EGU24-18650, updated on 25 Nov 2024
https://doi.org/10.5194/egusphere-egu24-18650
EGU General Assembly 2024

Bright-toned aeolian bedforms in Oxia Planum (Mars), the ESA ExoMars landing site

Simone Silvestro[1,2], Elena Favaro[3,4], David Alegre Vaz[5], Tao Yu[6], Andrew Valdez[7], Francesco Salese[8], Andrea Pacifici[9], Daniela Tirsch[10], Gabriele Franzese[1], Giuseppe Mongelluzzo[1], Ciprian Ionut Popa[1], Carmen Porto[1], and Francesca Esposito[1]

[1]INAF, Osservatorio Astronomico di Capodimonte, Napoli, Italy (simone.silvestro@inaf.it)
[2]SETI Institute Carl Sgan Center, Mountaoin View, CA, USA
[3]European Space Research and Technology Centre, European Space Agency, Noordwijk, Netherlands
[4]School of Physical Sciences, The Open University, Milton Keynes, Buckinghamshire MK7 7EA, UK
[5]Centre for Earth and Space Research of the University of Coimbra, Observat´orio Geofísico e Astron´omico da Universidade de Coimbra, Coimbra, Portugal
[6]Freie Universitat, Berlin, Germany
[7]Great Sand Dunes National Park and Preserve, 11500 Highway 150, Mosca, CO, USA
[8]Centro de Astrobiología, CSIC-INTA, Madrid, Spain
[9]International Research Schoop of Planetary Science, Pescara, Italy
[10]German Aerospace Center (DLR), Institute of Planetary Research, Berlin Germany

Bright-toned aeolian bedforms are abundant in Oxia Planum, the future landing site of ESA's ExoMars rover mission [1-3]. Their NE-SW orientation differs from other aeolian landforms in the area, such as the E-W oriented ridges carved in the bedrock (periodic bedrock ridges – PBRs [4, 5]), suggesting major changes in wind and climatic conditions [2, 3]. At Oxia Planum, bedforms formative winds have been interpreted as blowing from the NW to the SE based on the difference between dark stoss slopes and bright lee slope albedo, with darker surfaces interpreted as coarse grained materials and brighter surfaces interpreted as fine grained material, a relationship recognized in terrestrial megaripples observed on the Argentinian Puna Plateau [2]. In another interpretation [3], bedform formative winds were interpreted as coming from the SE, as evidenced by the presence of regularly spaced low albedo bands found on bedforms SE slopes and interpreted as exposed cross-beds at their windward sides. The same interpretation was given by other authors for similar bandings found on bright bedform slopes in other areas of Mars [6]. Here we propose an alternative explanation for these bands, which we interpret as potential "sorting streaks", analogous to what is observed over dunes in Great Sand Dunes National Park (CO, USA). The morphology of some crescent-shaped examples visible in the study area, with their tips pointing to the SE, confirms a formative wind from the NE. This scenario implies a complex wind regime where bright bedforms were first formed by winds blowing from the NE [2], and subsequently shaped by winds coming from the ESE (assuming that an oblique/parallel wind direction is necessary to deposit darker material in bands over the SE slopes). The presence of dark wind streaks pointing WSW supports this scenario. We also report the presence of similar

regular bands on bright bedform slopes at the Zhurong rover landing site in Utopia Planitia. Due to the widespread nature of these banded landforms [6-8], this new interpretation might help to interpret paleo-wind conditions on Mars.

References

[1] Balme et al. 2017, Geomorphology, 101(4), 703–720.

[2] Favaro et al. 2021, JGR, 126, e2020JE006723.

[3] Silvestro et al. 2021, GRL, 48, e2020GL091651.

[4] Montgomery et al. 2012, JGR, 117, E03005.

[5] Hugenholtz et al. 2015, Aeolian Research, 18, 135–144

[6] Day 2021, Geology, 49 (12): 1527–1530.

[7] Gou et al. 2022, EPSL.

[8] Bourke & Viles, 2016, GRL, 43, 12,356–12,362.