Yellow River Delta; 8 sedimentary environment zones from the Yangtze River Estuary to Hangzhou Bay; 3 sedimentary environment zones in the Taiwan Strait; 2 sedimentary environment zones in the Pearl River Estuary; cycle changes; three sea areas with different ecological environments in the South China Sea and four types of sedimentary areas in its north. Generally speaking, in the future, research on changes in the sedimentary environment in my country's coastal waters should be conducted from the perspective of the changes in the sedimentary environment of the entire coastal zone, through analysis and comparison of multiple characteristics; at the same time, research needs to strengthen dynamic observations of modern sedimentary environment changes, and conduct in-depth understanding of the dynamics of sedimentation and its relationship with the sedimentary environment. Research on environmental relationships.
Keywords: Quaternary geology; Marine geology; Coastal zone; Sedimentary environment

1 OVERVIEW OF RESEARCH ON SEDIMENTARY ENVIRONMENT IN NEARSHORE AREAS

Based on the analysis of the characteristics of my country's region and Quaternary strata, equal emphasis on sea and land is the highlight of Quaternary exploration in my country's coastal waters. Over the past half century, the exploration of the geology of China's coastal waters has drawn lessons from surveys to research, from the coast to shallow seas to deep seas, from the late Quaternary to the late Cenozoic, from low resolution to high resolution, and from qualitative Quantitative experience has been achieved and important results have been achieved, but further in-depth research is needed. In the 21st century, topics should be selected based on the key points of Quaternary exploration at home and abroad, with the offshore waters of the Western Pacific coast and the warm pool as the main battlefield, and exploration should be carried out in combination with land processes and modern processes [1].

He Qixiang believes that the Quaternary sedimentary sequence in the offshore waters of China's coastal zone should be explained by the opening and closing model of island arc channel channels. The opening and closing phenomena are controlled by sea level changes caused by climate events [2]. Based on the analysis of the sedimentary types and environment in the offshore waters of China's coastal zone, Liu Xiqing concluded that the continental shelf in the offshore waters of China's coastal zone, except for the bioclastic sedimentation type in the southern part of the South China Sea, is mostly terrestrial debris; semi-abyssal and continental shelves The regions have different depositional environments and depositional models; the sedimentation in the offshore waters of China's coastal zone has latitude zonality, circumland zonality and depth zonality; the carbonate solvation surface and CCD in the South China Sea (carbonate compensation depth), which is shallower than the depth in the Philippines and deep-sea clay deposition areas at the same latitude, and also shallower than the ocean [3].

To study changes in the sedimentary environment in coastal coastal waters, the cause is an important issue to consider. Although there are various explanations for the cause such as "capture mechanism", back-arc expansion mechanism, and intracontinental stress diffusion mechanism, there has not been one so far. The theory can explain the causes of sedimentation in all coastal and offshore waters. The cause It is not only the classic two-dimensional trench-arc-basin cross-section mechanism, but also a three-dimensional problem including the deformation of the continental plate on the plan view [4].

Shen Mingjie et al. preliminarily established the fluctuation sequence of sea level changes over time in eastern China since the Holocene, which is roughly bounded by 6500aBP. Before 6500aBP, the sea level rose rapidly in fluctuations; after 6500aBP, the sea level fluctuated frequently and the amplitude of changes weakened, but the general trend of its changes showed It has the characteristic of rising slightly in fluctuations[5]. Ancient river channels from different periods of the Quaternary Period are buried at different depths in the flood-alluvial floodplains and shallow marine continental shelves in eastern China. Zhao Yanxia and others discovered their formation age, burial depth, material

structure, structural characteristics, and their relationship with the upper and lower strata. Basically, it can be compared with [6]. The discovery of a large number of ancient river channels from the Last Glacial Maximum to the early Holocene shows that during the low sea level during the Last Glacial Maximum, all major outflow rivers in China flowed into the western Pacific through the shallow continental shelf that had exposed land.

