Project Kratos, 17th July 2022

# Selecting the Landing Site- Nili Fossae: 22°N, 75°E

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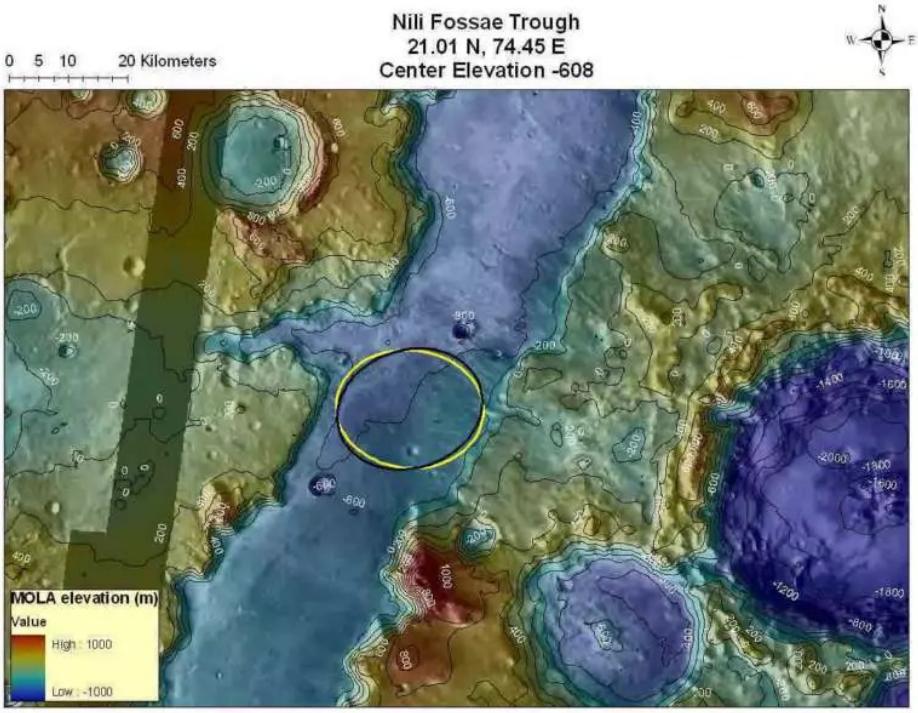
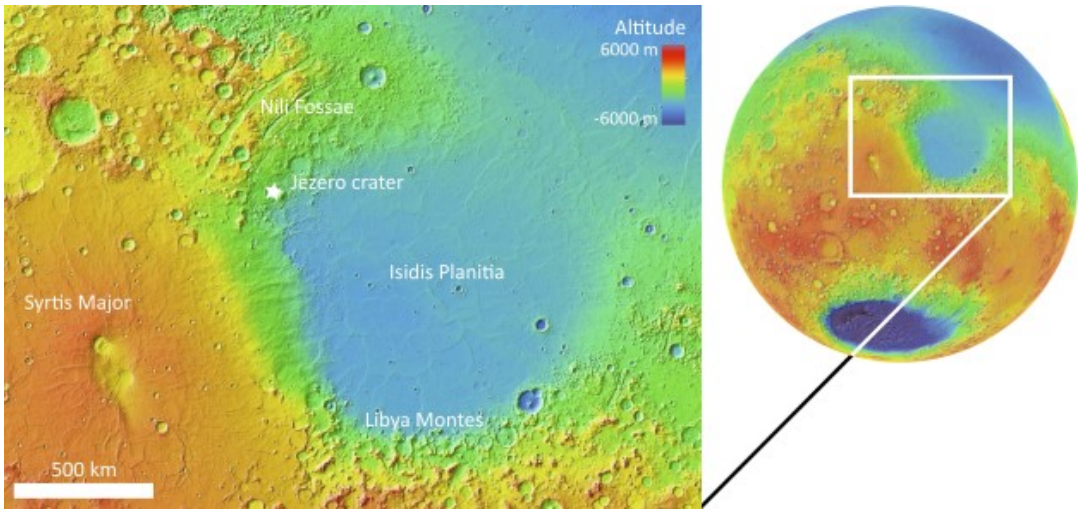



**POTENTIAL MSL LANDING SITE IN NILI FOSSAE**
*Image: NASA / JPL-Caltech / GSFC*

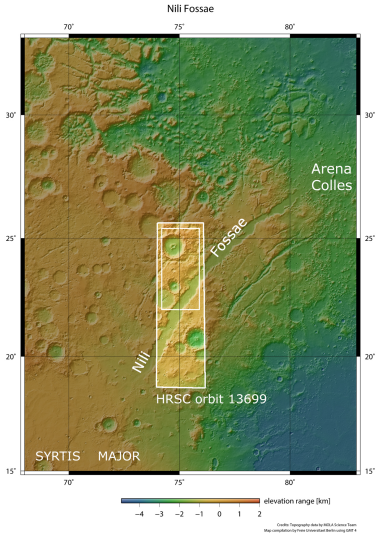
**Interestingly it was considered as a potential site in 2020 Perseverance Rover Mission and was one of seven possible sites of MSL (Mars Science Laboratory) rover in 2010.*

