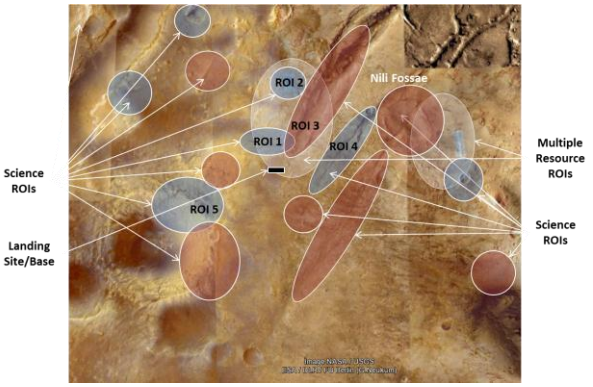
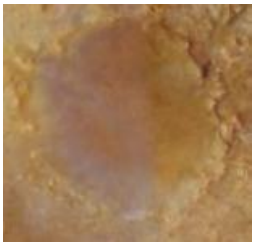
Nili Fossae Resource and Science ROIs. L. J. Markle.

Introduction: The Nili Fossae region is a very diverse region offering multiple opportunities for resource and science ROIs. The landing site, located approximately at 22.05°N, 76.95°E is centered in a crater at the southern end of a large valley. To the immediate east, north, and south, CRISM imagery indicates many key resources, most notably water ice.



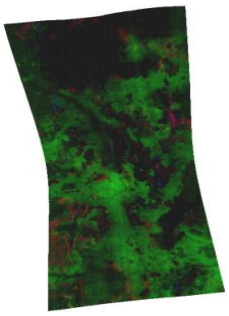
While this landing site is suggested, there are other nearby areas that could suffice for maximum ROI potential. Being located about 20° from the equator, this offers near maximum exposure to the sun for solar energy and food production. The Google Earth (GE) image below [1] indicates some of the many science and resource ROIs that are available in the area. One resource ROI is examined in more details below.

Landing Zone: This site [2] is a 9 mile wide crater with what appears to be a relatively smooth interior. The walls of the crater are no more than 600 feet at its highest peak and multiple passes provide easy exit to other ROIs.

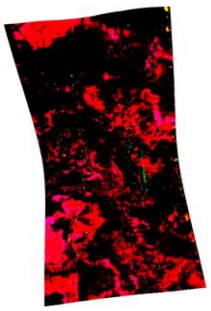


Alternate Landing Zone: This site [3] is an area about 9 mile wide also with what appears to be a relatively smooth interior. Located about 67 miles ENE of the primary LZ, this area is one where CRISM also indicates a wide area containing water ice. Another advantage of this site is that the Isidis region is much closer where that are could provide a science ROI to look for fossilized primordial live. Also located near here is a 5000' mountain which could operate as a communications repeater for long range communications.

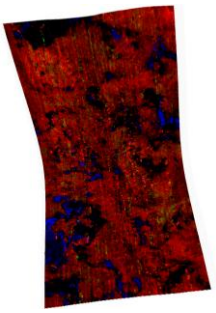
Resource ROI - Water Ice: This CRISM image [4] seems to indicate an abundance of water ice (green). Incidations of pockets of CO2 ice (blue) and water ice or hydrated sulphates, clays, or glass (red) are present in this image as well. Images south and east of this area show similar indications. Note, contrast and brightness were adjusted in this image to highlite the colors.



Resource ROI - Bound Water: This CRISM image [5] shows the presence of water containing minerals or water ice (red) and hydrated sulphates, clays, glass, or water ice (blue). Sporatic areas of monohydrated sulphates or water ice (green) can be seen in this image, but some of these may only be artifacts of the imagry.

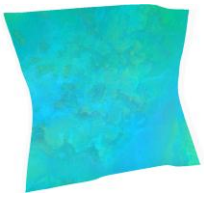


Resource ROI - Hydroxylated silicates: ThisCRISM image [6] shows indicates the presence of Fe/Mg phyllosilicates (red) in the area. There are some indications of hydrated sulfates (blue), clays, and/or glass in this image as well as small pockets of Al phyllosilicate or hydrated glass (green).



Resource ROI -Malfic Mineralogy: This CRISM image [7] shows the areas where olivine or iron phylosilicates may be found (red) and areas of low-Ca Pyroxene (green), and one possible area of high-Ca pyroxene (blue). It seems unclear in the image if the green areas are a combination of yellow and blue (high-CA) or actually green (low-Ca).

