Map of the landing site

Oxia Planum is the selected landing site for the ExoMars Rosalind Franklin Rover. The goal of the reformulated ExoMars Rosalind Franklin mission, now in planning for launch in 2028, is to search for signs of past and present life and to characterize the water and geochemical environment in the subsurface as a function of depth.

Rosalind Franklin will accomplish this with its 'Pasteur' suite of scientific instruments, and a drilling and sampling subsystem to retrieve samples for analysis from up to 2 m depth.

In preparation for the mission, the ExoMars science team undertook a geological mapping exercise of the landing site prioritizing the 1-sigma

rover operations of the OP landing site's geography, stratigraphy, and geological history, and to provide testable hypotheses to facilitate

area of the landing ellipses. The goal of this map is to develop a thorough understanding prior to interpretation of results and address the mission's science objectives. 27.3 km Correlation of map units

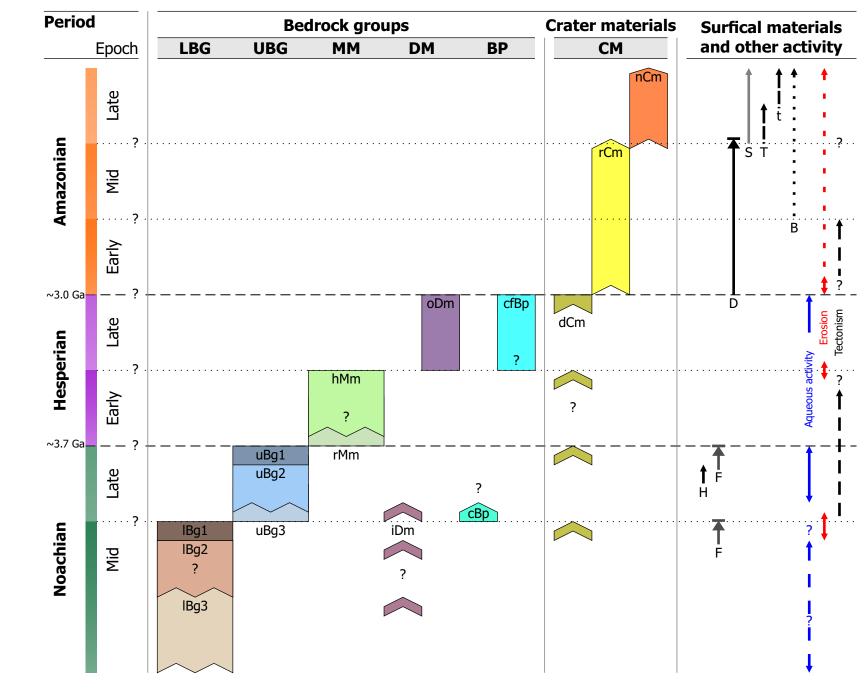
Interpreted cross section (A - A') from of the mapping area with 30 x vertical exaggeration and estimated dips.

Cross-section

The geological mapping identified 15 bedrock and 7 surficial units. These units are organised into 7 unit groups based on their contextual relationships.

Units in Lower bedrock (LGB), Upper bedrock (UBG) and Mound Material (MM) groups are laterally continuous, having previously completely covered the mapping area. Units in the Dark (DM) and Bright (BM) material groups are laterally discontinuous, representing heterogeneity within a bedrock group or deposition in discreet locations, overlying, or subjacent to, other bedrock units.

Material relating to impact craters (CM) are recorded in three state of degradation and surficial units are represented by textual overlays.



The stratigraphic relationships between the geological units found in the Oxia Planum landing site map and their relationships to various regional processes. The timing of events is drawn from the contextual geological literature to other events in the region. Coloured bars represent the time in which these

Contacts Launch Possibility Close (LPC) Lineament Scale Reverses fault, approx 1:30,000 events are likely to have occurred they do not reflection their duration. 24°15'W Crest of crater rim Scarp crest Location and context 22°W 20°W LPO Sigma 3 Map Boundry -3240 m -3240 m <(Left, top) Location of Oxia Planum on Mars <(left) Location of the landing site HRSC colore (Right)> The geological map location within Oxia Planum

The global setting of Oxia Planum on the margin between Southern Acidalia Planitia, Chryse Plantia and North-West Arabia Terra and the landing site within Oxia Planum region.

The local setting of the map in norther Oxia Planum. Marked in *italics* are informal names given to the local geography (Fawdon et al; 2021) used to describe the local setting of the map. The landing ellipses and extent the regions containing the map are marked.

