

MANNED MARS MISSION EXPLORATION ZONE: EASTERN RIM OF HELLAS IMPACT BASIN.

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Introduction: The Hellas impact basin, located in the southern cratered highlands of Mars, formed during the Late Heavy Bombardment period of the Solar System (3.9 to 4.3 Ga). This corresponds to the earliest period of Martian history, the Noachian. Hellas is the largest and deepest impact crater in the Solar System (2,300 km diameter and over 9 km deep from rim to basin floor). The Hellas impact event played a major global role in the geologic evolution of the planet.

Science Rationale: Our proposed 200 km diameter Exploration Zone centered near 40°S; 104°E is located along the eastern rim of the Hellas basin which will allow astronauts to study and collect very ancient deep seated materials which were excavated in the impact event and subsequently deposited as ejecta forming the rim. These rocks will provide a unique window on the very early history and conditions (astrobiological, geological and climatological) on Mars.

Another key type of landform/material/resource found in this EZ are the numerous Lobate Debris Aprons (LDA). LDAs resemble glaciers on Earth and are thought to be dust/debris covered glaciers. MRO SHARAD data indicate that these features are indeed ice dominated deposit covered by a thin veneer of regolith. The LDAs likely formed during a recent climatic episode favorable to glacial processes at these latitudes. It appears that a large portion of the glacial ice is preserved underneath a thin layer of regolith. These ice deposits will be very important sites for astrobiologic, climatic, and geologic studies/sampling. Additionally, these ice deposits will be crucial for ISRU purposes. This EZ also contains a large channel system, Reull Vallis, and a multitude of valley networks which dissect the highlands and plains.

Science ROIs: *Noachian age* massifs/mountains and intermontane basin fill (fluvial deposits) located along the rim of Hellas. The massifs and mountains are ancient crustal blocks of material uplifted during the impact event. *Noachian/Hesperian age* valley networks and deposits.

Hesperian age fluvial plains formed by the overbank flow of Reull Vallis. The channel walls and floor deposits of Reull Vallis which are composed of materials eroded upstream from the cratered highlands.

Amazonian age lobate debris aprons (LDA) which are dust/debris mantled glaciers located at the base of numerous massifs and mountains as well as on the floors of craters in the EZ.

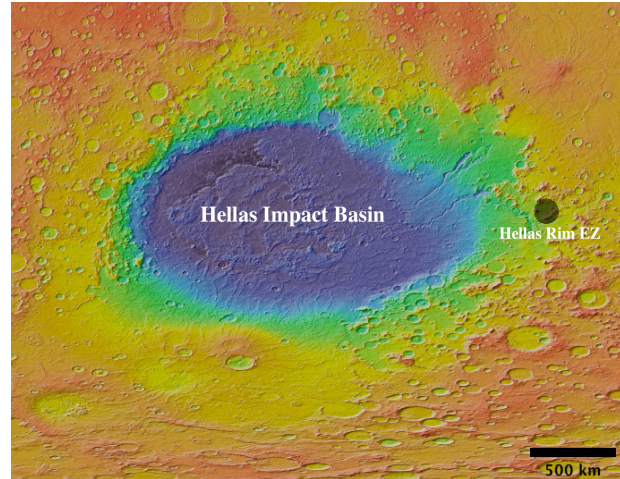


Figure 1. Regional view of the EZ located on the eastern rim of the Hellas impact basin in the Southern Highlands of Mars.

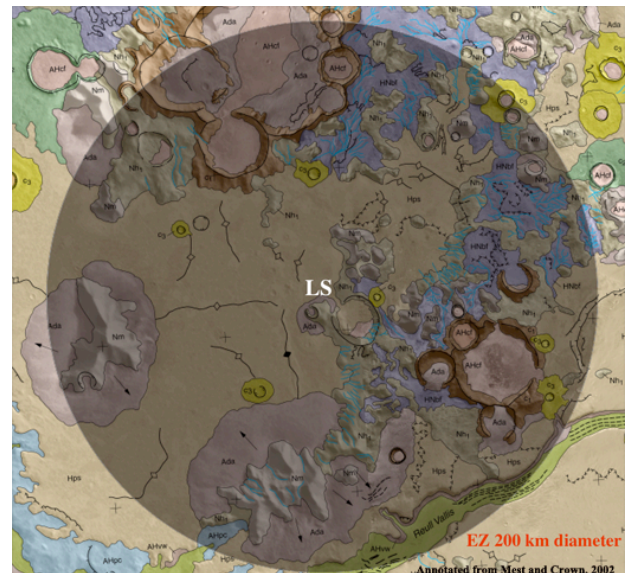


Figure 2. EZ placed on the geologic map of the area.