Facies architecture and Evolution of Late Permian Carbonate Platform Margin,Northeastern Sichuan,China

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Intriduction

The Lopingian of late Permian carbonate platform margin developed in Northeastern Sichuan,China,which located at the west part of Upper Yangzi Platform tectonically，that contain a peculiar and widespread microbial facies, but have received little attention. The microbial facies have been reported from PTB limestone from southeastern China and Japan and have been placed in the basal Griesbachian *Hindeodus parvus* zone (Sano et al.,1997; Kershaw et al., 2002).But the microbial structures developed below that horizon here and also influenced the evolution of carbonate platform margins. The study area in Daba mt.offers a few locations where the Late Permian carbonate platform margins can be studied along the continuous outcrops. Some very good exposured outcrops of Changxing Fm. provide detailed information on the platform margin evolution.

Facies architecture and Evolution

Three stages of the platform margin have been identified:1)ramp stage developed at the first and second member of Changxing Fm. , the thin dark micrite bed with small sponge mounds deposited with about 150 m in thickness. This stage was in the high stand system tract;2)microbial mound rimmed margin developed at the lower part of third member of Changxing Fm. with about 210 m in thickness,and the transgressive system tract developed at this time. The microbial mound shows three internal growth phases vertically including sponges-thrombolite, thrombolite-tubiphytes and thrombolite.The sponges-thrombolite developed in the lowest part of the microbial mound with lower topography and gentle slope,then,the thrombolite-tubiphytes and thrombolite，are the main contributors to mounds, developed quickly and made the rimmed margin to showing higher topography and steep slope gradually. The microbial mound structures play a key factor controlling the progradational geometry of the platform margins;3.oolitic and arenitic shoal stage ,which developed in the high stand system tract, distribute at the upper part of third member of Changxing Fm. with about 46 m in thickness. The evolution of the microbial structures as well as the final demise of late Permian reefs followed by microbial mound without true metazoan reefs may reflect the characteristics of the Late Permian biological crisis.

Conclusion

The evolution of the Late Permian platform margin here was mainly controlled by relation sea-level oscillation, microbial facies architectures, other control factors such as tectonic subsidence, synsedimentary faults may play the subordinate actions.

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Sea floor methane emissions in high-latitude continental shelves and the role of anaerobic methane oxidation

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The melting of submerged permafrost and increases in temperature in high latitude sediments have brought the Earth's methane gas hydrate reservoir closer to destabilisation which is a subject of great concern. Fluxes of methane from sea floor gas hydrates are a potential key forcing of Earth's climate; for example the abrupt environmental change of the Paleocene Eocene Thermal Maximum (PETM) has been linked to methane release from destabilized gas hydrates [1].

If the released methane is oxidized aerobically, such as in a ventilated water column or the surface oxidized layer of the sediment, it results in an increase in dissolved inorganic carbon (DIC), no change in alkalinity (ALK) and thus $CaCO_3$ dissolution. The effect can be opposite if anaerobic oxidation of methane takes place (eg. throughout the reduced part of the sediment column) as this process releases two equivalents of alkalinity per mole of methane oxidized and, thus, induces carbonate precipitation.

In this communication we explore the benthic geochemical dynamics following hydrate melting in high-latitude shelf environments typical of the W. Svalbard coast that are recognised areas for hydrate destabilization [2]. Benthic fluxes were calculated using the 1-D reaction-transport model, BRNS, after imposing an upward flux of methane based on hydrate dissolution estimates. Anaerobic methane oxidation (AOM) significantly reduced the efflux of methane to the overlying water and led to accumulation of DIC and ALK inventories in the sediment porewaters, favouring carbonate precipitation. This also resulted in increased effluxes of DIC and ALK to the overlying seawater.

The magnitude of AOM is, however, very sensitive to the assumed rate constant for this process. We therefore modulated the rate of AOM with microbial biomass growth dynamics [3] and observed a transient response of the microbial community to the upward methane flux. The microbial ecosystem was slow to respond to the fast methane supply leading to a transient loss of methane from the sediment into ocean waters.

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