A GEOLOGIC MAP OF THE JEZERO AND NORTHEAST SYRTIS REGIONS OF MARS. V. Z. Sun and K. M. Stack, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA (Vivian.Sun@jpl.caltech.edu).

Introduction: Jezero crater and the adjacent NE Syrtis terrains have been the subject of numerous orbital studies[1-7], and Jezero will be the focus of future investigations by the Mars 2020 rover. Both areas are closely located and host geologic materials with similar physical and mineralogic characteristics, yet the two sites have been hypothesized to represent different and generally unrelated ancient habitable settings, with Jezero representing surface habitability[1-3] and NE Syrtis representing subsurface habitability[4-7]. Producing a geologic map over the combined Jezero and NE Syrtis regions will enable us to: 1) Make connections between two sites with presumed different habitable settings, but with similar geologic and mineralogic units, and 2) Understand the diversity and distribution of environments that may be explored and potentially sampled by Mars 2020.

We will present our progress on a USGS Scientific Investigations Map (SIM) series geologic map of the Jezero and NE Syrtis regions (Fig. 1). Geologic maps have previously been separately produced for Jezero crater[3] and NE Syrtis[6] and there is also a current effort by the Mars 2020 science team to produce a 1:5,000 scale geologic map of the Jezero landing ellipse region[8] (which is an unrelated and separate effort from the work described here). However, these maps cover the combined Jezero and NE Syrtis region over different spatial extents and at variable mapped scales.

Methods: We are constructing a geologic map encompassing NE Syrtis, the western portion of Jezero crater, and the area between them (Fig. 1). The map is being constructed at 1:20,000 Digital Mapping Scale and printed at 1:75,000 Publication Map Scale. Mapping responsibilities were split equally between the two mappers. Each mapper first completed their half of the map area, and the two map halves will be reconciled and merged after resolving any discrepancies in map unit identification. Mapping was performed in ArcGIS on a CTX basemap, supplemented by HiRISE data to ensure accurate identification and characterization of geologic units. Relative ages will be attributed to map units based on their stratigraphic relationships, and absolute ages will also be determined based on crater-count age dating when possible.

This project is a two-year effort and we aim to publish this map prior to the Mars 2020 landing in February 2021, so as to provide a valuable and timely resource for the Mars community.

Year 1 Progress: We have completed a preliminary version of the geologic map (Fig. 1), and have also mapped linear features (large fractures, ridges) and small craters (<200 m diameter, mapped as point features). Our defined map units are overall consistent with what has been mapped previously in this region[3,6], although we identified in several units textural variations that were previously unmapped; some of these variations are described below.

Materials containing an olivine and/or carbonate spectral signature have previously been identified at Jezero[2,3] and in NE Syrtis[6] and correspond to our map units "Light-toned units" and "Rugged cratered unit 1" respectively. The stratigraphic relationship between these materials is difficult to discern and it is possible that they are laterally and/or stratigraphically equivalent, although they exhibit different physical properties. "Rugged cratered unit 1" is concentrated in the terrains southwest outside of Jezero and is characterized by distinct edges, sometimes forming long linear features, that enable this unit to be distinguished from the overlying capping unit ("Rugged cratered unit 2") and the underlying basement units ("Rugged light-toned units"). The "Light-toned units" exhibit various textures: a texture characterized by small-scale ridges that trend NE-SW is observed in the northern portions of Jezero (dark yellow color in Fig. 1), whereas the unit in the western and southern portions of Jezero is not ridged and has a muted expression and indistinct edges (light yellow and orange colors in Fig. 1).

Textural variations were also mapped for other units. In particular, the basement unit outside of Jezero and the crater floor unit within Jezero both exhibit areas with smooth and subdued textural expressions, likely due to variable surficial covering from some mantling material. In Fig. 1, the portions of these units that have subdued textures and are inferred to be mantled are indicated by different colors with an "s" designation in the legend. In the final map, these textural variations will be represented as part of a "surficial features" layer overlaid on the geologic map.

Expected Significance and Future Work: This geologic map of the combined Jezero and NE Syrtis region will enhance future scientific investigations of this important region of Mars by providing broad geologic context for future Mars 2020 rover observations of rocks studied and samples collected in this region. At the beginning of Year 2, we will focus on writing and refining geologic unit definitions, producing the Correlation of Map Units and determining relative and absolute ages of units where possible, and preparing

the map package for submission to the USGS Planetary Geologic Mapping Program.

Acknowledgments: This work is funded by a NASA Planetary Data Archiving, Restoration, and Tools Program (PDART 2018) grant awarded to K.M. Stack and V.Z. Sun.

References: [1] Fassett and Head (2005), GRL 32, L023456. [2] Ehlmann et al. (2008), Science 322, 1828-1832. [3] Goudge et al. (2015), JGR-Planets 120, E004782. [4] Mustard et al. (2009), JGR 114, E00D12. [5] Ehlmann and Mustard (2012), GRL 39, L11202. [6] Bramble et al. (2017), Icarus 293, 66-93. [7] Mangold et al. (2007), JGR-Planets 112, E002835. [8] Williams, N. et al., this conference.

Figure 1. Geologic map of the Jezero-NE Syrtis region. North is up and unit names are preliminary. In this current version of the map, units with different surficial textures are shown as different colors, and portions of units inferred to be covered by mantling material are indicated by "s" in the legend.