Shelf morphology on deep-marine sediment dynamic

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ABSTRACT

Shorelines and shelves that deposit calcium carbonate sediment make up a significant, although not overwhelming, portion of the world's continental shelf seas. Tropical coral reefs and the white sand beaches of tropical and temperate coasts are the most well-known examples of these deposits. Grain size maps, calcium carbonate content maps, and shelf morphology maps are all shown.

Two separate domains can be found on the shelf: terrigenous and carbonate. The inner shelf has more terrigenous sediment, whereas the outer shelf has more carbonate. North of Cape So Tomé, the carbonate domain reaches the inner shelf. Carbonate is the coarsest material on the shelf, whereas siliciclastic is the finest. Morphology and sedimentary facies are inextricably linked. Carbonate sediments have a rougher morphology and are better at maintaining paleochannels.

Key Words: *Geological hazards; Terrigenous; Bio clastic; Eustatic; Sedimentological; Low stand*

INTRODUCTION

Biotic and abiotic carbonates, average rates of accumulation on the sea floor in tropical shelves are around 1 m/year3. Only biotically-controlled carbonates accumulate in cold-water shelf habitats, and they do so at a slower rate (0.1–1 m/year3) than their warmer-water counterparts. Both of these rates of sediment accumulation are many orders of magnitude larger than passive continental margin subsidence (0.01–0.1 m/year3), implying that carbonate sediments infiltrate shallow-water locations and accumulate to sea level or wave base [1]. A carbonate platform is a flat-topped unit of carbonate sediment and rock that forms as sediment accumulates on either of these surfaces. The accumulation of skeletons and shells built by marine organisms through the precipitation of calcium carbonate forms the majority of carbonate deposits (e.g. corals, molluscs, and foraminifera). Skeletal carbonate sediments, also known as bio clastic carbonate sediments, are a type of carbonate deposit. Skeletal sediments can be found in both warm and cold oceans along the world's shelf. They are most frequent on continental shelves where huge amounts of eroded and transported siliciclastic silt are not present, such as near major river mouths and hilly coastal zones. The diverse ecologies of the creatures that construct skeletons and shells affect the composition of skeletal carbonates [2].

It is critical to improve our knowledge of the governing factors (e.g., tectonic, eustatic, and climatic) on deep-marine sediment dynamics in these environments. Most pioneering studies show that, in addition to tectonic control, eustatic and climatic fluctuations strongly influence deep-marine stratigraphic patterns along subduction margins (i.e., trenches and forearc basins), as seen along the Peru–Chile Trench, the Aleutian Trench and the Cascadia margin, the Astoria canyon and fan system. Some recent research has focused specifically on the last glacial–interglacial imprint found in deep-marine settings around the Hikurangi Margin [3].There has been no direct research on the characteristics that affect the deep-marine sediment dynamics in this area. Our main goals are to identify the different types of gravity-flow deposits for each system tract during the last glacial–interglacial cycle (Late Pleistocene to Holocene) in order to construct a reliable sedimentological model corresponding to a complete stratigraphic sequence, and (ii) identify the different extrabasinal and intrabasinal parameters controlling the sediment dynamics of the Kumano Basin during sea-level rise. We focus on a high-resolution shallow seismic dataset that spans the whole basin, from the Taiji to the Anoriguchi canyons, allowing us to investigate the morphodynamics of a forearc basin supplied by diverse sediment sources during a period of sea-level rise [4].

The growth of sequence stratigraphy over the last 50 years without oversight from any international stratigraphic scientific community has resulted in language mismatches and confusion. The goal of this paper is to define the vocabulary of deep-marine sequence stratigraphy, which is employed in this research. We describe an individual stratigraphic sequence as including three system tracts, from base to top, because there are no temporal or physical norms for the scale of stratigraphic sequences. These are the low stand, transgressive, and high stand systems tracts. The basal surface of forced regression at its base and the maximal regressive surface at its summit define the low stand systems tract, which is found at the bottom of a stratigraphic series [5].

