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Research on earthquake risk along the east boundary belts of the Sichuan-Yunnan Block

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Since dilatancy is generally observed as a precursor to brittle faulting and the development of shear localization, attention has focused on how localized failure develops in a dilatant rock. However, recent geologic and laboratory observations have demonstrated that strain localization may be pervasive in a compactant porous rock, particularly at stress states that are associated with the brittle-ductile transition. The coupled development of compaction and strain localization would significantly impact the stress field, strain partitioning and fluid transport in tectonic settings. While a broad spectrum of geometric complexity is associated with compaction localization, two end-members can be distinguished, with distinct signatures of acoustic emission activity. Shear bands may develop at relatively high angles, and arrays of discrete compaction bands may develop subperpendicular to the maximum compression direction. A hybrid localization mode involving high-angle shear bands and diffuse compaction bands has also been observed in rocks with intermediate porosities. These failure modes are often accompanied by significant permeability reduction of up to two orders of magnitude. Two approaches can be adopted to theoretically analyze such localization phenomena. While bifuraction theory provides a useful continuum framework, discrete element method has also been used to provide insights into the influence of pore space heterogeneity on the micromechanics of compaction localization.