



# FRACTURES IN JEZERO CRATER: IMPLICATIONS FOR UNDERSTANDING DARK-TONED CRATER FLOOR MATERIALS [Abstract #1303]

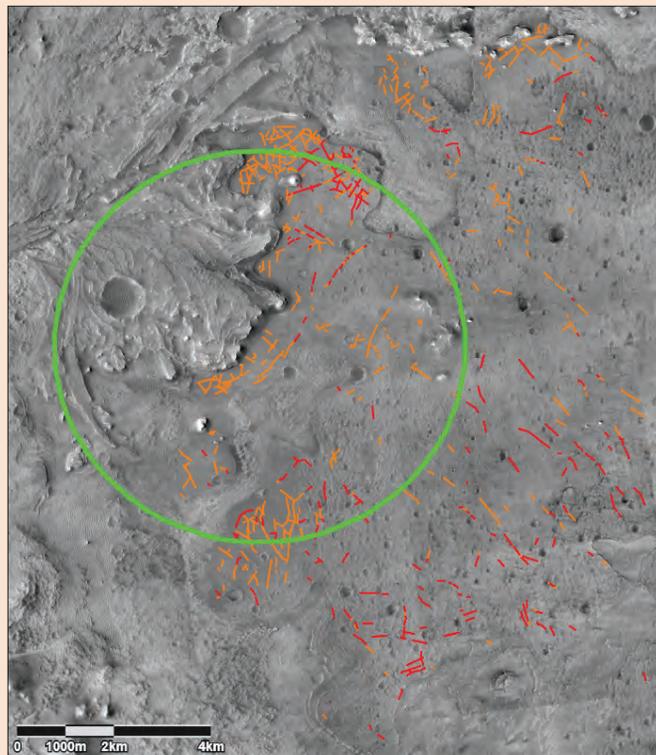


N. Miklusicak<sup>1</sup>, J. Atkins<sup>1</sup>, B. Boring<sup>1</sup>, T. Hicks<sup>1</sup>, E. Shaver<sup>1</sup>, R. Spaulding<sup>1</sup>,  
K. Golder<sup>1</sup>, W. Abbey<sup>2</sup>, L. Kah<sup>1</sup>

<sup>1</sup>University of Tennessee; <sup>2</sup>Jet Propulsion Laboratory

## Crater Floor Materials

### Fracture Distribution

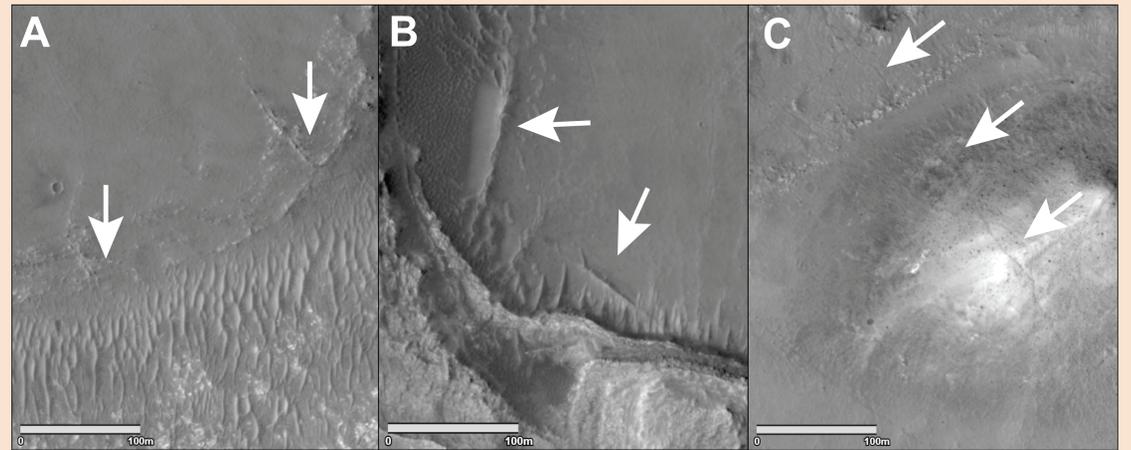


HiRISE Mosaic including landing ellipse (green), positive relief fractures (red) and no relief fractures (orange) visible at map scale (1:5000).

### Introduction

In preparation for the upcoming Mars2020 mission, mapping efforts in Jezero crater have focused on the description of lithological units that comprise the delta and crater floor. Determining temporal-spatial relationships among rock units is a critical step in developing a geologic history of the basin and determining hypotheses for the Mars2020 science mission. Here we examine the structure and distribution of fractures that occur within the Jezero crater floor. Fractures are unoriented, and can be exposed over 10s-100s of meters. Fractures, however, occur exclusively within the dark-toned crater floor, suggesting a relationship to the formation mechanism.

