TEMPORAL VARIATIONS IN WIND PATTERNS WITHIN JEZERO CRATER. T. C. Dorn and M. D. Day, Department of Earth, Planetary, and Space Sciences, University of California Los Angeles, Los Angeles, CA 90095, USA, (planetarytaylor@g.ucla.edu)

Introduction: Aeolian processes are the dominant modern agent of landscape modification on Mars, reworking existing surfaces and sedimentary materials [1]. Records of wind-surface interactions are often preserved in the morphologies of surface features, and careful interpretation of surface geomorphology can allow for reconstruction of recent and ancient wind regimes [2]. Several different features derive their morphology from wind-driven erosion or deposition, including yardangs [3], dunes [4], transverse aeolian ridges (TARs) [5], and wind streaks [6]. In this work we use these features to understand how winds in Jezero crater may have changed over time. The chosen landing site for the Mars 2020 rover mission, Jezero crater, is ~45 km in diameter and sits on the martian dichotomy boundary northwest of Isidis basin (Fig. 1a). Measurements of the wind at the rover location will be made by the Mars Environmental Dynamics Analyzer (MEDA) instrument [7], however, further analysis of the aeolian regime in Jezero crater as a whole is necessary to put these measurements in their broader geologic context. Understanding the ubiquitous aeolian processes in this location will provide critical context for rover operations and scientific investigations.

Although many features in Jezero crater record the long-term history of winds, wind streaks can reorient on time scales of days to weeks, and therefore provide the shortest time scale record of modern winds in the crater. In Jezero crater wind streaks commonly extend from the lee side of small impact craters, and indicate a formative wind direction along the long axis of the streak (Fig. 1b). Wind streaks form either low or high albedo linear features depending on the type of wind streak, scale, and formation mechanism [8].

We assess the orientation and seasonal variability of wind streaks within Jezero crater on Mars to understand the modern wind regime. Coupled with measurements of aeolian features forming over longer time scales, We 1) reconstruct the history of winds in Jezero crater, 2) demonstrate patterns in the modern wind regime, and 3) estimate the volume of unconsolidated aeolian material in the crater.

Methods: Although previous studies have looked broadly at aeolian features in Jezero crater [9], there has yet to be a systematic analysis of all scales of wind-formed features occurring within the crater. We looked at the 44 HiRISE images acquired between January 29, 2007 and January 1, 2017. From these images, we