It comprises both the regression deposits (i.e., falling stage systems tract) and the low stand systems tract (i.e., when the sea level is at its lowest). We used the standard seismic stratigraphic mapping tools implemented in the Kingdom Suite 2018 to map key horizons bounding the systems tracts and different seismic facies, and we followed standard seismostratigraphic interpretation techniques based on reflection terminations, reflection configurations, and geometry of facies units. The seismic basement depth (the deepest visualized reflector) is determined by the seismic penetration depth and varies across the basin due to lithological variances in acoustic signal attenuation.

SEISMIC UNITS AND FACIES

In the Upper Pleistocene/Holocene deposits, three primary acoustic facies can be recognized, allowing the sub-bottom profiler dataset to be divided into three discrete depositional units, ranging from unit 3 (the oldest) to unit 1 (the youngest) (the youngest). Each unit is defined by a horizon (i.e., boundary surface) that marks distinct changes in the succession, which are regarded as stratigraphic transitional phases.

The very constricted Anoriguchi Canyon mouth is characterized by stacked sheet-like, parallel, low- to moderate-amplitude reflections, with some dispersed lens-shaped deposits. The majority of the material is restricted between sediment waves on the basin's eastern and western margins. In a proximal-distal direction, the high-amplitude reflections decrease.

The top of was originally identified in the deep basin area since it is simpler to discern the last occurrence of high-amplitude reflections there. Unit 1 is mostly represented in the deep basin by a continuous, parallel, reflection-free layer. Throughout the deep basin, a single continuous high-amplitude reflection is visible, roughly near the middle of unit 1. There is a high content of parallel high-amplitude reflections in the proximal area of the deep basin, such as near the Taiji Canyon Mouth, but the amount diminishes in a proximal–distal direction [6].

The thickest unit is Unit 3b, which has a thickness of up to 28 metres in the deep basin and on the northwestern platform. We infer that the deep basin was primarily fed by the Anoriguchi Canyon to the east and the Taiji Canyon to the west, whereas the northwestern platform was primarily fed by the network of smaller canyons in the basin's northwestern area, based on

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the presence of two depocenters in unit 3b, i.e., in the deep basin and the northwestern platform. The mean envelope in unit 3b, which indicates the degree of reflection, is extremely low throughout the basin. This is due to the high content of chaotic, low-amplitude reflections that define cohesive-flow deposits, as well as the fact that the data exceeds seismic penetration limitations. Between unit 3b and unit 3a, the thickness decreases significantly, with the primary depocenter of unit 3a lying in the northern platform and near the mouth of the Anoriguchi Canyon, with a maximum thickness of 18 m [7]. Units 1 and 2a have comparable sediment patterns, with the primary depocenter in the northwest platform. Within the Anoriguchi Canyon, Unit 1 thickens to a thickness of around 9 metres. The mean envelope value between the deposits of unit 2b and those of unit 1 decreases because unit 1 is primarily made up of hemipelagic mud. In the proximal sections of the basin, such as the northern platform and the Taiji and Anoriguchi canyon openings, the mean envelope is higher (and similar to unit 2) than in the distal areas, indicating that some sand input reaches the proximal basin.

The energy-intensive process of precipitating a skeleton necessitates well-lit oxygenated marine waters of normal salinity for most organisms to create skeletal carbonates. Chemical circumstances must favour the precipitation of calcium carbonate from saltwater for non-skeletal carbonates; this occurs in conditions of increased temperature and salinity, as well as lower quantities of dissolved carbon dioxide. All of these factors favor faster carbonate sediment accumulation in shallow tropical seas than in colder temperate environments.

The word "carbonate platform" is used to describe a variety of carbonate shelf morphologies as well as a stratigraphic term for thick deposits of shallow-water carbonate rocks.•Connected carbonate platforms are carbonate shelves that form around and prograde from a nearby landmass, and the words carbonate platform and carbonate shelf are sometimes used interchangeably for both contemporary sediments and ancient rocks created in this environment: Land-derived siliciclastic sediments are occasionally mixed up with sediments from nearby shallow-water carbonate factories in shorelines and shallow-shelf sites [8].