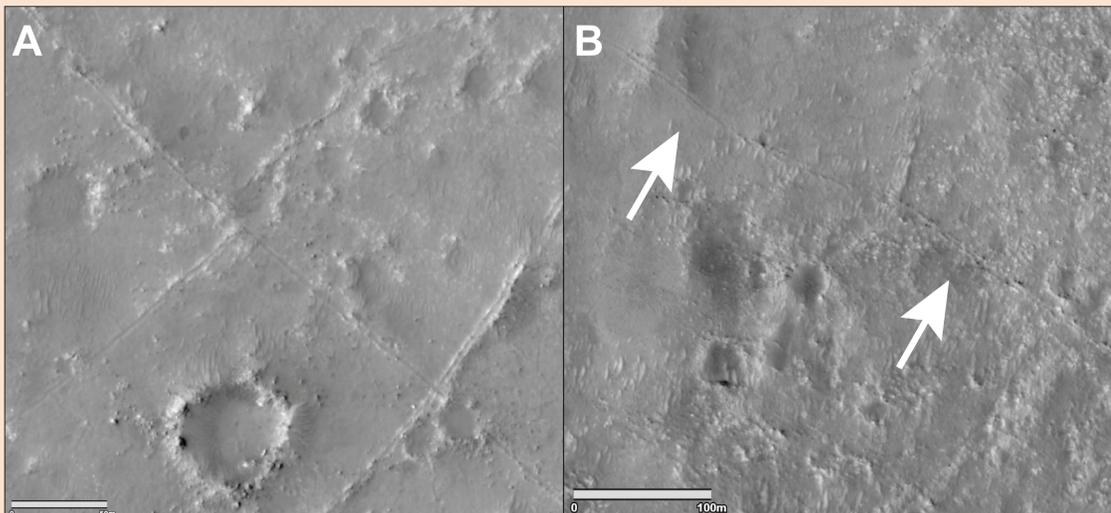
## Relationship to Dark-Toned Crater Floor



(A) Fractures often perpendicularly intersect the edges of the dark-toned crater floor materials where it borders inliers of underlying light-toned crater floor. This interaction suggests that the general shapes of these boundaries are nearly unchanged since the fractures formed. (B) Fractures show no clear relationship to the western delta deposit, suggesting that the delta may be younger, and overlie the dark-toned floor. (C) Fractures cross-cut deposits associated with deltaic-lacustrine sedimentation, providing constraint on timing of fracturing.

## Fracture Morphology

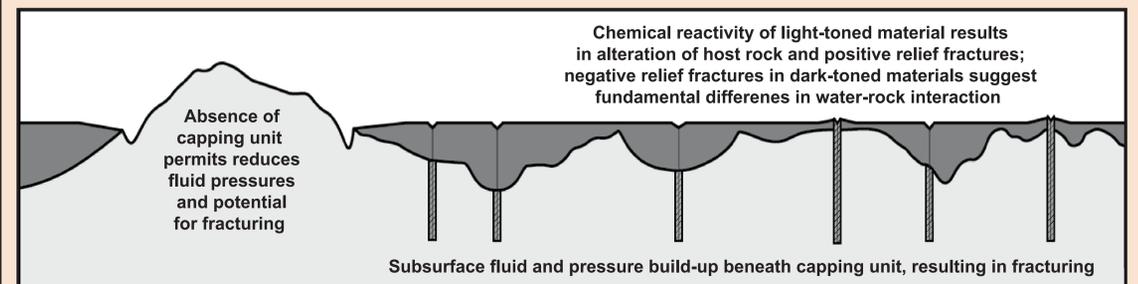
Fracture morphologies vary most prominently in terms of relief, ranging from positive to negative relief, with some fractures alternating between endmembers. The ratio of positive-relief to negative-relief fractures correlates positively with exposure of underlying light-toned materials. We interpret light-toned, positive-relief at the edges of fractures to reflect alteration of light-toned materials by fluid flow through the fractures, resulting in greater erosional resistance.



(A) Fractures showing a range of topographical relief, from positive- to negative-relief. (B) Change in relief from negative-relief to positive relief as the percent exposure of light-toned crater floor increases, suggesting a direct relationship between the light-toned crater floor materials and fluid alteration.