In addition, the relationship between sources and sinks is the key to studying the interaction between sea and land, sea level changes and their sedimentation feedback. A major feature of the coastal offshore water area is its dual terrestrial source system. The offshore waters of China's coastal zone are backed by mainland China. Terrestrial clasts from land are the main material supply. Island-derived materials provided by island arc corrosion are another important material supply. The depositional sequence formed by the alternation of the two is arc Important sedimentological features of the back basin. The source of continental shelf sediments changes with changes in sea level. The terrigenous materials of the lowstand system tract and the highstand system tract basically come from onshore, while the source of the transgressive system tract mainly comes from the erosion and reconstruction of residual sand. Source-sink exchange is the key to correctly identifying the shelf sediment dispersion mechanism [7].

2 RESEARCH STATUS OF BOHAI BAY-YELLOW RIVER ESTUARY

Since the Yellow River flows into the Bohai Sea, this article discusses the Bohai Bay and the Yellow River Estuary together to facilitate an overall understanding of the Bohai Bay-Yellow River Estuary. At present, people divide the geological environmental changes in the muddy coastal zone (coastal lowland-intertidal zone-shallow sea area) on the west coast of Bohai Bay into: since the late Pleistocene-the "Little Ice Age", the end of the "Little Ice Age"-modern times and the next 50~ Three periods of 100 years were established, and their main research directions were established [8].

2.1 Different Sedimentary Types in Bohai Bay and Their Research

Wang Hong's research found that the Holocene strata in the muddy coastal zone of Bohai Bay have four types of sedimentation: the traditional "three-point" type far away from the coast; the frequent alternation of marine and continental layers; the Holocene layer that did not undergo sedimentation after the last glacial period. The brackish water marine-terrestrial transitional phase directly covers the sedimentary discontinuity that lasted about 10 to 20 ka, and further developed into a marine phase upward; the coastal low-lying areas entered the transgressive stage in the late Pleistocene after the last glacial maximum. The marine-continental transitional phase sedimentation in the late Pleistocene and early Holocene was continuous, and marine layers continued to develop upward [9].

Xu Qinjin et al. took 4 boreholes drilled through the Upper Pleistocene as an example. Based on lithology and sedimentary structure, using analysis methods such as 14C, microbodies and palynomorphs, and considering the knowledge of meteorological stratigraphy and sequence stratigraphy, they conducted a study on the Bohai Sea. The late Quaternary strata of the bay were divided, and the lithofacies paleogeography and neotectonic characteristics were discussed [10]. Shang Zhiwen et al. conducted a comprehensive study on Holocene sedimentary diatoms in the CH114 core on the west coast of the Bohai Bay and found that the Holocene has experienced an evolution process from land to sea: in the early Holocene, it was a continental phase to a salt marsh lowland environment affected by salt water. ; From 6646 to 4280 calBP, it was a shallow sea environment affected by strong storm conditions; since 4280 calBP, it was a shallow sea environment with the water depth becoming shallower [11]. The early to middle Pleistocene transgression in the Bohai Bay area is spatially limited and highly variable. There is still controversy over the existence of the early Pleistocene transgression, and large-scale transgression has occurred since the late Pleistocene. Research by Yao Zhengyi and others found that the occurrence of marine transgression in this area is the consequence of sea level rise caused by climate warming during the interglacial period against the background of continuous tectonic subsidence since the Quaternary Period [12].

The sedimentary types and distribution in the central and southern Bohai Sea are affected by seafloor topography, water environment and material supply, and have significant zonal diversity. Comparison of sediment maps in different periods shows that the distribution pattern of seabed sediments in the Yellow River Estuary and the central and southern Bohai Sea has changed significantly, which not only reflects the dominant role of the residual current system in sediment transport in this sea area, but also reflects the The extension of the Yellow River mouth has a certain effect on the sediment distribution in the southern Bohai Sea area, and the discontinuation of the Yellow River has a significant impact on the sediment distribution in the estuary area [13].

