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Evolution of a fold-thrust belt deforming a unit with pre-existing linear asperities: insights from analog models

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Abstract

Heterogeneity, whether geometric or rheologic, in crustal material undergoing compression affects the geometry of the structures produced. This study documents the thrust fault geometries produced when discrete linear asperities are introduced into an analog model, scaled to represent bulk upper crustal properties, and compressed. Varying obliquities of the asperities are used, relative to the imposed compression, and the resultant development of thrust fault traces and branch lines in map view is tracked. Once the model runs are completed, cross-sections are created and analyzed. The models show that asperities confined to the base layer promote the clustering of branch lines in the surface thrusts. Strong clustering in branch lines is also noted where several asperities are in close proximity or cross. Slight reverse-sense reactivation of asperities cut through the sedimentary sequence is noted in cross-section, where the asperity and the subsequent thrust belt interact. The model results are