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Coseismic deformation from the 2003 Mw=6.5 BAM earthquake as constrained by the InSAR and precise leveling data

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The 26 December, 2003 BAM earthquake occurred in the southeast of Iran, in a region which is believed not to have experienced any great earthquake during the past 2000 years. We used radar interferometric and precise leveling observations capturing the event to estimate source parameters and slip distribution of the coseismic rupture. Our best-fitting uniform slip dislocation model predicts a vertical strike-slip fault dipping 88° to the east from about 1.5 km to 9.5 km depth. The rectangular fault has a size of 12 by 8 km, striking N2˚W, with the fault trace centered at 29.0391°and58.3626°. The dislocation involves a major right-lateral strike-slip component (2.45 ± 0.03 m) and only a small reverse dip-slip component (0.05 ± 0.007 m). For the slip distribution we consider patches with variable size, increasing with depth, to maintain a more uniform resolution of slip. Moreover, we use a smoothing constraint to overcome instability inherent in the discrete ill-posed problems. Distributed-slip inversions indicate that maximum strike slip occurs at a depth of about 3 to 5 km. We also compare the slip distribution patterns from the two Earth models: elastic half-space and the layered elastic one. We find that the common least square procedure that is utilized for the inversion of surface deformation data does not have the required resolution to detect

possible asperities that might have occurred on the rupture plane due to complexities in the Earth structure. A more sophisticated inversion strategy with the integration of different data sets (geodesy, seismology, etc) is necessary to detect such effects.