2.2 Research On Marine Sedimentation in the Yellow River Estuary Area

Based on the changes in the thickness of Holocene marine sediments in the western part of the South Yellow Sea, the sedimentary sequence of the QC4 hole in Chenjiaxiang, Xiangshui County, northern Jiangsu, the early Holocene sedimentary sequence of the Lixiahe depression south of Funing and north of Taizhou, and the materials of the sand ridge along the coast of northern Jiangsu. Judging from the composition, about 8500 years ago, the Yellow River flowed northward and poured into the Bohai Sea. The Yellow River underwater delta did not form during the sea level

rise between 8500 and 7000 years ago. The Yellow River delta began to form again 7000 years ago [14]. The Yellow River alluvial fan is an alluvial fan complex that has been accumulated in many stages since the Quaternary Period. It is not only a geomorphological unit where sediment from the Loess Plateau was violently deposited, but also an area where rivers have been breached and changed their courses in the past dynasties. It is also the birthplace of Chinese culture. The distribution pattern of the lower reaches of the Yellow River from wide to narrow from top to bottom Usually an inherent feature of alluvial fan channel development. And their evolution is also affected by It is subject to the limitations of factors such as meteorology, Yellow River sediment, geological structure, and terrain changes [15].

Xu Yuanqin and others found that the coastal wetland in the Yellow River Delta is a coastal wetland system that slowly develops and evolves based on the material of sediment carried by the Yellow River and the interaction of land and sea forces [16]. The lateral evolution of the Yellow River Delta coastal wetland goes through four stages of sediment lobe formation and development: fan-shaped plane expansion stage, longitudinal protrusion extension stage, and lateral expansion stage, abandonment and innovation stage. The development process creates a stage for the development and formation of wetlands. material conditions and living environment. Through the analysis of grain size, foraminifera, pollen and dating data, it is believed that the bottom of hole HS908 is shallow marine sediments, above which are the delta side sediments of the lobe from 1889-03 to 1897-05 and the lobe from 1976 to present. The onshore delta plain sediments reflect the superposition relationship during the seaward advancement of the delta. The Yellow River Delta coastal wetland appears vertically as an overlay of lobes of different stages above the base.

To sum up, in recent years, the research on the sedimentary environment of this area has mainly focused on the Quaternary and Holocene stages, and mainly analyzed the soil layers through drilling and sampling, combined with the different layering characteristics of organisms or vegetation and the actual coastal waters. based on regional conditions.

3 RESEARCH STATUS OF YANGTZE RIVER ESTUARY-HANGZHOU BAY

Islands such as Chongming, Changxing, and Hengsha at the Yangtze Estuary were formed by the sand bars at the mouth of the Yangtze River in the Holocene. Because the Yangtze River suffered severe erosion at the end of the Late Pleistocene, and the ancient valley was deeply cut, the estuary sand bars developed. Their Holocene accumulations are intact. They are strong evidence for studying the formation history and accumulation process of the Yangtze River estuary delta [17]. The main body of the Yangtze River Delta is located in the structural subsidence area. The sediment that shapes the Yangtze River Delta basically comes from the Yangtze River, and some comes from the abandoned Yellow River Delta and Qiantang River. The effects of waves, tidal currents and coastal currents in the Yangtze River Estuary area are moderate, and the seafloor slope is stable, which is conducive to the preservation of the delta. In the 21st century, due to the sharp decline in sand inflows and the sharp rise in sea levels at the Yangtze River Estuary, the delta will The siltation rate will be significantly reduced, and severe corrosion may occur in some areas [18].

