**GEOMORPHIC MAPPING OF THE BASEMENT UNIT WITHIN THE NORTHEAST SYRTIS MARS 2020 LANDING ELLIPSE.** V. Z. Sun and K. M. Stack, Jet Propulsion Laboratory, Pasadena, CA (Vivian.Sun@jpl.nasa.gov).

**Introduction:** Northeast (NE) Syrtis Major is one of the three final landing site candidates for the Mars 2020 mission. This region is located at the northwestern edge of the Isidis basin and is bordered by Nili Fossae to the north and the Syrtis Major volcanic complex to the south. The NE Syrtis landing ellipse contains diverse geology and aqueous mineralogy that is bracketed by the Late Noachian Isidis basin [1] and the Early Hesperian Syrtis Major lavas [2]. The major geologic units in NE Syrtis are, in ascending stratigraphic order: 1) a basement unit composed of low-Ca pyroxene, Fe/Mg phyllosilicate, and occasional Al phyllosilicate, 2) an olivine-rich, light-toned fractured unit that is variably altered to Mg-carbonate and interpreted to be impact melt from the Isidis impact [3], and 3) a spectrally featureless capping unit that forms mesas with the fractured unit [3-5].

The NE Syrtis basement unit is dated to the Late Noachian Isidis impact event [1] and preserves some of the oldest crustal materials exposed on the surface of Mars today. Various exposures of megabreccia in the basement also may provide a glimpse into pre-Isidis materials and stratigraphy from the Early/Middle Noachian periods [6,7]. Clays within the basement record past water-rock interactions and may also preserve biosignatures, which are an important focus for potential sample return from the Mars 2020 mission. Should NE Syrtis be selected as the Mars 2020 landing site, rover investigations of this basement unit would greatly enhance our understanding of the ancient martian environment and major transitions in Mars' climate.

The basement unit contains diverse morphology and mineralogy and can be divided into subunits on the basis of features such as ridges, fractures, megabreccia, and smooth textures [3,5]. These subunits may correlate with the presence or absence of low-Ca pyroxene and Fe/Mg clay signatures [3]. In this work, we characterize and map the basement within the NE Syrtis landing ellipse and determine the distribution of Fe/Mg and Al clays by correlating CRISM mineralogy with the geomorphic units. The location of clay-bearing basement rocks is likely to be of great interest to an *in situ* rover mission, and such detailed mapping could help guide the selection of Mars 2020 scientific waypoints.

**Geomorphic Mapping of the Ellipse:** Mapping was conducted at a scale of 1:1000 in ArcMap using a HiRISE basemap of the NE Syrtis ellipse [8]. Geomorphic units were defined from characteristics such as tone, texture, topography, and stratigraphic context. Though this work focuses on mapping the basement unit, younger superposing units were also mapped for completeness **(Fig. 1)**. These stratigraphically higher units are the "Light-toned Fractured Unit" (after "Fractured Unit" in [5]) and the mesa-forming units; "Complex Mesa" indicates stratigraphic packages of a capping unit overlying a light-toned, polygonally-fractured unit that is not associated with carbonate, and "Simple Mesa" indicates only a visible capping unit.

The basement unit can be divided into four subunits **(Fig. 1)**. The "Brecciated Basement" is characterized by scattered light-toned blocks within a darker-toned, often smooth-textured matrix. The "Fractured Basement" contains fractures and ridged features but otherwise has a smooth surface. The "Smooth" or "Covered Basement" is characterized solely by a dark tone and smooth texture, with no other features except for occasional eolian dunes. The "Rugged Basement" contains an assortment of knobs and ridges that contribute to an overall rough texture.

Mapping the distribution of these basement units is also useful for constraining possible sampling sites with the Mars 2020 payload. From the Mars Science Laboratory experience, regions that appear smooth-textured from orbit are often associated with rubbly, unconsolidated sands and gravel on the ground. In such cases, *in situ* bedrock is often not present and it can be difficult to obtain scientifically meaningful results from out-of-place material.

