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Anoxia vs. Bioproductivity Controls on the Cambrian and Ordovician Marine Source Rocks in Tarim Basin, China

The major debate over the origin of marine organic-rich source rocks invoke whether preservation in anoxic conditions or high primary bioproductivity is the first-order control factor. Tarim basin is largest and least explored petroliferous basin in China, the distribution of effective source rocks are controversial in past ten years because the lower Paleozoic strata occur over the entire basin and its maximal thickness exceed 12000m in the interior of basin. The organic geochemical and sedimentological studies have identified two organic-rich (TOC0.5%) source rock intervals in Paleozoic marine strata, the first is lower and middle Cambrian euxenic source rock with the thickness ranging from 120 to 415 m, widespread distributed in the Tarim cratonic basin, mainly located in the east and west parts of Awarti-Majaer depression, molecular evidence indicated that water-column stratification may have been an important factor for the formation of lower and middle Cambrian euxenic source rocks. The second is middle and upper Ordovician carbonate mud mound source rocks with a thickness of about 80 to 100 m, only restricted distributed in the slope of Tazhong and Tabei uplift to Majaer depression, the evidence reflected that high primary bioproductivity due to upwelling and not water-column anoxia is the first-order control on the deposition of middle and upper Ordovician organic-rich source rocks. Hsu (1994) speculated that lower Paleozoic marine source rocks were formed in buried-euxenic basin model(or anoxia model), which set Tarim basin potential about 350 billion bbl. The recent drilling have validated the upper and middle Ordovician strata in Awarti-Majaer depressions were composted with pelagic turbidite, the mudstone with very low TOC(<0.2%, mostly less than 0.1%), the putative upper and middle Ordovician source rocks in interior of basin did not exist! Therefore, buried-euxenic basin model of the lower Paleozoic marine source rocks overestimated the potential of Tarim basin.