

Characteristics of small-scale graben on the Moon discovered by the Lunar Reconnaissance Orbiter Camera (LROC)

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Small-scale lunar graben were discovered in 50 cm pixel scale Lunar Reconnaissance Orbiter Camera (LROC) images [1]. In this study, candidate graben are characterized and analyzed along with confirmed graben. This expanded set (n=92 in 12 groups) ranges from ~20 to 1800 m in length (average=302 m) and ~5 to 600 m in width (average=36 m), with 73% between 50 and 350 m long and 78% less than 20 m wide. These graben occur globally with no apparent latitudinal preference, but with 75% on the farside. Graben commonly occur near lobate scarps, where they are hypothesized to be relatively young secondary features associated with scarp formation (i.e., fault-bend folding; [1]). However, they occur in both the fore scarp and back scarp areas, equally distributed between perpendicular and parallel orientations to the scarp face – characteristics not expected from scarp forming mechanisms alone [2]. Furthermore, their occurrence is anomalous since the lunar surface should be dominated by compressional stresses associated with its thermal contraction [3]. The existence of young graben suggests either localized extensional stresses [1] or an incomplete understanding of the current stress regime. Currently, all graben are found near lobate scarps, but not all lobate scarps are proximal to graben. In this study, the occurrence of graben distal to lobate scarps (i.e., outside the influence of scarp formation, which is dependent on scarp dimensions) is assessed to test if graben are unrelated to scarps. In addition, graben dimensions, distribution, and orientation are catalogued in order to gain a better understanding of their formation mechanisms.

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