## Hydrofracture Interpretation

The association of fractures exclusively within the dark-toned floor unit supports interpretation of the dark-toned floor as a capping lithology. The length of the fractures rules out thermal contraction or dessiccation as formation mechanisms, and the absence of a clear preferred orientation rules out tectonic origin. The double-ridged, erosionally resistant light-toned fracture margins are consistent with alteration of the host rock facilitated by subsurface, ion-enriched fluids.



## Implications of Fracture Observations

Fractures within Jezero Crater provide constraints on crater history; specifically:

- (1) Dark-toned crater floor material may serve as an impermeable cap rock
- (2) Distinct inliers of light-toned crater floor material represent original boundaries between light- and dark-toned units
- (3) Relationship between fractures and deltaic deposits suggest that dark-toned strata underlies (and is therefore older than) deltaic deposits
- (4) Fractures intersect some overlying deltaic-lacustrine sedimentary deposits, suggesting that some floor deposits may be older than the current delta
- (5) Differential behavior of fractures indicates critical differences in the chemical reactivity of floor units during fluid-rock interaction



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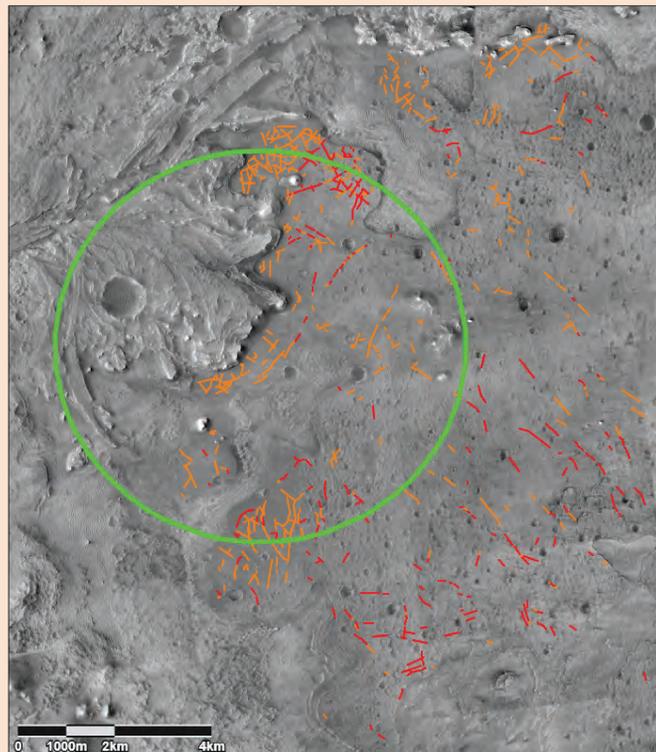


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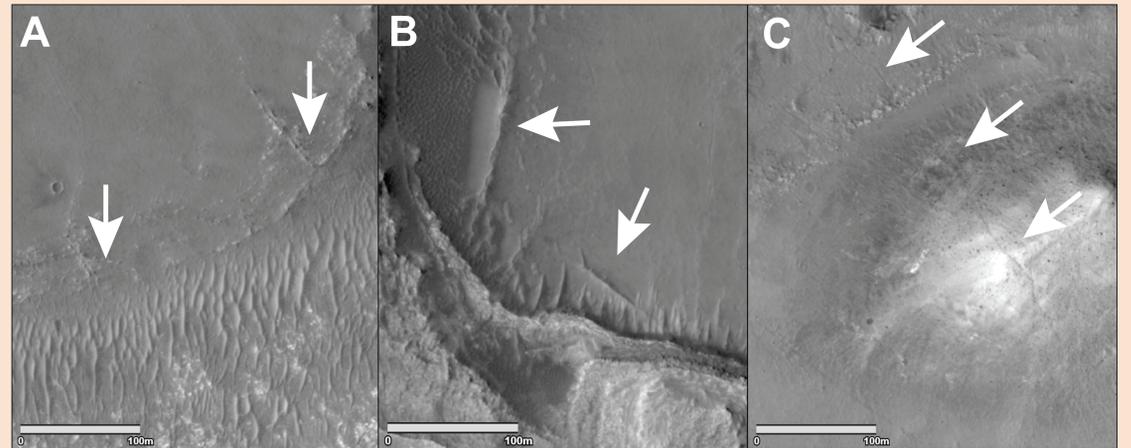


