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# Geometry and segmentation of the Cerberus Fossae fault system: implications on marsquake properties in Elysium Planitia, Mars.

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The NASA InSight mission to Mars successfully landed on November 26th, 2018 in Elysium Planitia. It aims to characterize the seismic activity and the internal structure of Mars. In this study we focus on the Cerberus Fossae fault system, which is the closest and largest tectonic structure (∼1200 km long) near the landing site of the InSight mission. It is formed by four to five main grabens located on the Southeast of the Elysium Mons volcanic rise. The faults tectonic activity is expected to generate medium-sized marsquakes (Mw > 3) during the nominal mission. In order to better constrain these potential seismic sources, we performed a detailed mapping of the entire fault system based on high resolution satellite images (e.g. CTX, HiRISE) and calculated DEMs. The refined cartography presents a wide range of fault and fracture patterns. Graben widths measurements show a strong correlation with existing fault throws measurements. Altogether they give some insights on the direction of long-term propagation of the fault system but also on fault dips at depth and how the grabens are rooted in the shallow part of the crust. Moreover, the exceptional preservation of the grabens allows to detect up to four scales of segmentation, each formed by a similar number of 3-4 segments/subsegments. This generic distribution of the number of segments is comparable to continental faults on Earth. Fault segmentation can be used to highlight local stress concentrations along the fault and thus anticipate locations of potential marsquakes. We finally compare our surface analysis of fault traces with numerical simulations of the regional crustal stress field of the Elysium Planitia area using joint analysis of gravity and topographic data truncated to spherical harmonic models.