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# Concurrent deformation in the Longmen Shan and the Sichuan Basin: a critical wedge captured by limit analysis

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The southern Longmen Shan region has seismically active faults in its western part, the Beichuan fault (BCF) and the Pengguan fault (PGF), both rooting on a deep décollement, and has flat topography in its eastern part which marks the current deformation front due to thrusting from a shallow décollement. The concurrent faulting at the rear and at the front is separated by the flat Sichuan Basin. The objective of this contribution is to propose a mechanical approach based on the limit analysis theory to estimate the frictional properties which could explain how this heterogeneous wedge could be critical in the sense that faulting occurs at various places concurrently. A simple prototype with bilinear topography is first proposed to construct analytical solutions. The activations of the BCF, the PGF and of the upper décollement up to the deformation front are examples of collapse mechanisms captured analytically by the limit analysis. Deformation maps are constructed, in the space of the friction angles of the upper and lower décollements, identifying the domain of activation of the various collapse mechanisms. The critical conditions in terms of friction angles for the concomitant activation of these various collapse mechanisms are established. A more realistic prototype is then analyzed with the numerical code OptumG2 which is also based on the limit analysis theory. The deformation maps established for the first prototype are then applied to evaluate the critical conditions of the complex prototype with a limited number of numerical simulations.