

Lior Rubanenko

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Education

University of California, Los Angeles (UCLA)

Mar. 2020

PhD Geophysics and Space Physics, the department of Earth, Planetary and Space Sciences.

Advisor: David Paige

Thesis subject: *A Tale of Two Planetary bodies: The Origin of Ice on Mercury and the Moon*

Weizmann institute of science

July 2015

MSc, the department of Earth and Planetary Sciences. Advisor: Oded Aharonson

Thesis subject: *The temperature distribution on the surface of airless planetary bodies*

Tel Aviv University

June, 2012

B.Sc., the department of Geophysics, Atmospheric and Planetary Sciences

Research

Assistant Professor, Faculty of Civil and Environmental Engineering. Technion, Israel.

2023-present

Adjunct Professor, Department of Earth and Planetary Science, Stanford University, CA.

2022-2023

Postdoctoral Researcher, the department of Earth and Planetary Sciences, Stanford University.

2020-2022

Employing deep learning algorithms to detect and analyze topographic features on the terrestrial planets.

Imaging of Lightning and Nighttime Electrical phenomena from Space (ILAN-ES) science team member.

2021-present

Applying a neural network to detect electric atmospheric phenomena from data obtained by the second Israeli astronaut, Eytan Stibbe, on board the International Space Station.

Lunar Reconnaissance Diviner Radiometer Experiment (LRO DIVINER) science team member. Studying ice deposits in cold traps on the Moon. Deriving surface roughness and regolith properties from radiometric data.

2013-present

Graduate Student Researcher, the department of Earth, Planetary and Space Sciences, UCLA. Analysis of results obtained by NASA's Lunar Reconnaissance Orbiter and the MESSENGER missions. Designed and implemented a thermal illumination model that uses ray casting algorithms to solve problems in radiation transfer on airless planetary bodies.

2015-2020

Researcher, ILAN science team, the Open University of Israel. Research of atmospheric transient luminous events, lightning and meteorites over the Mediterranean basin using image processing. Statistical analysis of the obtained results. Overseeing team members and managing their tasks.

2010-2014

Teaching and mentoring

Machine and Deep Learning in Geoinformation and Remote Sensing. Neural networks. Classification and abstraction. Segmentation models. Autoencoders and unsupervised machine learning analysis.

Fall 2023

Lecturer, planetary surface processes, Stanford university. The physics of crater formation. Investigating cratered terrains employing remote sensing techniques.

Spring 2021

Undergraduate Advisor. Advising undergraduate students at the department of geology and geophysics, Stanford university, on projects combining machine learning and remote sensing.

2020-2021

Teaching Assistant, Earth's energy balance. Teaching assistant and laboratory instructor. Delivering tutorial sections, composing homework problem sets and examinations. Instructor: Prof. David Paige

2018

Lab Assistant, Earth's energy balance. Setting up experiments, assisting and interacting with students in the lab. Instructor: Prof. David Paige

2017

Awards

- Eugene B. Waggoner Prize awarded for sustained superior academic achievement and demonstrated excellence in original research in planetary science, 2019.
- Harold and Mayla Sullwold Scholars awarded for excellence in academic performance and research potential, 2018.
- The William Shatner Master's scholarship in Earth and Planetary Sciences at the Weizmann institute of science, 2014-2015.