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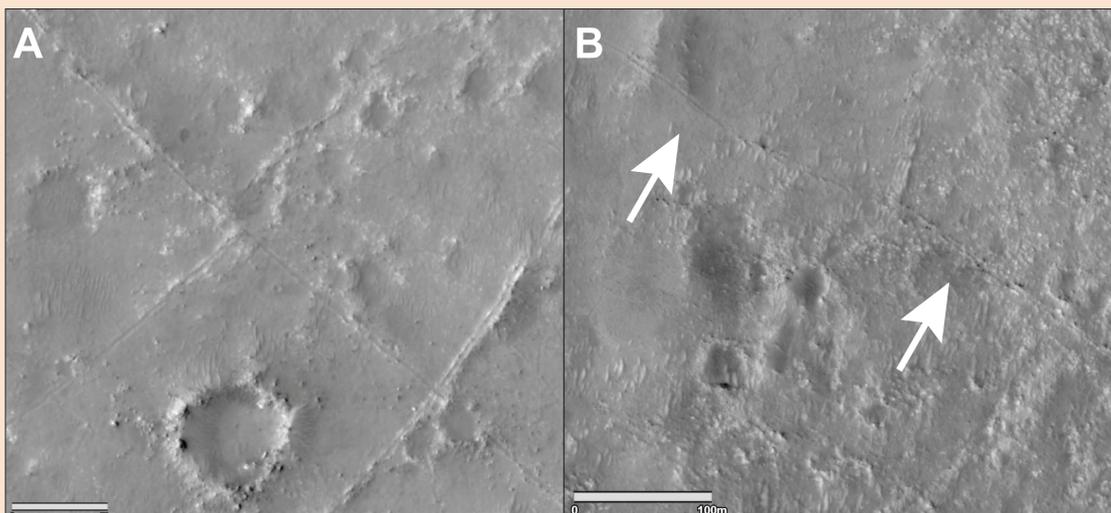
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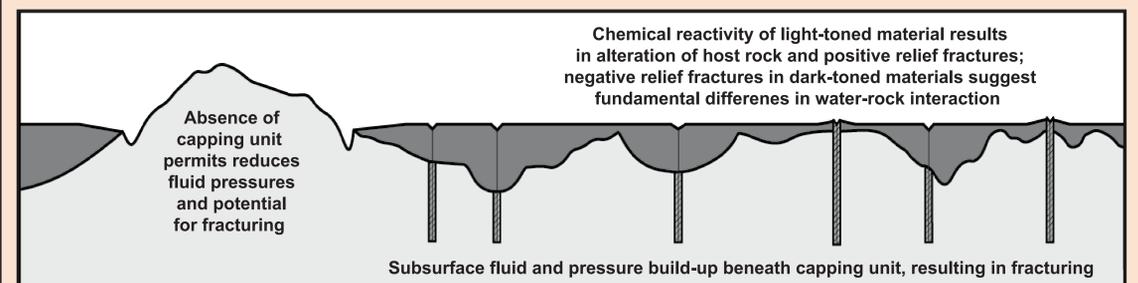
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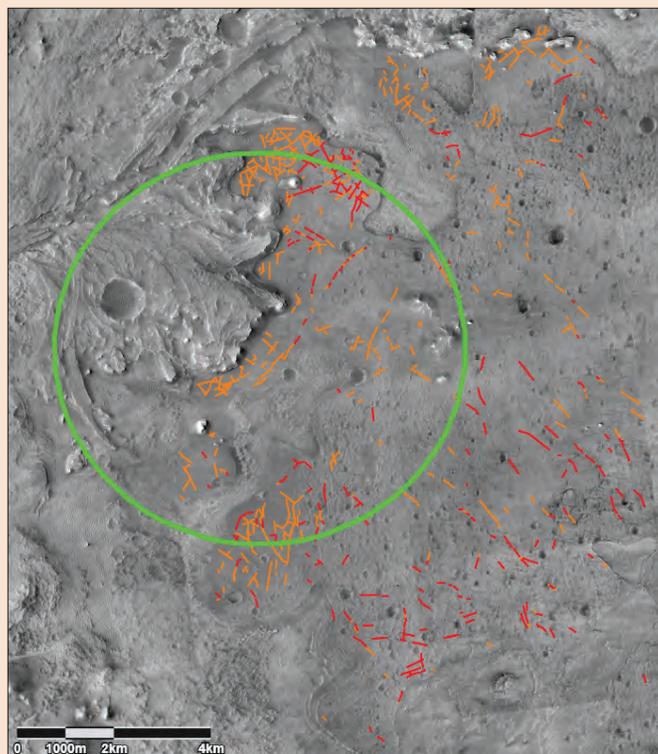


