Architecture and Development of Miocene Carbonate Platform in the Beikang Basin, Southern South China Sea

YAN Wei 1,2,3, ZHANG Guangxue1,2,* XI Bin1, ZHANG Li2,3, YANG Zhen2,3 and LEI Zhenyu2,3

1. Sun Yat-Sen University, Marine Institute, Guangzhou, Guangdong 510075, China
2. MLR Key Laboratory of Marine Mineral Resources, Guangzhou Marine Geological Survey, Guangzhou, Guangdong 510075, China

1 Introduction

The Miocene tropical carbonates deposition was extensive in the southern part of South China Sea. A large number of carbonate platforms developed on topographic highs which maybe inherited from block-tilting during the Eocene to Early Oligocene rifting phase (Fulthorpe and Schlanger, 1989, Sales et al., 1997, Eduard, 2015).

The Miocene and present-day carbonate platforms both exhibit platform fragmentation and contraction, which may be controlled by syn-depositional and could lead to the submerging of whole platform ultimately (David et al., 2014). Most of the Miocene Carbonate platforms may be affected by tectonic activity and eustatic variations, and have been explained as being submerged (Vahrenkamp et al., 1998; Zampetti et al., 2004; Fournier et al., 2005; David et al., 2014).

Based on the analysis of sea level rising/falling rate and carbonate growth rate, the platform could be divided into several styles (Fig.1), and growth history could be reconstructed in this article.

2 Architecture of Carbonate Platform

2.1 Submerged platform

When the relative sea-level rise rate is high or the carbonate growth rate is low, the submergence platform will be formed. The strong subsidence after Middle Miocene resulted in rapidly rising of relative sea level, which eventually caused the platform submergence.

2.2 Retrogradation platform

At relatively high rates of relative sea-level rise, the growth or accumulation rate of carbonate rocks at the edges of the original platforms rapidly reduce or completely stop. While carbonate rocks or reef growth are barely in sync with sea-level rise, and the sedimentation of carbonate rock gradually migrated into the platform with gradually decreased range. Then the original edge of the platform were submerged and a retrogradation platform was formed.

2.3 Aggradation platform

When the carbonate platform growth rate consistent with or stable pursued the relative sea-level rise rate, the sedimentary environment of platform margin and platform inner is basically remain unchanged, carbonate deposits is given priority to vertically accumulating, and progradation does not develop, thus forming the aggradation platform.

2.4 Outward with up-stepping platform

When the growth rate of carbonate rocks is relatively fast, and is slightly greater than the relative sea level rise rate or the growth rate of accommodated space, the vertical aggradation is likely to occur in the interior of the platform, while the progradation occurs at the platform edge. The aggradation and progradation increases the range of the carbonate platform, and at the

* Corresponding author. E-mail: zguangxue@tom.com
same time results in a thick accumulation sequence of the platform, thus forming an outward with up-stepping (upward stacking) platform.

2.5 Progradation platform

During the development of the outward progradation platform, relative sea level rises slowly or does not change. At this situation, the relative sea-level rise rate is lower than the carbonate growth rate or re-stacking rate, and there is no enough accommodate space available on the platform for carbonate filling. And excess carbonate rocks are transported toward the platform slope for outward progradation.

2.6 Outward with down-stepping platform

The periodicity of sea level changes and the differences in tectonic subsidence caused the relative sea level changes. During the relative sea level decline, especially at low water levels, some of the platform may be exposed, while the sea level outside the platform edge would become shallower, the increase in the production rate of carbonate rocks will cause the original platform to expand outward and form an outward with down-stepping platform.

2.7 Down-stepping platform

When the descent rate of relative sea level is large and the growth rate of the carbonate platform is small, a down-stepping platform is formed. At the top of the carbonate platform, there is a set of "wing-like" or "mushroom-like" carbonate rocks, which are mostly formed and the period of relative sea level decline in Beikang Basin. A lot of “Carbonate wings” or “carbonate mushrooms” also developed on Luconia platform which adjacent to the Beikang Basin (Euard, 2015).

References


