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Possible explosion crater origin of small lake basins with raised rims on Titan

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Supplementary Info
Eruption and contained regimes for explosion craters on Titan
Figure S1 shows the eruption and contained regimes for explosion craters on Titan. Figure S2 shows the maximum explosion crater diameter.
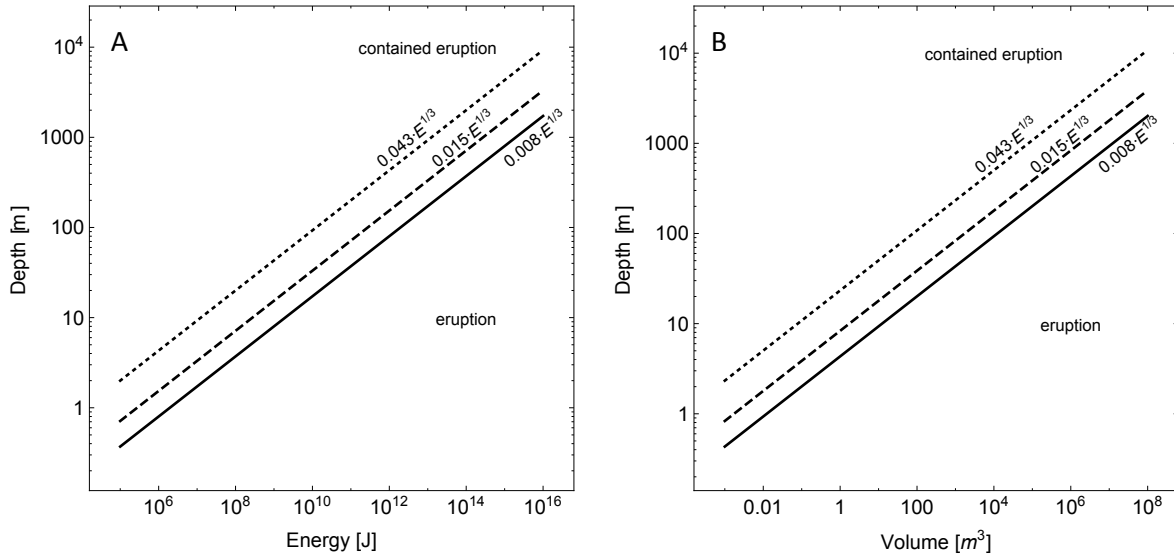

Figure S1. Eruption and contained regimes for explosion craters on Titan. Panel A presents the containment depth as a function of explosion energy. Data presented in the solid line is for terrestrial subsurface phreatomagmatic explosions in agreement with Valentine et al. (2014) analysis where the relationship between the containment depth and the mechanical energy is given by $d_{cont} = \left(0.008 \text{ m J}^{-1/3}\right)E^{1/3}$. In dashed line and in dotted lines are the scaled containment depths for Titan's tensile strength (*Y*) where $d_{cont} = \left(0.015 \text{ m J}^{-1/3}\right)E^{1/3}$ for *Y* = 2.2 MPa and $d_{cont} = \left(0.043 \text{ m J}^{-1/3}\right)E^{1/3}$ for *Y* = 0.1 MPa. The scaled containment depths are obtained from the relationship $d_{cont} = 2\,E^{1/3}/Y^{1/3}$ (see Methods section). Panel B presents the containment depth as a function of liquid nitrogen volume reservoir.
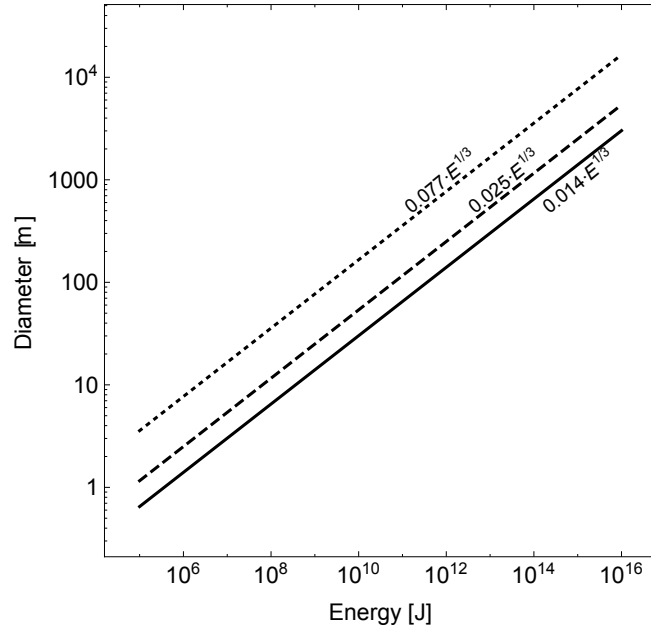
Figure S2. Maximum crater diameter as a function of explosion energy. Data presented in solid line is for terrestrial subsurface phreatomagmatic explosions in agreement with Valentine et al. (2014) analysis where the relationship between the containment depth and the mechanical energy is given by $D_{max} = \left(0.014\,\text{m}\,\text{J}^{-1/3}\right)E^{1/3}$. In dashed line and in dotted lines are the maximum crater diameter for Titan's tensile strength (Y) where $D_{max} = \left(0.025\,\text{m}\,\text{J}^{-1/3}\right)E^{1/3}$ for $Y = 2.2$ MPa and $D_{max} = \left(0.077\,\text{m}\,\text{J}^{-1/3}\right)E^{1/3}$ for $Y = 0.1$ MPa.

REFERENCES
Valentine, G. A., Graettinger, A. H., Sonder, I. Explosion depths for phreatomagmatic eruptions. Geophysical Research Letters, 41(9) (2014).