ters, representing impacts solely into icy substrates, create blast waves that sinter surface deposits, forming a protective layer [*Wrobel et al.*, 2006]. 2) Excess ejecta craters, which penetrate through the icy substrate into underlying deposits, excavate debris and bedrock units that cover and armor the icy substrate [*Black and Stewart*, 2008]. The depth of Vaduz relative to the thickness of the ice-rich unit, coupled with the shape of its crater facies, indicates that in contrast to typical pedestal craters, the impact event excavated bedrock, and that excavated regolith and fragmented target debris are an important factor in the armoring mechanism.

[23] The preservation of the crater facies to such great radial ranges, and the well-displayed relationships of those facies with the underlying substrate, suggest that this type of crater can serve as a laboratory for the future analysis of crater-related armoring mechanisms. We leave to future work explanation of the distinctive crater facies associated with Vaduz but believe that such investigations will likely benefit from the previous analysis of quasi-multiple-layer ejecta craters, given their similar morphology.

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