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The impact of regional erosion-deposition patterns on the distribution of active normal faulting in the central Italian Apennines

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To investigate the interaction between surface processes and faulting in active continental rifts, this study attempts to constrain their individual contributions to landscape evolution in the central Italian Apennines and to quantify the strength of interaction. The availability of independent records of deformation, surface uplift and erosion-deposition make this area especially suitable to investigate interaction and feedbacks between active tectonic deformation and surface processes. General agreement exists that the area emerged above sea level during the late Pliocene/early Pleistocene and that a combination of regional up-doming and extensional deformation has generated its high topography (elevations up to 2900 m above sea level) and a well-developed array of active normal faults. The presence of lacustrine deposits in hanging wall basins indicates that rift-internal drainage networks have been disconnected from externally draining river networks (i.e. transport of sediment out of the mountain belt) for considerable time. These observations imply that on the long-term, erosional removal of mass from the system has preferentially taken place on the eastern and western flanks of the mountain range whereas, in interior areas, locally sourced sediment has mainly become trapped in the internally drained hanging wall basins. We investigate the effect that long-term erosional unloading of the mountain flanks could have had on topographic development in the interior part of the central Apennines and, in turn, how this may have been associated with variations in the distribution of active faulting and fault slip rates over the last 1-2 million years. We use observational data that come from basin sediments, palaeoshorelines, coastal notches, levelling data, modern-day topography (DEM) and flat erosional surfaces from interior parts of the rift to reconstruct 'palaeosurfaces'. Thus we estimate the total volume of sediment that has been removed from the mountain range flanks since the late Pliocene. These data provide constraints for a suite of numerical experiments using a 2D model for lithospheric deformation that includes frictional faulting, viscous flow and allows for buoyancy-driven uplift due to convective removal of mantle lithosphere. Simple surface process rules for erosion and transport are included in the model to investigate the feedback between mass redistribution at the surface, convective flow, faulting and topographic development. We will present both our initial modelling results and an overview of the observational constraints.