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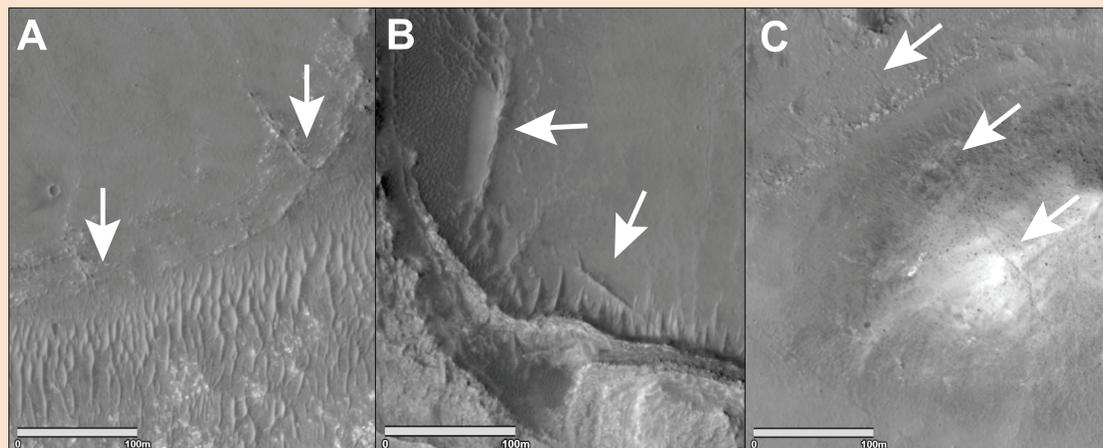


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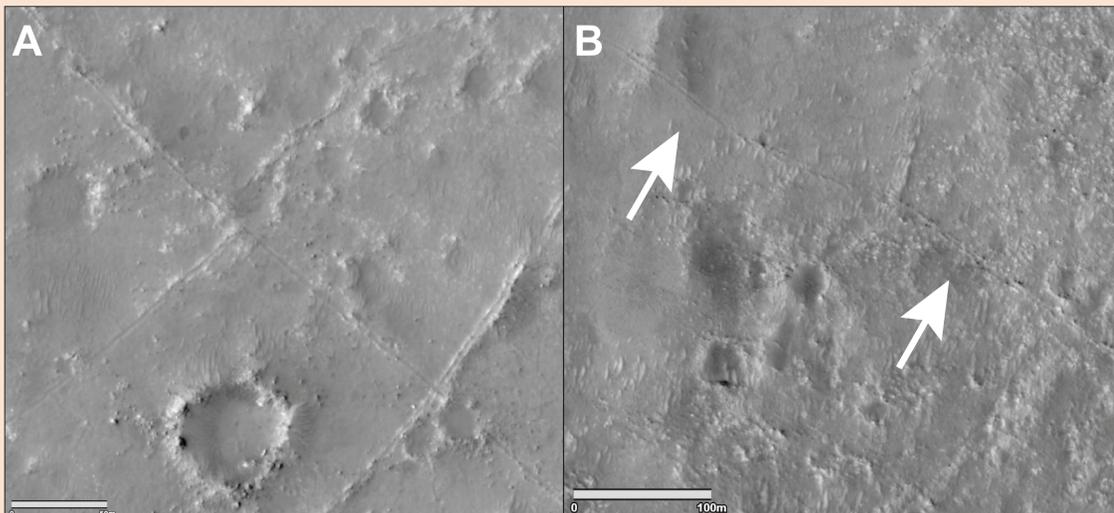
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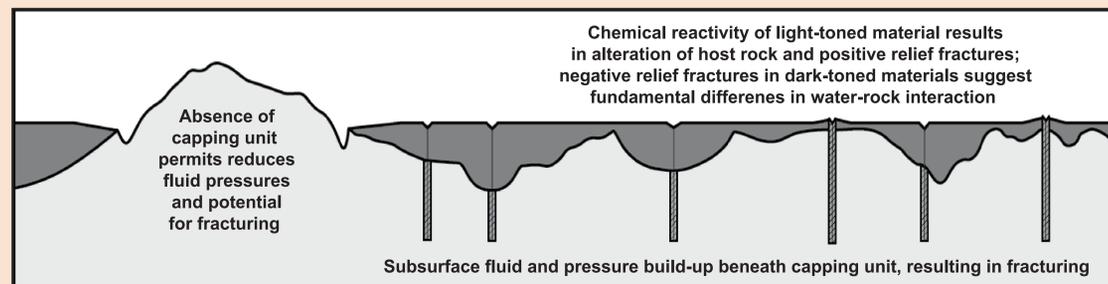
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