IMPACT MELT IN SMALL SIMPLE LUNAR HIGHLANDS CRATERS.

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Introduction: Impact melt is a typical characteristic of large complex impact craters on all of the terrestrial planets; it also occurs in some larger simple craters. The melt forms pools on the crater floor, flows beyond the rim, and drapes the inner crater wall. Melt deposits have been assumed to only be associated with larger simple craters and complex craters [1-6] with the smallest recognized crater with melt being ~750 m in diameter. Theoretical models of impact melt generation suggested that only small volumes would be produced [7-8] and most of that would be ejected from the crater interior.

Observations: LRO LROC images show that impact-melt deposits are recognized associated with simple highlands craters down to diameters of ~200 m. The melt forms pools on the crater floor, veneer on the crater walls, flows on the crater and ejecta outside the crater. Melt also forms stringers of dark material extending over the rim and across the surface. Such melt deposits are relatively rare, and can be recognized only in some fresh craters. These observations indicate that identifiable quantities of impact melt can be produced in small impacts and the presence of such deposits shows that the material can be aggregated into recognizable deposits. Estimates of the amount of melt present in craters with melt pools on the floor [10^{-3} to 10^{-5} km^3] are of the same order of magnitude as that estimated from the models of melt generation [8].

Interpretations: While target properties can influence the amount of melt produced during an impact, the physical properties of the highland megaregolith are more or less uniform in the context of impact crater formation. Similarly, variations in the properties of the projectile do not significantly change the amount of melt produced. Thus, some other aspect of the cratering process must be responsible. It is concluded that these craters represent vertical impacts rather than the more common oblique events. For a vertical impact, [10-11] the shock pressures can be larger and they are focused at the center of the crater. In such cases more melt is produced and less is ejected than in an oblique event.

Conclusions: Impact melt is observed in fresh simple lunar highlands craters as small as ~200 m diameter. Such deposits are rare. Small craters with recognizable impact melt are interpreted to represent vertical, rather than oblique, impacts.

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