Geophysical Research Abstracts
Vol. 17, EGU2015-5721, 2015
EGU General Assembly 2015

Comprehensive geobiological characterization of a bituminous carbonate facies with Ediacara-type fossils (Shibantan Member, South China)

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The Shibantan Member (Dengying Formation, Ediacaran Period) is one of only few carbonate settings with Ediacara-type fossils worldwide (e.g. Ding & Chen, 1981; Sun, 1986; Xiao et al., 2005; Shen et al., 2009; Chen et al., 2014). However, only little is known about the sedimentology and biogeochemistry of the environments in which these organisms throve. Here we provide a comprehensive geobiological characterization of the Shibantan Member, addressing the interplay between sedimentary and (bio-) geochemical processes.

Sedimentary analysis revealed that black laminated limestones of the lower Shibantan Member were deposited after a sudden local deepening in a subtidal lower- to middle ramp environment close to the storm wave base, while the dark wavy dolomites of the upper Shibantan Member were deposited in a subtidal middle ramp environment between storm- and fair weather wave base. Sedimentation in the Shibantan basin was generally highly dynamic as evidenced by a distinct slumping horizon and mass-flow deposits that were possibly due to synsedimentary tectonic processes.

The microbial-mat associated biota including Ediacara-type fossils is restricted to the lower Shibantan Member. Sedimentary analysis of this part reveals a close relationship between autochthonous mat growth and allochthonous and/or para-autochthonous event deposition. During deposition of the lower Shibantan Member the water column was probably temporarily stratified, with a sub- to anoxic water layer (evidenced by Ni/Co-, V/(V+Ni) and V/Sc ratios) overlain by a oxygenated upper layer (evidenced by negative Ce anomalies and low V/Cr ratios). However, such stratification was not permanent, as mixing by storm events is evidenced by hummocky cross stratification structures. ^{13}C-enrichments in carbonates of the Lower Shibantan Member (δ^{13}C = +3.3 to +4.0‰ VPDB) together with ^{13}C-depletions of syngenetic n-alkanes cleaved from the respective extraction residue using catalytic hydropyrolysis (HyPy; δ^{13}C = -31.7 to -36.3‰ VPDB) indicate a significant withdrawal of ^{12}C by primary producers that thrived within the microbial mats. At the same time, sulphurised biomarkers in the bitumen and HyPy-treated extraction residue hint at organic matter decomposition and concomitant sulphide production by sulphate-reducing bacteria. Given the sedimentological evidence for periodical ventilation of the water column by storms, sulphide oxidising bacteria were possibly favoured whenever oxygen became available at the sediment-water interface.

Taken together, the environments in which the microbial-mat-associated biota including Ediacara-type fossils throve were highly dynamic due to a complex interplay of geological and biological processes.

References

Chen Z., Zhou C., Xiao S., Wang W., Guan C., Hua H., Yuan X., 2014. New Ediacara fossils preserved in marine limestone and their ecological implications. Scientific Reports, 4

Ding Q. and Chen Y., 1981. Discovery of soft metazoan from the Sinian System along eastern Yangtze Gorge, Hubei. Journal of the Wuhan College of Geology, 2, 53-57.

Shen, B., Xiao S., Zhou C., Yuan X., 2009. *Yangtziramulus zhangi* New Genus and Species, a Carbonate-Hosted Macrofossil from the Ediacaran Dengying Formation in the Yangtze Gorges Area, South China. Journal of Paleontology, 83(4): 575-587.

Sun W., 1986. Late precambrian pennatulids (sea pens) from the eastern Yangtze Gorge, China: *Paracharnia* gen. nov. Precambrian Research, 31(4), 361-375.

Xiao S., Shen B., Zhou C., Xie G., Yuan X., 2005. A uniquely preserved Ediacaran fossil with direct evidence for

a quilted bodyplan. Proceedings of the National Academy of Sciences of the United States of America, 102(29), 10227-10232.