Zhang Pingping found that the magnetic susceptibility and rock stratigraphic characteristics of borehole sediments changed significantly in the extraordinary era boundary area, and regional comparisons can be implemented based on this [19]. Since the Quaternary, continuous tectonic subsidence has occurred in the Yangtze River Delta area, and the subsidence core has continued to move to the southeast. The occurrence and persistence of tectonic subsidence movements occurred in three important periods: 2.58Ma, 0.78Ma, and 0.125Ma respectively. Zhang Weiyan et al. conducted a detailed analysis of the sedimentary dynamic environment of the Yangtze River Estuary-Hangzhou Bay and its adjacent sea areas, and divided it into eight sedimentary environment divisions: two strong dynamic The modern sedimentary area of Lihekou consists of two nearshore water mass intersection areas, a shelf water mass frontal area, two residual sedimentary areas, and a cold vortex modern sedimentary area [20]. And through cluster analysis of rare earth elements and platinum group elements, combined with the dynamics of the study area Environmental analysis shows that the modern sedimentary area of the Yangtze River Estuary and the northeastern coast of the Yangtze River Estuary The modern sedimentary area, the modern sedimentary area of Hangzhou Bay, and the modern sedimentary area of the cold vortex in the southwest of Jeju Island are dominated by material input from the Yangtze River; to the east of the Taiwan Warm Current, the Yellow River The residual sand of the East China Sea shelf and the residual sedimentary area of Yangtze Shoal on the shelf to the west of the coastal current are mainly from the Yellow River. The modern sedimentary area at the mouth of the Qiantang River, the mixed transitional sedimentary area between modern sedimentary and residual sedimentary sediments on the nearshore, and the mixed area between modern sedimentary and residual sedimentary sedimentation on the shelf east of the Yellow Sea coastal current are dominated by mixed input sources.

By comparing the well-studied drilling data in the Yangtze River Delta region and revealing the Quaternary strata, Zou Liang and others found that the source of Quaternary materials and the depositional environment of the Yangtze River Delta were relatively stable [21]. Although the DZS2 hole in the offshore area of the Yangtze River Estuary also shows multiple sedimentary cycles, compared with the onshore delta area, its lithological changes are relatively simple and cannot completely correspond to the onshore Yangtze River Delta strata. Due to the undulating bedrock, the higher basement at the outer edge of the estuary area may have hindered the outward input of materials from the Yangtze River. The sedimentary strata of the DZS2 hole in the offshore area of the Yangtze River estuary are no longer a simple continuation of the Yangtze River Delta strata.

Generally speaking, there is a lot of research data on the Yangtze Estuary-Hangzhou Bay area [22,23]. Through cluster analysis of elements and stratigraphic cycle phenomena, a series of conjectures or conclusions can be drawn, which provides a reference for current research. important materials.

4 RESEARCH STATUS OF TAIWAN STRAIT

The Taiwan Strait is the largest strait in my country and an important channel for material and energy exchange between the South China Sea and the East China Sea. The sediment distribution pattern in the Taiwan Strait is very consistent with the circulation system. The sea areas and estuary areas touched by the warm current and Kuroshio branch of the Strait are sandy accumulations, and the areas where the coastal currents pass through are fine-grained accumulations. The area between the two current systems is Thick and fine mixed accumulation. Different water environments are located in different geomorphological locations. For example, the strait warm current acts on the strip depression in the center of the strait, and the influence of the longshore current not only affects the nearshore slopes in the west, but also affects the shelf plains between the depressions [24].

Fang Jianyong et al. used systematic clustering analysis and factor analysis to analyze the particle size composition of 283 surface sediment samples and the mineral composition of 85 samples in the Taiwan Strait. They concluded that the surface sediments in the Taiwan Strait are composed of 6 sediment types. They can be divided into three main depositional environment areas corresponding to sedimentation dynamics [25]. Type I sedimentary areas: basically scattered in Taiwan shoals and nearby sea areas, distributed in lumps on the west and north sides of the Penghu Islands, and in Taiwan There are sporadic distribution in the northeastern corner of the bay and strait. Type II sedimentary area: basically distributed in the northern part of the study area, with scattered distribution on the southern slope and northeast of the study area. Type III sedimentary area: basically distributed in strips in the southeastern sea area of Haitan Island in the northern Taiwan Strait and the northwestern sea area of Taiwan Island, and scattered in several sea areas in the central and southern parts of the strait. The factors that affect the distribution and content changes of minerals in surface sediments in the Taiwan Strait are material supply, followed by the water environment and the metamorphic level of the minerals themselves.