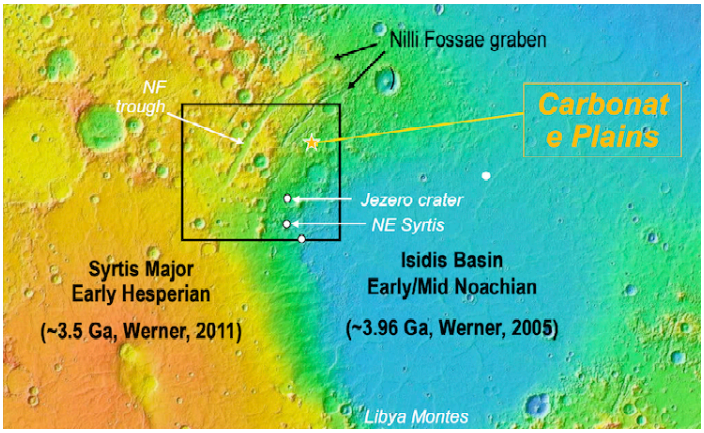
Nili Fossae is the name of a collection of curved faults and down-dropped blocks of crust between the faults. The "fossae," or troughs, lie northeast of the large volcano Syrtis Major and northwest of the ancient impact basin Isidis. The troughs, which are about 500 meters (1,600 feet) deep here, make concentric curves that follow the outline of Isidis; the faults likely formed as the crust sagged under the weight of lava flows filling Isidis. The crust in this region is approximately 4 billion years old.



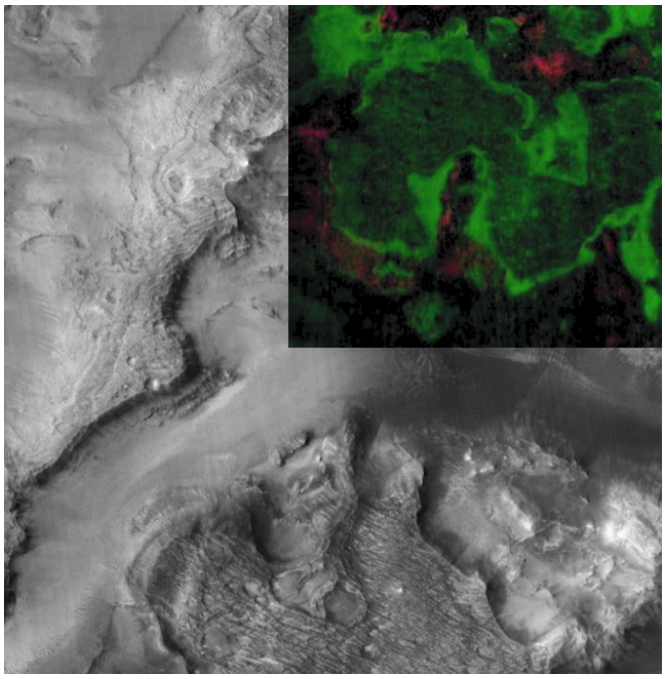
**Why Nili Fossae as the landing site?**

1. The spot allows us to make two important findings about the age of the Martian surface. One of the first things noticed was the stream of lava filled by the Syrtis Major. This helps in precise dating by counting the craters on its surface. The older the surface, the more holes it has. Also, the surface has rocks that have come from deep down. This can again be dated and their chemistry can be understood. (Thollot, 2017)
2. The mineralogy of the region is spectacular. Within a few hundred kilometres of the site, there are volcanic minerals like olivine and pyroxene, and many types of phyllosilicates (clays).
3. CRISM (Compact Reconnaissance Imaging Spectrometer) images indicate the presence of water ice. Once confirmed, this can be the key to long-term habitation. Habitation on Mars is one of the major questions asked in the search for Martian life. (NASA)
4. The presence of carbonate has been one of the key discoveries. The site is part of the largest exposure of carbonate-bearing rocks on Mars. Carbonates dissolve in acidic waters, so their presence indicates a neutral to high pH in the region, which is generally more friendly to life.




5. The site is special because high-Mg olivine traps primitve lavas or mantle cumulates.( Ehlmann et al., 2014)
6. Earth-based telescopes have detected hints of possible methane in the atmosphere. The existence of methane on Mars can be linked to microbial metabolic activity. The variable detections of methane by the Curiosity rover, orbiters, and terrestrial telescopes, coupled with methane's short lifetime in the martian atmosphere, may imply an active gas source in the planet's subsurface. (Oehler&Etiope, 2017)




**CRISM IMAGES indicating presence of water ice and microbial life.**

References:

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3. Bethany Ehlmann, Christopher Edwards et al.(2014), Nili Fossae Carbonate Plains https://marsnext.jpl.nasa.gov/workshops/2014_05/16_Ehlmann_CarbonatePlains_Mars2020_1stWkshp_v4.pdf
4. Hand (2019), Nature: ’Methane-producing mineral discoreve on Mars’ https://www.nature.com/articles/news.2009.197#citeas
5. Dorothy Z. Oehler and Giuseppe Etiope(2017), Mary Ann Liebert,Inc. Publishers- ‘Methane Seepage on Mars: Where to Look and Why’ https://doi.org/10.1089/ast.2017.1657