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Description of map units

Each geological unit is described in terms of its apparency in the HiRISE and CaSSIS data sets. We report notable aspects of their stratigraphic relationships, any compositional information available and their

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				uBg, and Mm unit groups (McNeil et al., 2022).
		Mound material group (MM)		

neations. CaSSIS: Yellow tones in all illumination

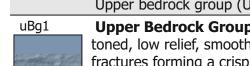
hMm forms the tops of larger mounds. Mounds conical mounds ~100 m across and up to 10 m in often have a bright layer half way up, scree around the base of the topographic mound below hMm. height. The bright smooth surface has occasional their bases and occasionally have small impacts on hMm never overlies oDm. Mounds with hMm are them. No good CRISM observations are avaliable in

part of a population extending 100s of km into Chryse Planitia (McNeil et al., 2022). In Oxia Planum hMm must predate oDm. Some mounds are dissected by troughs and have internal ridges.



Bright 'knobbles' often trend into ridges parallel to upstanding knobby patches and ridges often with a the trend of periodic bedrock ridges (PBRs). No dark unconformity (contact?) seen at base. CaSSIS; resolvable compositional associations.

Knobbles and ridges both overlie uBg and IBg group. Similar ridges are frequently seen thoughout the wider Oxia Planum region commonly trend into PBRs (Favaro et al., 2021).



Upper Bedrock Group 1 - HiRISE: Mid to bright Strongly associated with the top of local oned, low relief, smooth with widely spaced (>5 m) topographic highs and scarps. Not strongly ractures forming a crisply-defined layer \sim 1 m thick. associated with phyllosilicate minerals in CRISM. CaSSIS: Low relief, bright/white/grey tones.

Overlies uBg2 It is overlain by examples of both the Mm and Dm groups. Similar units appear at the top of scarps and on local topographic highs throughout the region where they are often overlain by Mm and Dm group style units.



Upper Bedrock Group 2 - HiRISE; High relief, bright, rugged material, forming low hills. CaSSIS: High relief with bright/blue tones.

regions of the map. Strongly associated with the 'honeycomb' texture and scarps in Pannonia. Some mixtures with olivine (Mandon et al., 2022). Dark obscure this signal.

Forms wide (>100m) upstanding areas in all

underlies uBg1 in mesa walls. Occurs thoughout the association with phyllosilicate minerals and possible Oxia Planum region. Crater wall cross-sections show sedimentary architecture. Layering often variable in regolith distribution below the CRISM pixel size may thickness. uBG1 is also strongly associated with inverted/exhumed channels (Davis et al., 2022)

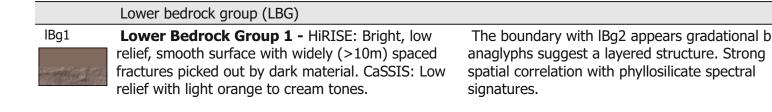
Overlies or grades downwards into uBg3, low hills

of this unit are often capped with uBq1. Directly



Upper Bedrock Group 3 - HiRISE: Bright, rough, Small patches of S t and D material frequently small-scale (<5 m) fractures/knobs with darker overlie the surface complicating identification. Not material between them. CaSSIS: Dark blue/black sampled in any CRISM data.

Occurring as a layer around the bottom of larger mesas of uBg2 and appears to underly uBg2. Appearing as outliers overlying IBg units. Evident in the stumps at the base of rounded buttes capped with hMm where HiRISE coverage permits



The boundary with IBg2 appears gradational but

Often occurs in slightly lower, rougher areas than

adjacent IBq1. The more eroded fractures have

Directly underlies uBg units and cBp and has a gradational boundary with IBg3. Across the Oxia Planum region, material similar to IBg1 crops out below uBq-style material where it consistently correlates with phyllosilicate spectral signatures. Also spatially correlates with PBRs.

There is a gradational boundary with IBg1 but a

distinct topographic step (~50 cm) between the two



more dark infill. Below the resolution of CRISM where iDm is exposed. Seen throughout the wider Oxia Planum where scarps or windows though IBg



Legend









Lower Bedrock Group 3 - HiRISE: Bright, low Only seen at the lowest elevations of the map relief surface with moderately (~5-10 m) spaced (Pannonia and impact craters). The margins can fractures that show no strong orientation pattern. appear to grade into the other surrounding units. CaSSIS: Low relief with bright, light orange tone. Very strong spatial correlation with phyllosilicate spectral signatures.

It could underlie or be at the same level as examples of iDm. Elsewhere in the region this unit often occurs in areas with bright orange tone in CaSSIS data, and occur in the lowest parts of the