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Quantifying surface rupture morphology of active normal faults

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Fault traces in 2D or map view often display segmentation, bending and undulations, reflecting the growth of the fault, the mechanical stratigraphy of the surrounding geology, and interactions with neighbouring faults. Topography will often exaggerate some of the geometrical variations. Here, we investigate, once the topographic effect is eliminated, the 2D representation of surface traces from active major fault zones to look for possible insights into the underlying fault processes.
Using LiDAR and Google Earth datasets of normal fault systems in the Italian Apennines and Owens Valley, California, we aim in this project to map and quantify 2D morphological characteristics of the surface fault traces. Those characteristics are quantitatively analysed for sinuosity, curvature and length of segment, to investigate the relationships between those characteristics and scale of observation, strain rate and mechanical stratigraphy. The relationships are then assessed in the context of the proposed “isolated fault” and “constant length” models of fault growth. Differences in 2D morphological characteristics between the respective study areas are examined and explained with reference to the geology of those areas.