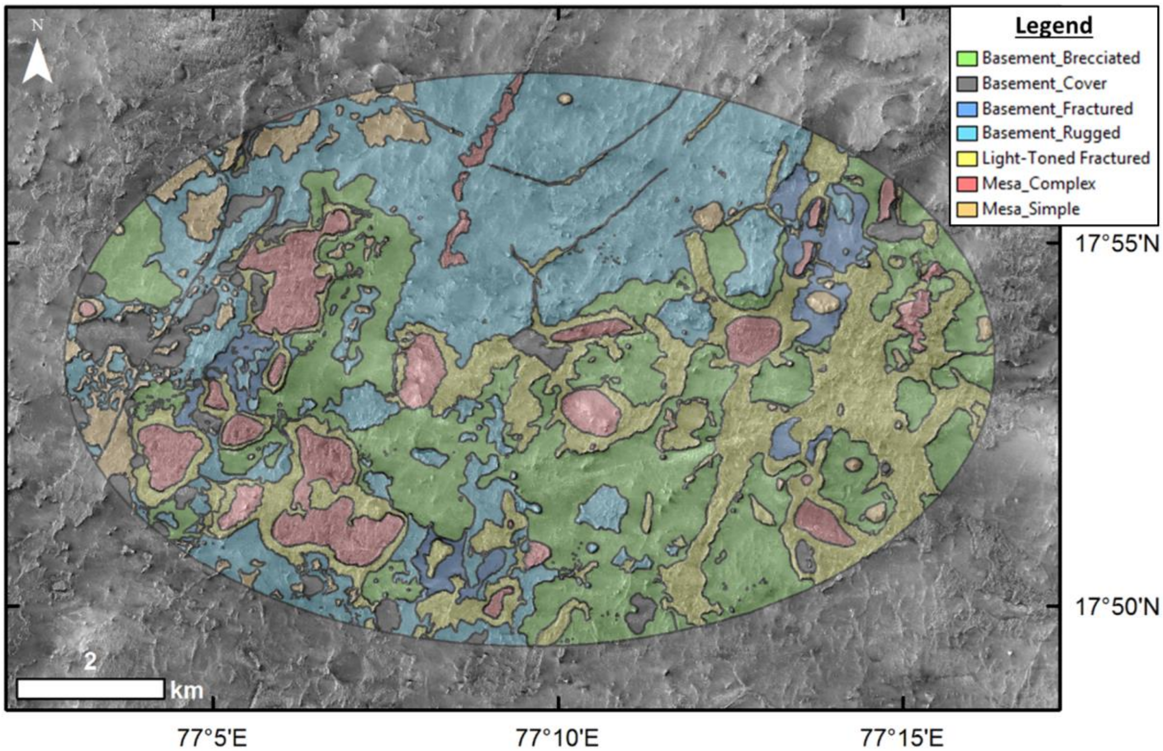
**Aqueous Mineralogy within the Ellipse:** Hydrated minerals were identified from CRISM MTRDR cubes [9]. As per previous reports [3-5], olivine and carbonate are associated with the Light-toned Fractured Unit and Fe/Mg clays are found only in the various basement units. Fe/Mg clay signatures are not consistently identified throughout the different basement units, either due to a true absence of clay in the basement rock or due to dust, sand, or cover obscuring the clay signatures. Further refinement of the geomorphic map and detailed correlation with the CRISM detections may help determine the reason for the spectral presence or absence of Fe/Mg clay within the basement units.

Very few detections of Al clay are found within the ellipse, although several exposures with stronger spectral signatures are found in the vicinity of the ellipse **(Fig. 2)**. Regionally, Al clays have been observed to overlie Fe/Mg clays in stratigraphy, suggesting surface weathering or acidic leaching processes [4]. Ongoing efforts will assess the geologic context of the detected Al clays to determine if this is similarly the case for the Al clays found in and around the ellipse.