Based on the sedimentary facies, grain size and AMS14C age analysis and high-resolution shallow stratigraphic section interpretation of the geological shallow drilling (TWS1208 hole) in the western part of the Taiwan Shoal, Wang Libo et al. found that three phases of marine strata are preserved in the western part of the Taiwan Shoal: the lower The marine layer (DU6) is an intertidal layer dominated by clayey silt and silty clay. Zone-subtidal zone shallow sea accumulation; the middle marine layer (DU4) is a coastal-intertidal zone accumulation mainly composed of fine sandy silt and clayey silt; the upper marine layer The layer is mainly medium-coarse sand, DU2 is transgressive sand, and DU1 is the latest tidal current sand. ocean The facies layer is divided by two phases of valley-fill accumulation (DU5 and DU3) subjected to exposed oxidation [26]. Research on the sedimentary environment of the Taiwan Strait has mainly focused on surface layer research in recent years, with few stratigraphic analyzes through drilling. In addition, the analysis object is relatively single, and the changes in the sedimentary environment are not grasped as a whole.

5 RESEARCH STATUS OF PEARL RIVER ESTUARY

China's Pearl River alluvially forms the Pearl River Delta where it enters the sea in central Guangdong. It is composed of three small deltas alluvial by the Xijiang, Beijiang and Dongjiang rivers, covering an area of about 11,300 km2. Among them, the Xijiang and Beijiang deltas account for one-tenth. There are more than 160 bedrock residual hills on the delta. They were originally islands in a shallow bay about 6000 to 2000 years ago. The sediment content of the Pearl River is relatively small, with the annual total sediment volume not exceeding 100 million tons. The shallow bays with many islands are conducive to sediment accumulation, so the delta's economic construction has been rapid since 2000. In the modern Pearl River Delta region, where the geological environment changes rapidly, there are many views on the age of Quaternary sedimentation.

Through analysis of organic carbon, terrestrial organic carbon and carbon-nitrogen ratio, and using micropaleontology and 14C dating materials, Gao Fanglei and others divided the PD hole into four depositional stages, revealing the two phases of transgression-regression-transgression-regression in the Pearl River Delta. The change process of a cycle [27]. Among them, the first transgression was more intense, about 22.21 kaBP. The first large-scale regression of the Pearl River Delta began, and the delta plain underwent strong weathering and denudation during the Last Glacial Maximum in South China; the second transgression was smaller in scale, belonging to Transitional sedimentation between sea and land. The second sea regression began around 2.88 kaBP in the late Holocene. The climate was hot and humid, and the delta was dominated by rivers entering the sea. Chen Shuangxi and others used records of sea level changes in the South China Sea and found through AMS14C and optical luminescence dating that the oldest age at the bottom of the Quaternary core of QZK4 hole in the hinterland of the Pearl River Delta is approximately 43.71ka BP[28]. The Quaternary environment recorded in the core has a good feedback on the sea level changes in the South China Sea: the continental fluvial sediments and exposed regolith in the lower part of the core were developed during the low sea level period from the last glacial period to the early Holocene, and the coastal-estuarine sediments were developed in the

upper part. During the period of high sea level since the early and middle Holocene. According to the environmental analysis of the borehole core, it is inferred that the Quaternary bottom boundary of the modern Pearl River Delta region may be older than that recorded in this borehole.

Wang Jianhua and others inferred based on the dating data, lithofacies characteristics and palynostratigraphic information of the GZ-2 hole in the Pearl River Delta that the Holocene sporopollen assemblage began to accumulate at 6.0 kaBP in this area, and the characteristics of the Holocene sporopollen assemblage are significantly different from those of the Pleistocene. It is revealed that there are significant changes in the climate between the Holocene and the Pleistocene[29]. Pollen and sedimentary information show that the Holocene climate in this area was basically warm and humid, with little climate change. It was hottest and humid between 5.0 and 2.4 kaBP, relatively cool and dry between 2.4 and 1.9 kaBP, and then returned to warm and humid. Among these relatively significant changes are also sub-level weaker changes. In addition to reflecting climate fluctuations, pollen information also reveals certain sedimentary environmental changes and human activity information. This area experienced a significant transgression in the mid-Holocene. After entering the late Holocene, the impact of human activities on the delta vegetation and environment intensified. At this time, the water depth gradually became shallower, and the sedimentary environment changed from estuary bays, shallow seas, and coastal tidal flats. It slowly evolves into a delta plain, and the fluctuations in regional climate and sea level changes tend to be basically unified. The distribution characteristics of rare earth elements (REE) in PRD05 hole in the southern plain of the Pearl River Delta are closely related to changes in the sedimentary environment in the late Quaternary. As the depositional environment changes in each time period, the distribution of rare earth elements also changes accordingly [30]. Weng Yi et al. studied the AMS (magnetic spectrometer) age and age of Dongyong section samples in Panyu, Guangzhou. Mangrove pollen analysis found that late Pleistocene and Holocene mangroves existed in the Pearl River Delta, and mangroves are one of the signs of marine invasion [31]. According to the distribution of 9 sections in which mangrove pollen was detected and the distribution of 5 buried mangrove decayed trees, the boundaries of the Holocene transgression can be delineated. According to the comprehensive analysis of the sedimentary cycle of the Tung Chung section, sample age, mangrove pollen content curve, brackish water-freshwater diatom and thermal-temperature diatom content curves, the changes in the sedimentary environment can be divided into four stages. The first and third stages of transgression were beneficial to the growth of mangroves, while the second stage was not conducive to the growth of mangroves. In the fourth stage of the late Holocene, mangroves grew frequently, showing the influence of human factors.

