Storm deposit characteristics and orbital cyclicity of the Xiejiawan Formation of early Devonian in the Longmenshan area, Sichuan Province, China

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Abstract

The Xiejiawan Formation of early Devonian age in the Longmenshan area of Sichuan Province, China, is a shelf facies that consists of three types of carbonate-siliciclastic deposits: Mixed near-shore, clastic mixed shelf and carbonate mixed shelf facies. The variability of storm deposits in the Xiejiawan strata, based on tempestite sedimentary structures and sequences, was used to establish a storm abundance curve and a storm event-per-meter curve as climate proxies. A main long-eccentricity signal (405 kyr) and superimposed short-eccentricity signals (100 kyr) were identified by applying spectrum analysis, Fast Fourier Transform (FFT) and low-pass filtering to exact the orbital signals. There are seven main long-wavelength cycles in this record, and the implied 2.8 Myr span is nearly identical to the estimated ca. 2.5 Myr age span of corresponding conodont zones according to current Devonian conodont-zone timescale. Therefore, the storm frequency and magnitude were modulated by orbital forcing, in which eccentricity-induced climate cycles control the magnitude and frequency of tropical cyclones impacting the shelf, in addition to fluctuations in sea level.

Keywords: Early Devonian, Storm beds, Tempestites, Mixed shelf facies, Orbital cycles

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