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Effects of fault slip distribution on the geometry and kinematics of the southern Junggar fold-and-thrust belt, northern Tian Shan

Gang Rao, Jianhua Qiu, and Xin Wang
School of Earth Sciences, Zhejiang University, Hangzhou, China (raogang@zju.edu.cn)

In foreland fold-and-thrust belts (FTBs), tectonic shortening could either be accommodated by the thick-skinned and/or wedge structures developed near range-fronts, or be transferred along detachment levels further into basins, forming thin-skinned structures. Although the geometry and kinematics of these structures have been well investigated, the study that could quantitatively depict how fault slip is distributed (localized at range-fronts and/or transferred to basins) as well as its effects on the geometry and kinematics of fault-related folds is still lacking. In this study, we present a case study of the southern Junggar FTB, northern Tian Shan, which is characterized by thrust-type earthquakes, such as the 1906 M 8.0 Manas and 2016 M 6.2 Hutubi earthquakes. Based on the integration of the structural interpretations and forward modelling of seismic reflection profiles and the age constraints provided by previous studies, we have demonstrated that: 1) The southern Junggar Thrust (SJT) has experienced two-stage structural deformation: ramp-flat-ramp fault-bend folding subsequent to structural wedging at the Changji and Qigu anticlines, by which displacement has been transferred northward, forming the Tugulu anticline. 2) Along-strike variations in displacement also affect the geometry and kinematics of the Tugulu anticline, varying from detachment folding, pure-shear fault-propagation folding, classic fault-propagation folding to fault-bend folding. 3) The SJT has an average Quaternary slip rate of 3.9$\pm$0.4 mm/yr, serving as a principal structure accommodating tectonic shortening in the southern Junggar FTB. The results of this study would provide important insights into the seismic risk assessments of the study area as well as structural evolution of fault-related folds in FTBs.