REMOTE SENSING TECHNIQUES THAT AID IN THE IDENTIFICATION OF LOCATIONS WITH HIGH BIOSIGNATURE PRESERVATION POTENTIAL. J. M. Williams[1], T. P. Nagle-McNaughton[1], L. A. Scuderi[1], H. E. Newsom[1], Z. E. Gallegos[1], [1]University of New Mexico, Albuquerque, NM 87131, USA (jwilliams4@unm.edu).

Introduction: The Jezero crater has been selected to be the destination for the Mars 2020 rover in early 2021. One of the primary goals of the Mars 2020 mission is to identify locations within or near the landing ellipse that could have high biosignature preservation potential. The rover would then seek these locations and cache samples for return and analysis on the Earth. It is therefore vital to locate areas near or in the landing ellipse utilizing orbitally derived imagery. Solar and cosmogenic radiation destroys organic molecules at the Martian surface, however fresh outcrops (<100ma) re-exposed by aeolian dominated erosion provide sites where biosignatures could have been protected and made recently available for sampling. Previous work on analyzing aeolian dominated erosion by mapping meter-scale scarp orientation [1] returned a distribution of scarp orientations not significantly different from random, and bearing little correspondence with the wind directions. However, coupled with further study of possible scarp retreat indicators such as a detailed analysis of boulders shedding, [2] and Infrared Red Blue (IRB) color stretch analysis [1] might help yield locations with relatively fresh outcrops that were previously shielded from solar and cosmogenic radiation and may be useful to identify samples with potential biosignatures.

Scarp Orientation in Jezero: Williams, J. M. et al. [1] utilized 25cm/pixel imagery obtained from the High Resolution Science Experiment (HiRISE) onboard the Mars Reconnaissance Orbiter (MRO) to map scarp orientations found in and near the landing ellipse within the Jezero crater. Scarps were mapped using this imagery to investigate (1) if scarp orientations aligned normal to eroding wind direction indicating that scarp orientations are perpendicular to that of the formative wind stepped back uniformly or (2) scarps become parallel to the formative eroding winds, (3) scarps orient in bimodal distributions of parallel and perpendicular to the formative winds, and (4) scarp orientation does not correlate with wind direction. This investigation did not yield a statistically significant result and therefore meter-scale scarp orientations in Jezero do not appear to correlate with erosive wind directions and therefore cannot help to predict locations of active or most active erosion [1].

Boulder Identification and Quantifying positions in Jezero: We developed an automated methodology for identifying boulders in and near the landing ellipse at Jezero crater utilizing images from the HiRISE instrument [2]. Parallel scarp retreat; softer material below erosion resistant bedforms within a scarp is removed through aeolian processes allowing the erosion resistant layer(s) to fail, creating cleaved blocks or boulders. This process repeats over time causing the scarp to retreat and step back in the direction of the scarp face. Scarps with abundant boulder shedding could indicate increased erosion. These scarps could be eroding quickly enough to allow boulders to accumulate without being destroyed by erosion. This procedure was applied to the Jezero delta/fan and surrounding areas (~64km^2) and correlated with the manually digitized scarps [1] covering the southern portion of the Jezero delta/fan. Over 440,000 were identified correlating with boulder-like features over 170,000 meter-scale scarps on the western delta/fan formation. The density on the western delta/fan was heterogeneous and varied by three orders of magnitude [2]. The Jezero delta/fan elevation histogram shows a clustering of boulders at the -2400 m to -2435 m.

Discussion: Prior to landing the Mars 2020 rover mission will be completely dependent on remote sensing analysis to assess point of interests within the mission area. The scarp orientation study did not reveal scarp orientation patterns indicative with retreating scarps related to eroding winds. This indicates that the erosive wind directions are either not the driving force behind scarp evolution or that the combined formative winds occurred at a multitude of different directions. However, there clearly is scarp retreat, exposing newly unshielded terrain that will be suitable for sampling. The boulder study within the western delta/fan yielded a multitude of boulders in close proximity to scarps associated with the delta/fan complex. These scarps are assumed to be derived from a silica indurated channel floor and would be a good astrobiologic target. With further study a correlation between these scarps and boulders could help identify scarps that could be more actively eroding than others found in the area. This would be useful for identifying locations that could have recently exposed surface materials and therefore help to identify locations with high biosignature preservation potential.

References: [1] Williams J. M. *et al.* ICARUS 2020. [2] Nagle-McNaughton T. P. *et al.* (The 9TH International Conference on Mars).