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Estimation of vertical slip rate in an active fault-propagation fold from the analysis of a progressive unconformity at the NE segment of the Carrascoy Fault (SE Iberia)

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Many studies have dealt with the calculation of fault-propagation fold growth rates considering a variety of kinematics models, from limb rotation to hinge migration models. In most cases, the different geometrical and numeric growth models are based on horizontal pre-growth strata architecture and a constant known slip rate.
Here, we present the estimation of the vertical slip rate of the NE Segment of the Carrascoy Fault (SE Iberian Peninsula) from the geometrical modeling of a progressive unconformity developed on alluvial fan sediments with a high depositional slope.
The NE Segment of the Carrascoy Fault is a left-lateral strike slip fault with reverse component belonging to the Eastern Betic Shear Zone, a major structure that accommodates most of the convergence between Iberian and Nubian tectonics plates in Southern Spain. The proximity of this major fault to the city of Murcia encourages the importance of carrying out paleosismological studies in order to determinate the Quaternary slip rate of the fault, a key geological parameter for seismic hazard calculations.
This segment is formed by a narrow fault zone that articulates abruptly the northern edge of the Carrascoy Range with the Guadalentin Depression through high slope, short alluvial fans Upper-Middle Pleistocene in age. An outcrop in a quarry at the foot of this front reveals a progressive unconformity developed on these alluvial fan deposits, showing the important reverse component of the fault. The architecture of this unconformity is marked by well-developed calcretes on the top some of the alluvial deposits. We have determined the age of several of these calcretes by the Uranium-series disequilibrium dating method.
The results obtained are consistent with recent published studies on the SW segment of the Carrascoy Fault that together with offset canals observed at a few locations suggest a net slip rate close to 1 m/ka.