An unattached or isolated platform (also known as a carbonate bank, e.g. Great Bahama Bank) is a small, circular isolated platform built over a sinking volcano or undersea high and is separated from any significant landmass by deeper waters. Attached or isolated platforms can have two distinct morphological characteristics that have a significant impact on sediment collection and dispersion on the shelf:

- A shelf margin rim or barrier, such as a reef or sand shoal, partially separates an inner platform or lagoon and drops sharply into deeper waters on the seaward side of a rimmed carbonate platform.
- A carbonate ramp is a gently sloping (less than 1°) platform or shelf that leads to the open sea or ocean and has no significant reefs or rim.

The sedimentary processes that occur on the many morphological types of carbonate platforms, as well as the various types of sediment that accumulate on them, are the topic of this article. Because the features of these sediments are frequently linked to the climatic setting, examples from both warm, humid, and arid settings, as well as a cool-water environment, are included. This information is crucial for understanding how and where ancient limestones accumulated. Carbonate rocks are commercially significant because they are widely used in the construction sector, and they also contain water aquifers, oil and gas reserves, and heavy metal accumulations. They are also used in the pharmaceutical sector. The continental shelf morphology offshore of western Sicily suggests that two of the Egadi Islands, Favignana and Levanzo, were connected to Sicily by a wide emerged plain during the Last Glacial Maximum (LGM, 20 ka cal BP), while Marettimo was only separated from the other islands by a narrow channel during the LGM. We focused on two significant time slices.

The evidence presented in this study, particularly the radiometric data, supports the theory that seafaring in the western Mediterranean region began between the early Mesolithic and late Epigravettian (between 8.4 ka cal BP and 13.5 ka cal BP), though it was not well-established until the Neolithic.

Bathymetry along the coast is also essential since it regulates incident wave energy. This is especially critical when the shelf morphology is disrupted, such as when undersea canyons are present.

CONCLUSION

Bottom rugosity, bed forms, and facies are used to divide the continental shelf into sections with similar geomorphic properties. Morphology and sedimentary facies are inextricably linked. Carbonate sediments have a rougher morphology and are better at maintaining paleochannels, whereas siliciclastic sediments have a smoother morphology and are better at preserving paleochannels. Major driving forces and controls Its effectiveness of headlands as natural sediment barriers is determined by the interaction of various factors including geomorphological constraints, oceanic and climatic forcing, as well as sediment qualities and availability. Evans (1943) discovered that erosion and deposition patterns around piers, groynes, and other manmade facilities erected outward from the shore are strikingly similar to those found around a headland.

REFERENCES

1. Gerber TP, Pratson LF, Kuehl S, et al. The influence of sea level and tectonics on Late Pleistocene through Holocene sediment storage along the high-sediment supply Waipaoa continental shelf. Mar Geo. 2010;270(1-4):139-159.
2. Agar SM, Cliff RA, Duddy IR, et al. Accretion and uplift in the Shimanto Belt, SW Japan. Journal of the Geological Society. 1989;146(6):893-896.
3. AOKI T. Late Quaternary equilibrium line altitude in the Kiso Mountain Range, central Japan. Geo Rev of Japan. 2000;73(2):105-118.
4. Cornard PH, Pickering KT. Supercritical-flow deposits and their distribution in a submarine channel system, middle Eocene, Ainsa Basin, Spanish Pyrenees. J Sed Res. 2019;89(6):576-597.
5. Fukusawa H. Non-glacial varved lake sediment as a natural timekeeper and detector on environmental changes. Quat Res (Daiyonki-kenkyu). 1995;34(3):135-149.
6. Ikehara K. Recurrence interval of deep-sea turbidites and its importance for paleoseismicity analysis. An example from a piston core analysis from Kumano Trough, southwest Japan forearc. J Sed Soc Jap. 1999;49(49):13-21.
7. Elom NI, Entwistle JA, Dean JR. How safe is the playground? An environmental health risk assessment of As and Pb levels in school playing fields in NE England. Env Chem Let. 2013;11(4):343-51.
8. *Oleg Halidullin.* Variety of clouds. J Env Geo. 2021;5(2).1-1.