THE PALEOECOLOGY, PALEOGEOGRAPHY AND ORE DEPOSITS OF TRIASSIC MARINE STRATA IN THE LOWER AND MIDDLE YANGZI VALLEY

(Professional Paper)

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Abstract

The Lower and Middle Yangzi Valley is an important mineral belt in eastern China where many deposits are hosted in Triassic strata. In this paper the paleoecology, paleogeography and minerogenic conditions of some strata hosting deposits in the Lower and Middle Yangzi will be discussed emphatically.

The marine facies Triassic here includes Lower Triassic and the lower part of Middle Triassic, mainly comprising of limestone, dolomite, argillaceous rocks as well as gypsum, and yeilding fossils such as ammonites, conodonts as well as bivales. Based on the multiple classification of stratigraphy, we made classification on chronostratigraphy as well as on lithostratigraphy: subdividing several chronozones with different taxonomic fossils belonging to 2 series and 3 stages (see Table 2–2); collating and checking the lithostratic units which were designated by some geologists before; proposing an integrated scheme of lithostratic units (see Table 2–3). Their diachronism in the region has been discussed too.

There are 6 communities of ammonites occurring in different strata of Lower Triassic as follows (in descending order):

6. *Subcolumbites* – *Pseudoceltites* community
5. *Columbites* – *Tirolites* community
4. *Anasibirites* – *Meekoceras* community
3. *Flemingites* – *Pseudosageceras*, community
2. *Gyronites* – *Prionolobus* community
1. Ophiceras – Lytophiceras community

According to analysis and comparision with their structural characteristics and distributions of time and space, it seems that: (1) Ammonites was only suitable to live in the normal sea area being in low energy or hydrostatic environment. (2) The diversity of an ammonite community may have the reference to dissolved oxygen levels in sea water. (3) It

shows an identity in ecologic environments as the total feature, with the exception of some changes on the abundance of their individual of each ammonite community within the limits of its horizontal distribution. (4) According to the evolution of morphologic characters of ammonite shells in different communities, combined depositional environment analysis, it manifests that the vertical alternation of communities from one to another was coincident with their paleogeographical transition.

Trace fossils are also abundent in the strata. More than 21 ichnogenera from some 20 beds here have been recognized, which could be roughly separated into 3 assemblages in desending order as follows:

3. *Arenicolites* – *Laevicyclus* – *Planolites* assemblage

2. *Planolites* – *Cochlichnus* – *Thalassinoides* assemblage

1. *Palaeophycus* – *Ophiomorpha* – *Planolites* assemblage

Although the typical facies trace fossil in above assemblages has not been found yet, judging from the whole assemblage feature, that they are compared to cruziana ichnofacies in line with the environment displayed by biofacies which found expression in ammonite communities.

Some stromatolites formed in layers, columns or in form of the passage occuring as small, sparadic and isolated bioherms or biostromes occured in the dolomite of marine Triassic. Based on the study of their morphology and development feature, associated with analysis on comparative sedimentology, it is indicated that some of them were formed in high hydrodynamic environment at the lower part of intertidal or the upper part of subtidal (e.g. Wuxi), and the other in tidal flat environment where is in low energy or hydrostatic (e.g. Fanchang).

An exposition in accordance with forming conditions of the various sedimentary rocks and combination with analysis of paleoecology and depositional models, the strata in this region could be subdivided into 5 facies belts i.e. basin, ramp, shoal bank, lagoon and tidal–flat complex facies, further, that the paleogeography and its change were discussed too.

The Lower and Middle Yanzi Valley was situated near the equator in early Triassic and covered by sea water, even though the global regression event perhaps influenced on this region at the end of Permian. No sooner had occurred in the next transgression than here fell into an epicontinental neritic basin again at the begining of Triassic, and then was gradually developed a carbnate ramp which the north is lower than the south relatively. The terrain of the platform slopes gently, except occurrence of a few isolated beaches on some survived high land formed by paleostructure (e.g. Wuxi).

The transgression of Triassic reached its climax at the end of Indian and most of the southern part in the region was located near the storm wave base in a shelf ramp zone where storm occurred. Coming into Olenekian, the sea level relatively maintained for a stable period then the regression started that the beach was appeared in southeast Hubei. The

persistent fall in sea level, the constant extension northward in the shoal area, the unceasing enlargment in the shallow beach, a high hydrodynamic energy zone in the front margin of the shelf platform was preliminarily formed from south Anhui to southeast Jiangsu during late Olenekian. The sea level incessantly fell that more and more places gradualy became tidal–flats or lagoons and the sea water was salting beginning at the end of Olenekian. During early Anisian in the middle Triassic, the sea became shallower and further most of the region was converted into a tidal–flat complex and the sea water was further salified by evaporation. The deeper parts of the complex were translated into gypseous and saline lakes but the shallow parts were turned into algal flats or sabkha, parts of the complex (e.g. Puxi) were changed into some deltaic plains as well. Finaly, the sea water withdrew from the whole region in late Anisian.

When discussing depositional environment here we also dealt with the storm deposition in detail. The tempistite is wide–spread, multixtory and multiform that indicated its different distances to the centre of storm of the degree of affect on storm.

The mineral resources related with marine Triassic in this region are mainly sulfide metallic ore and gypsum and, in addition, oil seepages appears widely.

It is confirmed by the analytical results of argillaceous rock, mudstone (micrite), algal dololaminite etc. that the strata contained organic carbon richer than the standard of oil source rock, and their kind of organic material is mainly putrid mud, being essentially from algal sedimentation.

The gypsum, which is widely distributed in the region and in stable beds mainly belongs to original deposition.

Changes of their various kinds are dependant on the horizons of the strata, the sequence being in ascending order as follows: thin bedded–massive–fine grained dolomitic anhydrite→dololaminite→anhydrite→nodular and mosaic gypsum – anhydrite, reflected, in certain degree, differences in depositional environments along with the diversity of stages in the development of the salt lake.

There are different opinions on the origin of sulfide metal ore deposits (iron, copper etc.) concerned with the marine Triassic here. The comprehensive study by means of analytical results of samples from intrusive body, alteration zone and country rock, in combination with the existent state and the forming conditions of the ore deposits, it seems that their formation and concentration were certainly involved in petrolium and gypsum as well as salt, controlled, by gypsiferous or saliferous beds and organisms, especially algae and bacteria play an important role in the mineralization process in a great degree.