Invited Talks and Travel Awards

- Geological Society of America (GSA) annual meeting, Pittsburgh, Pennsylvania, October 2023.
- Lunar Surface Innovation Consortium, John's Hopkins Applied Physics Laboratory (APL), January 2023.
- Travel award to the Surface-Atmosphere interactions workshop, 2022, Boise, Idaho.
- Travel award to the Planetary Dunes Workshop 2022, Alamosa, Colorado: the morphology of barchan dunes on Mars using a convolutional neural network.
- Bay Area Planetary Science (BAPS) meeting, Berkeley, CA, 2022: surface winds on Mars from the morphology of Barchan dunes using a convolutional neural network.
- Morphometric analysis of barchan dunes on Earth and Mars using artificial intelligence, Institute for Geophysics and Planetary Physics, UCSC, 2021.
- Morphometrics of lunar impact craters reveal thick ice deposits, TSU: Moon Series, 2021.
- Mapping Surface Winds on Mars from the Global Distribution of Barchan Dunes Employing an Instance Segmentation Neural Network, European Geophysical Union (EGU) general assembly, 2021.
- Gardening Thick Ice Deposits on the Moon and Mercury: Lunar Reconnaissance Orbiter (LRO) PSWG meeting, 2019.
- Thick Ice Deposits in Shallow Simple Craters on the Moon: Lunar Reconnaissance Orbiter Camera (LROC) team meeting, 2019.
- Travel Award for the Mercury: Current and Future Science of The Innermost Planet meeting, Columbia, MD.

Community Contributions

- Reviewer for the Binational Science Foundation (BSF) grant.
- Reviewer for various NASA Data Analysis Programs (2020-2023).
- Primary Convener: Lunar Polar Volatiles, 2022.
- Primary Convener: AGU Machine Learning and Data Science in Planetary Science (2022-2023).
- Serving on NASA panels (2020-2022).
- Convener: AGU Machine Learning in Planetary Science session (2021)
- Reviewer for NASA Data Analysis Program (2020-2021).

Peer-reviewed Publications

- **Rubanenko, L.**, et al., Global Surface Winds and Aeolian Sediment Pathways on Mars from the Morphology of Barchan Dunes (in review, 2022).
- Williams, J-P, **Rubanenko, L.** Cold-Trapped Ices at the Poles of Mercury and the Moon; in Soare R. J. (ed.), Ices in the Solar System. Elsevier (In press).
- **Rubanenko, L.**, Lapôtre, M.G., Ewing, R.C., Fenton, L.K. and Gunn, A., 2022. A distinct ripple-formation regime on Mars revealed by the morphometrics of barchan dunes. *Nature Communications*, 13.
- Gunn, A., **Rubanenko, L.** and Lapôtre, M.G.A, 2022. Accumulation of windblown sand in impact craters on Mars. *Geology*.
- Williams, J.P., Greenhagen, B.T., Bennett, K.A., Paige, D.A., Kumari, N., Ahrens, C.J., **Rubanenko, L.**, Powell, T.M., Prem, P., Blewett, D.T. and Russell, P.S., 2022. Temperatures of the Lacus Mortis region of the Moon. *Earth and Space Science*, 9(2).

- **Rubanenko, L.**, Perez-Lopez, S., Schull, J. and Lapotre, M. Automatic Detection and Segmentation of Barchan Dunes on Mars and Earth Using a Convolutional Neural Network. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing* (2021).
- **Rubanenko, L.**, Powell, T.M, Williams, J.-P., Daubar, I., Edgett, K. S., Paige, D. A., Challenges in crater chronology on Mars as Reflected in Jezero crater, in Soare R. J. (ed.), Conway, S. J. (ed.), Oehler, D. (ed.), Williams, J.-P. (ed.) Mars Geological Enigmas: From the Late Noachian Epoch to the Present Day. Elsevier (2021).
- Powell, T.M, **Rubanenko, L.**, Williams, J.-P., Paige, D. A., The Role of Secondary Craters on Martian Crater Chronology, in Soare R. J. (ed.), Conway, S. J. (ed.), Oehler, D. (ed.), Williams, J.-P. (ed.) Mars Geological Enigmas: From the Late Noachian Epoch to the Present Day. Elsevier (2021).
- **Rubanenko, L.**, Schorghofer, N., Grennhagen, B. T., Paige, D.A., The Equilibrium Temperature Distribution and Emissivity of Sunlit Gaussian Surfaces with Applications to the Moon. *JGR:Planets* (2020).
- **Rubanenko, L.**, Venkatraman, J., Paige, D.A., Thick ice deposits in shallow simple craters on the Moon and Mercury, *Nature Geoscience* (2019).
- **Rubanenko, L.**, Mazarico, E., Neumann, G.A. and Paige, D.A., Ice in Micro Cold Traps on Mercury: Implications for Age and Origin. *JGR: Planets*, 123(8), (2018).
- **Rubanenko, L.**, & Aharonson, O., Stability of ice on the Moon with rough topography. *Icarus*, 296 (2017).
- Yair, Y., Price, C. G., Katzenelson, D., Rosenthal, N., **Rubanenko, L.**, Ben Ami, Y., Arnone, E., Sprite climatology in the eastern Mediterranean region. *Atmospheric Research*, 157, 108-118 (2015).
- Yair, Y., **Rubanenko, L.**, Mezuman, K., Elhalel, G., Priente, M., Glickman-Pariente, M., Ziv, B., Takahashi, Y., and Inoue, T., New color images of transient luminous events from dedicated observations on the International Space Station. *Journal of Atmospheric and Solar-Terrestrial Physics*, 102, 140-147 (2013).