The Pearl River Estuary is one of the more developed areas in my country, so there are many discussions on the sedimentary environment of the Pearl River Estuary. The main research content focuses on the impact of transgression and regression on the Pearl River Estuary.

6 RESEARCH STATUS IN OTHER REGIONS (EAST CHINA SEA AND SOUTH CHINA SEA REGIONS)

In addition to the above-mentioned research on the offshore water areas of my country's main coastal zones, there are also some research results on the East China Sea and South China Sea. The specific results are as follows.

In the Quaternary (northern South China Sea), with changes in glacial and interglacial periods, the depositional environments alternated between nearshore land surface erosion environments, shallow water coastal depositional environments, and shallow sea environments. The "gangling hillside" section in Hong Kong belongs to a land surface weathering and denudation environment, while in the "valley plain" the land surface weathering and denudation environment has evolved into a land surface river, lake or swamp depositional environment. Solar radiation pulsation and other factors are comprehensive factors that affect paleoenvironmental changes [32].

Li Liang et al.'s research found that gravel is basically distributed in the southern Taiwan Strait, areas with high sand content are basically distributed in the southern Taiwan Strait and the waters near the Dongsha Islands, areas with high silt content are basically distributed in the southeast of the study area (northern South China Sea), and areas with high clay content are basically distributed in the southern Taiwan Strait and the waters near the Dongsha Islands. The area is basically scattered in the deep water area in the south of the study area, with high carbonate The content area is mainly located in the areas adjacent to the Dongsha Islands and east of Hainan Island (19° N, 112 °E) sea area [33]. Using factor analysis method, the northern part of the South China Sea is divided into four categories sedimentary area. Area I is a clay-level sedimentary area, concentrated in the southeast of the study area. Sea areas with larger water depths; Area II is a medium to fine sandy sedimentary area, concentrated on the outer continental shelf of western Guangdong and the coast of South China; Area III is a coarse to medium silty sandy sedimentary area. They are concentrated in the southeastern part of Qiongtong, the mainland slope of the Pearl River Estuary, and the mainland of southwestern Taiwan. Shelf; Area IV is a coarse sandy sedimentary area, concentrated in the inner continental shelf waters of southwestern Taiwan.

Chen Muhong et al. used mathematical statistics and cluster analysis to obtain that the northern, central and southern South China Sea are represented by three sea areas with differentiated ecological environments: the northern sea area is more significantly affected by land sources; the central sea area is affected by central water masses, submarine volcanic activities and It is controlled by upwelling activities in summer; the southern sea area basically belongs to a typical coral reef marine environment, and the ecological and sedimentary environment is significantly superior to that of the

northern sea area [34]. The assemblage and distribution characteristics of radiolaria in the surface sediments of the South China Sea better reflect and represent the ecological environment and accumulation conditions of the sea area, and are an important basis for discussing the ancient marine environment.
Hao Tianjuo et al. believe that the gravity field in the East China Sea region has the characteristics of "east-west zoning" due to deep structures, and the formation of the Okinawa Trough Basin should be related to the oceanic plate. It has a great relationship with the subduction and retreat effect of the block [35]. At the same time, it is believed that the Philippine Island Arc It shows a more special structure, a depression under the Moho surface, and a lower velocity at the top of the upper mantle. According to the judgment, the South China Sea and the Pacific plate show the characteristics of opposites along the Philippine Island Arc here.

