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Formation Mechanism of Authigenic Grain-Coating Chlorite and Sequence Response: Evidence from the Upper Triassic Xujiahe Formation in Southern Sichuan Basin, China

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Authigenic grain-coating chlorite is widely distributed in clastic rocks of many sedimentary basins around the world. This study found that grain-coating chlorites are composed primarily of FeO, SiO_2, and Al_2O_3 based on thin section identification, SEM, EPMA, and physical property analysis. Iron minerals were mainly derived from flocculent precipitates formed when rivers flowED into the ocean, especially in deltaic environments with high hydrodynamic conditions. Sandstone sequences with grain-coating chlorites also tend to have relatively high glauconite and pyrite content. EPMA composition analysis shows that glauconites have “high Al and low Fe” content that are interpreted to indicate slightly to semi-saline marine environments with weakly alkaline and weakly reducing conditions. By analyzing the chlorite containing sandstone bodies of the southern Sichuan Xujiahe Formation, this study found that chlorite was mainly distributed in sedimentary microfacies, including subaqueous distributary channels, distributary channels, shallow lake sandstone, and mouth bars. Chlorite had a tendency to form in the upper parts of sandstone bodies with signs of increased base level, representing the influence of marine (lacustrine) transgression. This is believed to have been influenced by megamonsoons in the Middle and Upper Yangtze Region during the Late Triassic Epoch. During periods of abundant precipitation, river discharge increased and more Fe particulates flowed into the ocean (lake) Increases or decreases in sea level were only affected by precipitation for short periods of time. The sedimentary environment shifted from weakly oxidizing to weak alkaline, weakly reducing conditions as sea level increased, and Fe-rich minerals as authigenic chlorite and glauconite began to precipitate.

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