Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07610, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07610
EGU General Assembly 2008

Oceanic stratification recorded in the spatial variation in carbon isotope profiles from the Upper Neoproterozoic, Yangtze Block, South China.

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Late Proterozoic and early Cambiran are the periods of the frequent events in biosphere from multiple global glaciations to drastic animal diversification.Ocean stratification was one of the event in these periods, and previous studies suggested that it happened aftermath of the snowball and the end of the Proterozoic (e.g. Goldberg et al., 2007; Shen et al., 2007; Shield et al., 1997; Tucher, 1992). However, these studies covered for a limited range of time space and the comprehensive paleo-ocean history of these periods has been poorly demonstrated.

In this study, we investigated four sections of the upper Neoproterozoic distributed in the Yangtze block, South China Craton. Approximately 350 samples were collected from the Doushantuo (635-551Ma; Condon et al. 2005) and Dengying (551-542Ma) Formations, along with these shallow-water sections and one deep-water section. The Doushantuo Formation, deposited immediately after snowball earth event, consists of bedded dolomite and mudstone. Overlying the Dengying Formation mainly consists of bedded to massive dolomite. These two formations in the shallow-water sections contain stromatolites and bacterial structures derived from microbial mat. On the other hand, deep-water rocks are characterized by content of framboidal pyrites, which indicate sulfate reduction in an anoxic condition.

The spatial variation was also recognized in the carbon isotope values. The shallow-

water facies of the Doushangtuo and Dengying Formation record the δ^{13}C values of carbonate around +5 per mill (VPDB), while deep the facies entirely have lower values and decreasing to -10 per mill during the middle Doushantuo Formation. Active photosynthesis in shallow water may have causes a large amount of ^{12}C fixation which increased the value of dissolved inorganic carbon. A large fraction of organic carbon by the intensified primary production was downflowed and consumed dissolved oxygen. This resulted in reductive degradation of organic carbon and decreasing of carbon isotope values in deeper environments. The redox boundary was developed in the stratified ocean water column.

According to our results of the reductive condition in the deep ocean had lasted for $\sim$84 m.y. during the Doushantuo deposition, and after this, the ocean was gradually recovering the oxygen content in $\sim$9 m.y of the Dengying age. Recovery of the deep circulation carried nutrients, such as phosphate that resulted in global development of apatite deposits at the PC-C boundary. This could have brought a profound effect to the subsequent drastic biologic evolution in Cambrian.