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The Structure and Sequence Stratigraphic Architecture Evolution of Rifting Stage, Lishu Faulted-depression, Songliao Basin, China

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Clarifying the basin configuration features, the stratigraphic and sedimentary architecture characteristics of different basin development stage, and clearing their genetic relationship, are the foundation of basin analysis and resource evaluation. This study aimed at the rifting stage of Lishu faulted-depression in Songliao basin. Based on large amount of seismic and drilling data, we divided the rifting unit into three sub-structural units, emphatically analyzed the basin configuration, sequence stratigraphic characteristics of different sub-structural units, as well as their genetic relationship, evolutionary regulation.

Studies show that the activity rate, distribution and style of local faulting demonstrate the timing and extent of regional rifting. Distinct episodes of compressional tectonic activity caused uplift and exposure of strata evident as the traditional syn- and post-rift stages of basin evolution. These episodes led to the sequential denudation of the Huoshiling, Yingcheng and Denglouku Formations, and corresponding regional unconformities. Acting in tandem with regional compression, activity along the major boundary faults influenced the evolving basin configuration, as well as seismic sequences and sedimentary patterns. Seismic, well log and drill core data described here suggest subdividing sections of the Lishu Depression strata according to discrete phases of the traditional syn-rift stage of deposition. We refer to these sub-stages as the initial rifting, the intensive rifting and the recession phases. The basin configuration shifted from a graben / halfgraben configuration during the initial rifting phase, to a dustpan-shaped half-graben pattern during the subsequent phase of intensive rifting, and finally into a gentle sedimentary basin during the final recession phase. The early seismic sequence divides into a LST, TST and HST. Evidence of the LST within the seismic sequence becomes less apparent with the intensive rifting phase, while the HST occupied an increasing proportion of the section. The shallow water depositional fill formed during the final recession phase consists only of TST and HST components. Depositional environment then shifts from alluvial fan and shallow lacustrine systems to fan delta, braided delta - lake, and finally to a braided fluvial setting. The vertical stacking pattern shifts from retrogradational, to progradational, to aggradational.

Using this information to clarify genetic relationships and basin evolution can serve larger-scale continental basin analysis and resource evaluation efforts.

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