

Molecular and isotopic evidence for photic zone euxinia during the deposition of Yurtus Formation in Early Cambrian, Tarim Basin, Northwest China

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The Cambrian explosion occurred between increases in atmospheric oxygen concentration during the early Paleozoic Era. Oceanic chemistry conditions during the early Cambrian have experienced frequent oscillations between anoxic and oxic, which tied intimately to the evolution and extinction of life. Carbon isotopic data and Biomarker analyses of the black shale of Yurtus Formation that was the earliest strata records of Cambrian in the Tarim basin, northwest China, indicate that euxinic conditions prevailed in the paleowater column during the early Cambrian stage.

$\delta^{13}\text{C}_{\text{carb}}$ from the Yurtus Fm. varies from -3.3‰ to 2.0‰ with the mean value of -1.2‰, while $\delta^{13}\text{C}_{\text{org}}$ exhibit abnormally negative values from -37.0‰ to -33.1‰ leading that the values of ϵTOC exceed 32 during this stage. Occurrences of $\epsilon\text{TOC}>32$ indicate significant inputs from sulfide-oxidizing or other chemoautotrophic bacteria[1] which resulted in depletion of $\delta^{13}\text{C}$ in the preserved biomass. The biomarkers of Yurtus Formation are characterized by indicators of stratified water including abundant Gammacerane derived from tetrahymanol and abundant aryl isoprenoids(1-alkyl,2,3,6-trimethylbenzenes). The prevalence of abundant aryl isoprenoids that derived from green sulphur bacteria(Chlorobiaceae) using hydrogen sulfide as electron donor in anoxygenic photosynthesis provides reliable evidence for photic zone euxinic during early cambrian in the Tarim basin[2]. The Yurtus Formation is considered comparable with pervasively distributed black shale of early Cambrian age in the Yangtz Block as they shares a lot of geochemical and geological resemblance. Thus, euxinic conditions may be widespread during early Cambrian in the Yangtz and Tarim blocks.

[1]Hayes, et al(1999), *Chemical Geology* 161, 103-125.[2] Grice, et al(2005), *Science* 307, 706-709.