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Deciphering the source parameters and genesis of the 2017, Mw 4 Montesano earthquake close to the Val d'Agri Oilfield (Italy)

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On October 27th, 2017, a M_w 4 earthquake occurred close to the municipality of Montesano sulla Marcellana, less than 10 km external to the concession of the largest European on-shore hydrocarbon reservoir - the Val d'Agri oilfield (Southern Italy). Being a weak event located outside the extended monitoring domain of the industrial concession, the relevance of this earthquake and possible links with the hydrocarbon exploitation were not deepened. The study of weak to moderate earthquakes can improve the characterization of the potentially destructive seismic hazard of this particular area, already struck by $M > 6.5$ episodes in the past. Taking advantage of a wide coverage of seismic stations deployed in the VA region, we analyze the source parameters of this M_w 4 earthquake applying advanced seismological techniques to estimate the uncertainties derived from the moment tensor inversion and identify plausible directivity effects. The moment tensor is dominated by a NW-SE oriented normal faulting with a centroid depth of 14 km. A single M_L 2.1 aftershock was recorded and used as empirical Green function to calculate the apparent source time function for the mainshock. Apparent durations (in the range 0.11 - 0.21 s, obtained from S-waves) define an azimuthal pattern which reveals an asymmetric bilateral rupture with the 70% of the rupture propagation in the N310°W direction, suggesting a rupture plane dipping to the SW. Our results conclude that the Montesano earthquake activated a deeper fault segment associated to the Eastern Agri Fault System close to the basement. The relative low trigger potential below 10% based on depletion-induced stress changes discards an induced or triggered event due to the long-term hydrocarbon extraction in the Val d'Agri oilfield, and it rather suggests a natural cause due to the local tectonic stress.