7 SUMMARY AND OUTLOOK

7.1 Summary

The discussion on changes in the sedimentary environment in my country's coastal waters mainly involves analyzing and studying drilling and sampling soil layers, taking into account various factors such as organisms, elements, sea level changes., and applying mathematical statistics, cluster analysis and other measures to obtain research conclusions. In recent years, research has been done on:
(1) Four types of sedimentation in the Bohai Bay: the traditional "three-point" type far away from the coast; repeated alternations of marine layers and continental (sea-land transition) layers; the last glacial period It did not undergo sedimentation in the later period, and the Holocene brackish water transitional phases directly overlaid the historical On the sedimentary discontinuity surface of about 10~20 ka, a marine layer further developed upward;
The low-lying coastal areas have entered the transgressive stage in the late Late Pleistocene after the Last Glacial Maximum. The transitional phase deposition between sea and land in the late Late Pleistocene and early Holocene is continuous, and marine layers continue to develop upward;
(2) Four stages of the formation of the Yellow River Delta: fan-shaped plane expansion stage, longitudinal protrusion and extension stage, lateral expansion stage, and abandonment and transformation stage;
(3) Eight sedimentary environment divisions in the Yangtze River Estuary-Hangzhou Bay: two modern sedimentary areas in strong dynamic estuaries, two nearshore water mass intersection areas, one shelf water mass frontal area, two residual sedimentation areas, and one cold vortex modern sedimentary areas;
(4) There are three types of sedimentary environment areas in the Taiwan Strait: Class I sedimentary area: concentrated in Taiwan shoals and nearby seas, distributed in lumps on the west and north sides of the Penghu Islands, and scattered in the northeastern corner of the Taiwan Strait. Type II sedimentary area: concentrated in the northern part of the study area, and scattered in the southern slope and northeast of the study area. Type III sedimentary areas: concentrated in the southeastern waters of Haitan Island in the northern Taiwan Strait and the northwest waters of Taiwan Island, scattered in strips, and scattered in individual waters in the central and southern parts of the Taiwan Strait;
(5) Two cycles of changes in the Pearl River Estuary: transgression-regression-transgression-regression;
(6) There are three sea areas with differentiated ecological environments in the South China Sea: the northern sea area is significantly affected by land sources; the central sea area is controlled by central water masses, submarine volcanic movements and summer upwelling activities; the southern sea area is generally a typical coral reef ocean. The environment, ecology and sedimentary environment are significantly superior to those in the northern sea area. and four types of sedimentary areas in its north: Area I is a clay-level sedimentary area, which is concentrated in the sea area with larger water depth in the southeast of the study area; Area II is a medium and fine sandy sedimentary area, which is concentrated in the outer continental shelf of western Guangdong and South China. The continental coast; Area III is a coarse to medium silty sedimentary area, which is concentrated in the continental slope of southeastern Qiongnan, the Pearl River Estuary, and the outer continental shelf of southwestern Taiwan; Area IV is a coarse sandy sedimentary area, which is concentrated in the inner continental shelf of southwestern Taiwan.

7.2 Outlook

(1) At present, the sedimentary environment of my country's coastal and offshore waters is mainly studied and analyzed in a single area. In the future, the scope of research should be expanded, and even based on the sedimentary environment of my country's entire coastal zone, multiple characteristics should be used to analyze and compare;
(2) Strengthen the dynamic observation of modern sedimentary environment changes and conduct in-depth research on the relationship between sedimentary dynamic processes and the environment;
(3) The coastal waters are not an independent entity. They are a complex of interactions among rivers, seas, rocks, atmosphere, organisms and other factors. Therefore, in the future, more emphasis should be placed on cross-disciplinary and comparative research with other geological records..

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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