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Variable behaviour of the Dead Sea Fault along the southern Arava segment from GPS measurements

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Tectonic deformation in the Levant is primarily related to the Dead Sea Fault (DSF), about 1000 km long continental transform fault forming the tectonic boundary between the Arabian plate and the Sinai sub-plate in the eastern Mediterranean region. The DSF is generally divided into 3 sections: the southern section spanning from the Gulf of Aqaba to the Jordan Valley, the central section that includes the Mount Lebanon and Anti Lebanon ranges, and the northern section that goes parallel to the eastern side of the Syrian Coastal Mountains and joins with the East Anatolian Fault in southern Turkey. The main movement along the DSF is left-lateral. The velocity is varying from a rate of $\sim$5 mm/year along the southern and central segments to a rate of $\sim$2 mm/yr along the northern segment (north of 35°N). An average locking depth of 11 $\pm$ 9 km is proposed along the southernmost segment (Le Béon et al., 2008; al Tarazi et al., 2011; Sadeh et al., 2012) while this locking depth is very difficult to estimate along the northernmost segment (Alchalbi et al., 2010).

In this study we focus on the Wadi Arava fault, which is located in the southern section of the DSF, between the Gulf of Aqaba and the Dead Sea. We propose a reassessment of the slip rate and locking depth along the southern DSF from the Dead Sea to the Aqaba Gulf. Thanks to a third measurement of a geodetic network installed in 1999 and covering both sides of the fault, we are able to propose a finer velocity description than proposed in the previous studies which points out some complexities along the Wadi Arava fault not previously taken into account. Moreover our geodetic velocity field allows for the first time an unambiguous determination of the locking depth of the fault.