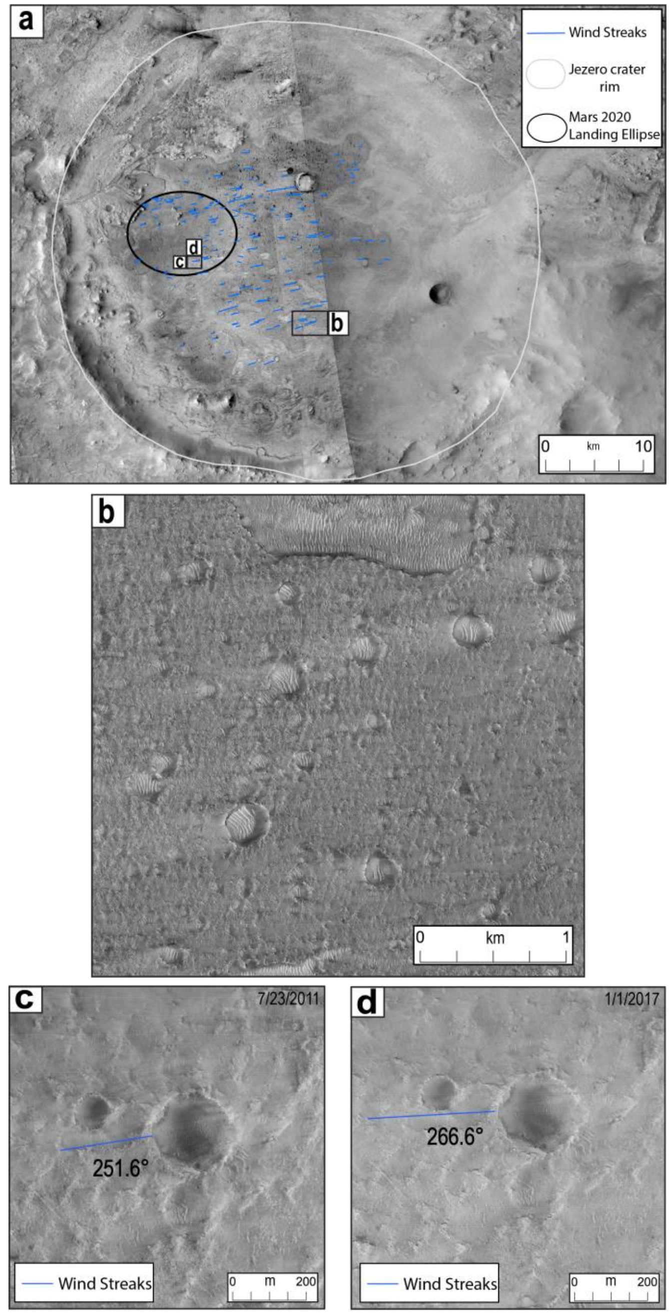

Fig. 1. Jezero crater, Mars. North is up in all images. ***(a)*** *CTX mosaic of Jezero crater, outlined in gray. Locations of figures 1b and 1c are boxed and the Mars 2020 landing ellipse is shown.* ***(b)*** *Prominent wind streaks in Jezero centered. HiRISE images ESP_023102_1985. Contrast and brightness were stretched to better display wind streaks.* ***(c and d)*** *Wind streak orientation change observed in two HiRISE images: ESP_023379_1985 and ESP_048908_1985.*

identified wind streaks, TARs, and bedrock yardangs, which reflect the modern, topographically-controlled, and long-term winds, respectively.

Measurements of individual features were made using GIS software. High and low albedo wind streaks were identified in each HiRISE image where they were then measured from the interpreted upwind point (typically at a crater rim) to the most downwind point where the high or low albedo feature became indistinguishable from the surrounding landscape (Fig 1c). TARS and yardangs were considered 180° ambiguous indicators of wind direction normal and parallel to the feature elongation direction, respectively.

The volume of modern aeolian material in Jezero crater was estimated from mapping of TARs. TARs vary little across Jezero crater and tend to form in fields of densely packed bedforms of ~20 m wavelength. Using well-established TAR cross-sectional geometries [10] we estimated the volume of aeolian material in TAR fields assuming a constant mean wavelength of 20 m and associated height.

Results: In total, we identified 334 wind streaks in 26 of the 44 HiRISE images, spanning 10 years with coverage in each of Mars' seasons. Wind streaks in Jezero crater occur primarily in the units described as the "volcanic floor unit" (VF) and the "light-toned floor unit" (LTF) [11]. These two units are exclusive to the crater's interior and exhibit a high density of impact craters. The measurements yielded an average orientation of 263° with a standard deviation of 8.2° indicating a predominance of easterly winds (Fig 2). Wind streak length within Jezero crater is highly varied with the shortest wind streak measured at ~35 m and the longest measured at ~3 km.

Yardangs occur in the southwestern portion of the crater floor, carved into exposed bedrock of the "mottled terrain" (MT) and "crater rim and wall material" (Crw) units [11]. These features have wavelengths of ~100 m and extend 50-100 m parallel to one another. The orientation of the yardangs varies from the southwest to southeast portions of the crater floor, but overall the yardangs exhibit a northeast-southwest elongation that is at odds with the modern easterly winds. The asymmetrically blunted morphology of the yardangs suggests southwesterly winds shaped these features, possibly as katabatic winds coming down the crater rim.

Conclusion and ongoing work: Detailed analysis of aeolian features within Jezero crater has revealed complex interactions between the surface and the atmosphere that have changed over geologic time. The features that reorient on the shortest time scales (wind streaks) show a modern wind regime dominated by very low variance easterly winds. However, longer time-scale features (yardangs) show southwesterly winds. Ubiquitous transverse aeolian ridges house modern unconsolidated aeolian sediments. When considered holistically, the aeolian-formed features in Jezero crater describe an active aeolian regime that was likely similarly active alongside the formation of the interior delta deposit.

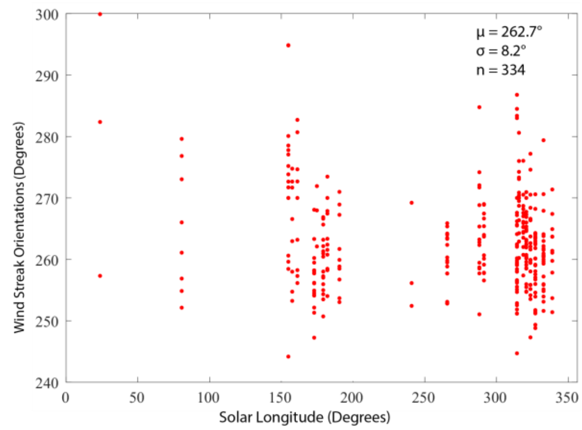

Fig. 2. *Wind streak orientation measurements taken within Jezero crater. Wind streak orientations vary over the year with an average orientation of 262.7° and standard deviation of 8.2°.*

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