Multiple detachments of thin-skinned fold-and-thrust belts in the eastern Sichuan Basin, China

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The eastern Sichuan Basin, South China, is characterized by approximately parallel thin-skinned fold-and-thrust belts with exposed narrow anticlines and wide synclines. The structural deformation, however, has remained controversial due to the previous poor seismic data. In this study, the new collected pre-stack long-offset 2D- and 3D seismic data have been applied, and a 200-km long cross section perpendicular to the fold-and-thrust belts has been constructed to analyze the structural style and geometric and kinematic evolution. The stratigraphic succession is composed of competent layers separated by three main incompetent layers being multiple detachments, which are the Cambrian evaporites, the Lower Silurian shales, and the Middle-Lower Triassic evaporites, respectively. The basal detachment, the Cambrian evaporites, played a dominant role in the structural deformation, above which the fold-and-thrust belts were generated, and the middle and top detachments accommodated the displacement during the deformation. The main structural styles are detachment folds, fault propagation folds, back thrusts and basement-involved folds. The evolution succession of the fold-and-thrust belts should be kink band, detachment folds, and sequential thrusts of the forelimb and backlimb of the folds. The style of deformation is dependent on the mechanical characters of stratigraphic succession, i.e., the thickness variation of competent and incompetent layers in the stratigraphic units.