**Acknowledgements:** We are grateful to Nathan Williams and Jay Dickson for providing basemap mosaics.

**References:** [1] Werner (2005), dissertation. [2] Hiesinger and Head (2004), *JGR* 109, E01004. [3] Mustard et al. (2009), *JGR* 114, E00D12. [4] Ehlmann and Mustard (2012), *GRL* 39, L11202. [5] Bramble et al. (2017), *Icarus* 293, 66-93. [6] Weiss et al., this conference. [7] Scheller and Ehlmann, this conference. [8] Williams et al., this conference. [9] Seelos et al. (2016) *LPSC 47*, #1783.

**Fig. 1.** Preliminary geomorphic map of the NE Syrtis landing ellipse. The basement unit comprises the majority of the ellipse area and can be divided into four subunits.



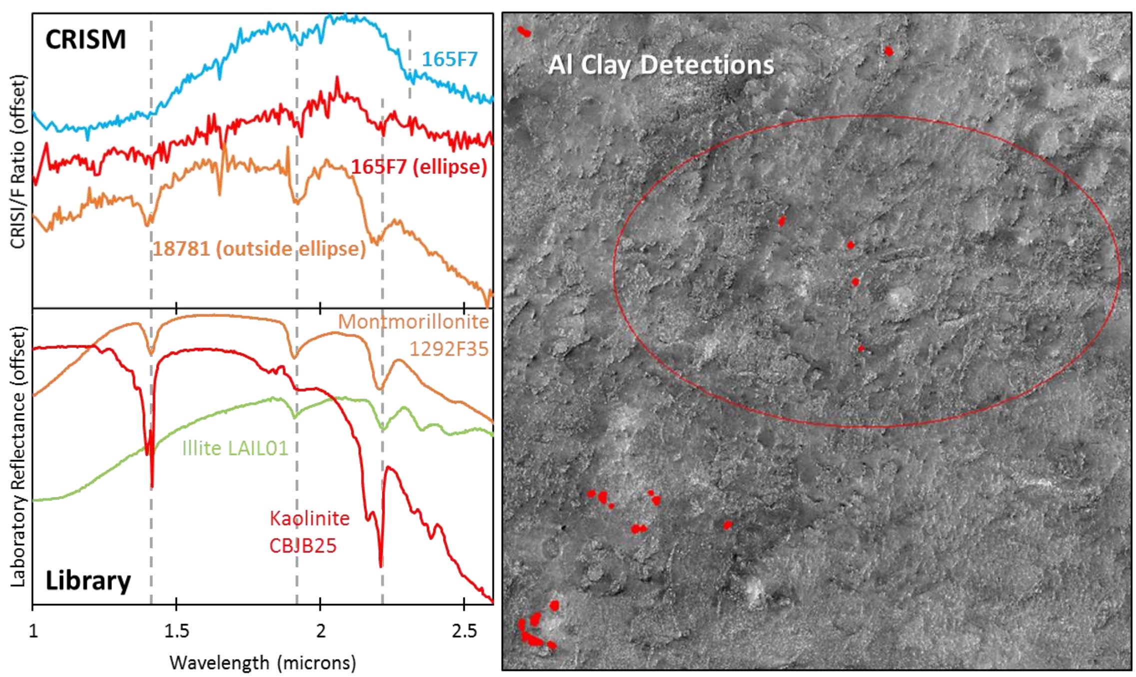




**Fig. 2.** (Left) Al clays are identified by their absorptions at 1.4, 1.9, and 2.2 µm, while Fe/Mg clays have absorptions at 1.4, 1.9, and 2.3 µm. (Top) Al clays (red, orange) identified in and around the ellipse, with Fe/Mg clay (blue) for comparison. (Bottom) Library spectra of various Al clays for comparison. (Right) Al clays detected in and around the ellipse thus far.