
ExoMars 2020

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Abstract

ExoMars is a cooperative programme between ESA and Roscosmos, with NASA contributions.

On 19 March 2021 the second ExoMars mission will deliver two science elements to the martian surface: (1) a lander instrumented to conduct environment and geophysics measurements, and (2) a 310-kg rover tasked with conducting a search for signs of life.

The rover-named after Rosalind Franklin-will explore the landing site to obtain crucial geology information and use a drill to collect samples from outcrops and at depth. The drill can reach down to 2 m below the surface; such depth range has never been probed on Mars before. ExoMars' subsurface sampling capability will provide the best chance yet to access and analyse sedimentary deposits, possibly containing molecular biosignatures, that may have been shielded from the ravages of ionizing radiation prevailing at the surface [1].

The rover's Pasteur payload includes: panoramic instruments (PanCam [2] wide-angle and high-resolution cameras; ISEM [3], an infrared spectrometer; WISDOM [4], a ground-penetrating radar; and ADRON [5], a neutron detector); a subsurface drill to acquire samples; contact instruments for studying rocks and collected material (CLUPI [6], a close-up imager; and Ma_MISS [7], an infrared spectrometer in the drill head); a Sample Preparation and Distribution System (SPDS); and the analytical laboratory, the latter including MicrOmega [8], a visual and infrared imaging spectrometer; RLS [9], a Raman spectrometer; and MOMA [10], a Laser-Desorption, Thermal-Volatilization, Derivatization, Gas Chromatograph Mass Spectrometer (LD + Der-TV GCMS).

The ExoMars 2020 mission will land at Oxia Planum [11], an ancient location interpreted to possess strong potential for past habitability and for preserving physical and chemical biosignatures (as well as abiotic/prebiotic organics).

Oxia Planum is situated on the eastern margin of the Chryse basin, along the martian dichotomy border, and at the outlet of the Coogoon Valles system. At present, the coordinates for the nominal touchdown location are 18.159°N, 24.334°W.

The approximately 100 km x 9 km dispersion ellipse lies in the lower part of a wide basin, where extensive exposures of Fe/Mg-phyllsilicates (> 80% of the ellipse surface area) have

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been detected with OMEGA and CRISM hyperspectral and multispectral data [12]. The Fe/Mg-rich clay detections are associated with early/middle- to late-Noachian layered rocks (with layering thickness ranging from a few meters to < 1 m for several tens of meters). A 10-km wide, 80-km long, low thermal inertia feature interpreted as a delta, bearing hydrated silica signatures in its stratum, is observed at the outlet of Coogoon Valles. The putative delta waterline suggests the presence of a standing body of water after the formation of the clay-rich unit over the entire landing ellipse area [11].

The ExoMars 2020 flight model is being assembled and tested, with the aim to deliver a complete spacecraft to Baikonur by end 2019.

This presentation will discuss the mission's preparation progress, with a focus on the ExoMars rover and its strategy to search for biosignatures.

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