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Source characteristics and listric fault geometry of the 2007 February 21st Sivrice earthquake Mw 5.7 deduced from InSAR

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On February 21, 2007, a moderate-sized (Mw 5.7) earthquake struck the town of Sivrice located within the East Anatolian Fault (EAF) zone, a left-lateral strike-slip boundary between the Arabian and Anatolian plates in south-eastern Turkey. Earlier seismic studies show noteworthy dissimilarities in terms of location, magnitude and mechanism of the earthquake. The absence of surface ruptures and poor seismic network coverage steer our endeavors in solving the problem by means of the InSAR technique. Accordingly, we identified the surface displacement field by calculating three interferometric pairs of ENVISAT ASAR scenes; each pair wrapping time before and after the earthquake. One of the coseismic interferograms calculated from the descending T264 satellite track discloses that the earthquake took place not on the EAF, but on the NE-SW trending Adiyaman fault (AF), a major southern splay of the EAF. Modeling using elastic dislocations on both rectangular and triangular fault surfaces with a nonlinear minimization procedure based on simulated annealing algorithm reveals that a north-dipping section of the AF that ruptured during the earthquake has distinct listric geometry. The best-fitting models expose that the earthquake is associated with normal faulting that has a significant left-lateral strike-slip component ($\sim$ -60°). The coseismic slip is nearly 60 cm and occurred on the lower mildly dipping (65°) part of the fault at a depth between 5 and 9 km with a centroid depth of approximately 7 km. The acquired results support the view favoring the dominance of the transtensional regime along this part of the EAF zone, which has been inferred from recent GPS observations and field studies.