Resource ROI -Oxidized Iron Minerals: This CRISM image [8], located about 27 miles SSE of the previous image shows the areas of a varity of iron minerals (blue). Green indicates coatings (SH600 nm)



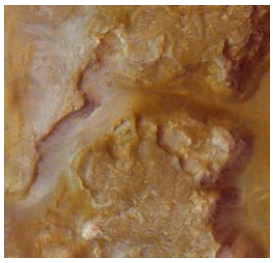
but further analysis would be needed to determine whether this is a viable source of minerals or simply scarce indicatations.

Astrobiology: As this area seems to indicate a large amount of water ice, this ice could contain the frozen/fossilized remains of Martian life. This would need to be considered if used for a source of water for drinking or growing crops. Also, approximately 150 miles east is the Isidis region which could offer interesting studies in possible fossilized remains of Martian life on the edges of what could have been a large Martian sea or ocean. While this is outside the current constaints of the EZ being proposed here, it does offer the possibility depending on where the base of operations is located or if extended explorations are realized.

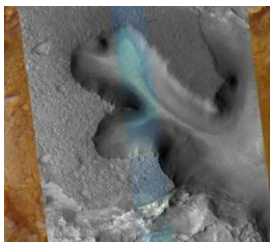
Geosciences: Craters, flows, crustal regions, and canyons (fossae) all offer multiple and diverse opportunities for geoscience. In surrounding craters, layered strata is exposed for geological analysis. In the fossae, studies can be done as to the origin, makeup, and age of these formations. While some of these are large, there do appear to be several locations for access into these canyons from the southern ends.

Atmospheric Studies: The proposed LZ is approximately 1700-1800 feet below mean elevation. Being this low, it offers an excellent opportunity for studies in an area of thicker atmosphere. This could also be beneficial for warmer temperatures because of the decreased elevation of the area.

ROI 1 – Canyon 1: This canyon [9], located at 21 45'N, 77 02'E appears to have easy access from the SW end and may also provide access to the large fossae as well. GE imagry indicates possible layering throughout the canyon.

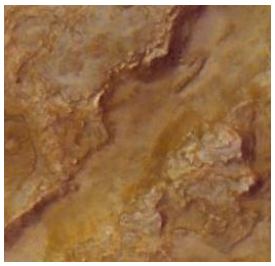


ROI 2 – Canyon 2: This canyon [10], located at 22.25°N, 77.07°E appears to be located in an ancient crater, with the SE portion opening into a large fossae. Dunes are present at the bottom of the canyon. The crater surface has a crust-like surface of some unknown material. Water ice appears abundant in the area as well. It appears to access the canyon from the SE portion of this image where other interesting geological features also appear.

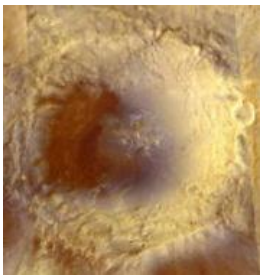


ROI 3 – Large Fossae: This canyon [11], begins at about 22.5°N, 77.0°E and extends approximately 200 miles to the NE. Beginning just outside the crater where the LZ is proposed, this appears to be an easy access point to the canyon to explore the cause, history, and geology of the canyon.

ROI 4 – Small Fossae: This canyon [12], begins just to the east of the large fossae, 21.1°N, 77.25°E While not as deep or long as the larger fossae, it could provide easier access and may be able to be traversed further into the interior for geological studies.



ROI 5 – Hargraves Crater: [13] Located about 32 miles SW of the proposed landing site, this large crater has multiple geological features. Expoxed layers on the rim as well as eroded features, flows, and subsequend impacts are some of the scientific interests in this area. About 37 miles in diameter, this crater provides an extensive area for exploration and research.



Additional ROIs: Many more scientific ROIs are available from either LZ. Only some are presented here.

References:

[1] Image from Google Earth, Nili Fossae region. [2] Google Earth image centered about 21.43°N 76.93°E [3] Google Earth image centered about 21.75°N 78.95°E [4] CRISM imagery HRL00011336_07_IF183L_ICE1.png
[5] CRISM, HRL00011336_07_IF183L_HYD1.png. [6] CRISM, HRL00011336_07_IF183L_PHY1.png. [7] CRISM. HRL00011336_07_IF183L_MAF1.png. [8] CRISM. FRT0000871C_07_IF166S_FEM1.png. [9] Google Earth image centered abt 21.75°N 77.05°E [10] Google Earth image centered abt 22.25°N 77.07°E [11] Google Earth image centered abt 21.92°N 77.25°E [12] Google Earth image centered abt 21.53°N 77.53°E [13] Google Earth image centered abt 20.72°N 75.75°E