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Can Mechanical Balancing Explain Untypical Fractures When Geometrical Balancing Fails?

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SUMMARY

The motivation of the study is to demonstrate that geometrical constructions of fault-related folds can be mechanically balanced according to the theory of limit analysis assuming that materials are cohesive and frictional. The advantage of the proposed methodology is to remain simple in terms of geometry and to introduce explicitly the various discontinuities such as the ramps which compose the geological structure. The main outcome of such mechanically balanced cross section construction is the availability of the stress field history which is fundamental to estimate the fracture pattern. These fracture predictions could be compared and benchmarked with data from outcrops. The proposed methodology is presented with the help of the field example of the Nerthe duplex, South-Est France, with two horses, each well described with the classical fault-bend fold geometry. The results highlight the role of erosion in the tectonic history of the folds and try to answer why early, inherited, fracture networks have not been reactivated during folding

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