

HiRISE-scale characterization of the Oxia Planum landing site for the ExoMars 2022 Mission

Elliot Sefton-Nash¹, Matt Balme², Cathy Quantin-Nataf³, Peter Fawdon², Matthieu Volat³, Ernst Hauber⁴, Csilla Orgel¹, Alessandro Frigeri⁶, Laetitia Le Deit⁷, Ottaviano Ruesch⁵, Solmaz Adeli⁴, Damien Loizeau¹⁰, Joel Davis⁸, Peter Grindrod⁸, Andrea Nass⁴, Sander de Witte¹, Fred J. Calef⁹, Tariq K. Soliman⁹, Jorge L. Vago¹,

and the ExoMars Rover Science Operations Working Group (RSOWG) Macro Mapping Team

European Space Research and Technology Centre, European Space Agency, Noordwijk, Netherlands (e.sefton-nash@cosmos.esa.int)
 The Open University, Walton Hall, Milton Keynes, United Kingdom
 Laboratoire de Géologie de Lyon, Université de Lyon, France
 Institut für Planetenforschung, Deutsches Zentrum für Luft und Raumfahrt (DLR), Berlin, Germany
 University of Münster, Germany

6. Instituto di Astrofisica e Planetologia Spaziali (INAF-IAPS), Via del Fosso del Cavaliere, Roma, Italy
7. Laboratoire de Planétologie et Géodynamique, Université de Nantes, France
8. Natural History Museum, London, UK
9. Jet Propulsion Laboratory/California Institute of Technology, Pasadena, CA, USA
10. Université Paris-Sud, Orsay, France

Overview

CC

Oxia Planum (OP) [1] is the selected landing site for the ESA-Roscosmos ExoMars Programme's 2022 mission. The descent module and landing platform, Kazachock, will transport the Rosalind Franklin Rover to OP. With the primary goal of searching for signs of past and present life on Mars, Rosalind Franklin will investigate the geochemical environment in the shallow subsurface [2].

Gaining a thorough understanding of the OP landing site prior to operations will provide testable hypotheses that facilitate interpretation of results, and hence provide an effective approach to address the mission's science objectives. In pursuit of this, the 'Macro' sub-group, part of the Rover Science Operations Working Group (RSOWG), are performing a detailed group mapping exercise of the OP landing site.





POCKOCMOC

For further details regarding Oxia Planum, plesae refer to the abstract accompanying this poster, and references therein: https://meetingorganizer.copernicus.org/EPSC2020/EPSC2020-978.html.

Schedule and Organization

The mapping coordination/leadership team begun planning in Q4 2019 and the mapping exercise began in Q3 2020 with reconciliation underway in Q4 2020. We use a grid of 1×1 km 'quads' to cover the landing area, focussing on the envelope covering a family of 1-sigma ellipses for a 2023 landing. We divided quads amongst 3 'Areas' informally referred to as Pannonia, Dalmatia and Aquitania. Volunteer mappers were assigned between 1-4 quads each depending on thier preference and availability. As of September 2020, the mapping phase is mostly complete and the quad reconciliation phase has begun.

Following ~1.5 month phase of training and 'discovery', contributors mapped geologic contacts and surface features in their assigned quads, guided by a preliminary geologic unit definition, but with flexibile guidelines and symbology to enable independent interpretations.

During the reconciliation phase (throughout Q4 2020), a small and focussed team is responsible for reconciling contacts, surficial features and unit definitions across quad boundaries to establish a common geologic interpretation. The map is planned to be published once complete.

Data and Tools

The Multi-Mission Geographic Information System (MMGIS) [3] provides capabilities for group mapping and centralised data management for this project. Mapping proceeds using an instance deployed at ESA ESTEC.

Volunteers map on a HiRISE orthorectified image and DTM mosaic produced. These data are co-registered with a CTX DTM and orthomosaic, which in turn are georeferenced to the HRSC MC11W mosaic [4]. Preparation and processing of HiRISE and CTX mosaics is performed by MarsSI planetary geospatial processing infrastructure hosted at Université de Lyon [5]. Above: Map status on 7 September 2020 - Green quads are mapped and undergoing reconciliation. Beige/tan quads are either scheduled for mapping completion by end of Sep. 2020, or were classified as lower priority quads and not intended for mapping at this stage. The three mapping areas are colourized. Background is HiRISE overlying HRSC orthomosaics [4].

Right: Example of mapped quads in MMGIS [3] in 2D and 3D views.



Map Contributors

Andrea Nass, Stuart Turner, John Bridges, Elena Favaro, Andrea Apuzzo, Matthieu Volat, Tanya Lim, Pantelis Poulakis, Lucia Mandon, Jorge L. Vago, Ben Man, Fred Calef III., Ottaviano Ruesch, Zach Dickeson, Antonio Molina, Francesca Altieri, Cathy Quantin-Nataf, Albert Haldemann, Pete Grindrod, Nicolas Oudart, Juan Manuel Madariaga, Benjamin Bultel, Zsuzsanna Toth, Solmaz Adeli, Steven Banham, Tim Parker, Rickbir Bahia, Rebecca Thomas, Detlef Koschny, Jacqueline Campbell, Daniela Tirsch, Walter Goetz, Agata Krzesinska, Jan-Peter Muller, Wolf-Stefan Benedix, Julene Aramendia, Tomaso Bontognali, Stephanie Werner, Fernando Rull, Laetitia Le Deit, Damien Loizeau, Antonio Sansano, Frédéric Foucher, Lydia Sam, Martin Voelker, Dirk Plettemeier, Anshuman Bhardwaj, Peter Fawdon, Sarah Boazman, Barry Whiteside, Maria-Paz Zorzano, Elliot Sefton-Nash, Angelina Kapatza, Jack Wright, Sergey Nikiforov, Christian Schröder, Kiky (Alfiah Rizky Diana) Putri, Andrea Pacifici, Joel Davis, Adam Parkes Bowen, Andoni G. Moral , Robert Barnes, Alessandro Frigeri, Sara Motaghian, Valérie Ciarletti, Javier Martin-Torres, Gorka Arana, Alex Barrett, Marco Ferrari, Ernst Hauber, Joe McNeil, Nicolas Mangold, Frances Westall, Christoph Statz, Elise Harrington, Alice Le Gall, Rebecca (Becky) Williams, Nicole Schmitz, Matt Balme, M. Cristina De Sanctis, Csilla Orgel, Andrew Griffiths, Stephen Lewis

References

[1] Quantin-Nataf, C. et al., (2019) 9th Mars, Abs.# 6317.
[2] Vago, J. L. et al., (2017) Astrobiology 17 (6–7), 471–510.
[3] Calef, F. J. et al., (2019) in 4th Planet. Data Work., Vol. 2151.
[4] Gwinner, K. et al., (2016) Planet. Space Sci. 126, 93–138.
[5] Volat, M. et al, (2019), 9th Int. Conf. on Mars (LPI Contrib. No. 2089), Abs. 6164,