Silica-rich hydrothermal activity and its effect on organic matter enrichment during the earliest Cambrian

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The earliest Cambrian was a critical time in Earth's history during which siliceous sedimentary rocks (mainly hydrothermal bedded chert) are widely distributed around the world, including those in China, India; and West Africa [1]. And the organic-rich source rocks developed at the same time. Up to date, however, there are few studies on the effect of hydrothermal activity on organic matter (OM) enrichment. Here, we report for the first time that silica-rich hydrothermal activity (SRHA) does not always contribute to the accumulation of organic matter, from a typical case of lower-Cambrian Yurtus Formation in the Tarim Basin, Northwest China.

It's believed that large quantities of inorganic nutrients are carried to surface water bodies along with the SRHA, which can improve the bloom of plankton (algae) and then enhance the burial of OM[2,3]. Based on the detail sedimentological, mineralogical and geochemical evidence, the SRHA are divided into the strong SRHA and weak SRHA. During the happen of the former, large amounts of silica were deposited rapidely, which significantly diluted the paleoproductivity and resulted in poor TOC content (< 1 %) in the thick silica-rich sediment (SiO_2 > 90 %); while during the occurrence of the latter, hydrothermal silica were deposited slowly, which remarkably enhanced the thrive and preservation of plankton and then resulted in abundant TOC content (> 4 %) and algal macerals in the silica-poor shale (SiO_2 < 90 %). Thus, organic-rich source rocks are likely to occur near the silica-rich hydrothermal sediment, which will provide reference for oil & gas exploration in ancient deep strata.

Reference

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