Selected conference presentations

- Rubanenko, L., Chjonacki, M., Fenton, L., Schorghofer, N. The impact of near-surface volatiles on the morphology of Barchan dunes on Mars. AGU Fall Meeting, 2022.
- Rubanenko, L., the inventory of ice within micro cold traps on the Moon, 2022. Lunar Polar Volatiles 2022 meeting, LASP Boulder, CO.
- Rubanenko, L., Lopez, S.P., Fenton, L.K., Ewing, R.C. and Lapôtre, M.G.A., 2022. Global Map of Surface Winds on Mars from Barchan Dune Migration Directions and Horn Asymmetry Using a Convolutional Neural Network. LPI Contributions, 2678, p.1209.
- Rubanenko, L., Lapotre, M.G.A., Gunn, A., Schull, J., Perez-Lopez, S., Fenton, L. and Ewing, R., 2021, December. Global Surface Winds Inferred from Barchan Dunes on Mars Using a Convolutional Neural Network. In AGU Fall Meeting 2021. AGU.
- Rubanenko, L., Lapotre, M.G.A., Schull J., Perez-lopez, S., Fenton, L.K. and Ewing, R.C., Mapping Mars' Surface Winds From The Global Distribution Of Barchan Dunes Employing Artificial Intelligence. Lunar and Planetary Science Conference, 2021.
- Rubanenko, L., Lapotre, M.G., Schull, J., Perez-Lopez, S., Fenton, L.K. and Ewing, R.C., 2021, April. Mapping Surface Winds on Mars from the Global Distribution of Barchan Dunes Employing an Instance Segmentation Neural Network. In *EGU General Assembly Conference* (pp. EGU21-12960).
- Rubanenko, L., Lapotre, M.G.A., Schull, J., Fenton, L.K. and Ewing, R., 2020, December. Morphologic Analysis of Eolian Bedforms on Mars using Fully Convolutional Instance Segmentation Networks. In AGU Fall Meeting 2020.
- Rubanenko, L., Schorghofer, N., Greenhagen, B.T. and Paige, D.A., Equilibrium Temperatures and Directional Emissivity of Sunlit Rough Surfaces with Applications to the Moon. Lunar and Planetary Science Conference, 2020.
- Rubanenko, L., Schorghofer, N. and Paige, D.A., Analytic Model for the Equilibrium Temperature Distribution of a Sunlit Gaussian Airless Surface. In Lunar and Planetary Science Conference (2019).
- Rubanenko, L., Mazarico, E., Neumann, G.A., Paige, D.A., The Depth of Ice Inside the Smallest Cold-Traps on Mercury: Implications for Age and Origin, Mercury: Current and Future Science of the Innermost Planet, 2018.
- Rubanenko, L., Hayne, P.O., Paige, D.A., The Effects of Surface Roughness on the Apparent Thermal and Optical Properties of the Moon, AGU Fall Meeting, 2017.

- Rubanenko, L., Mazarico, E., Neumann, G.A.; Paige, D.A., Evidence for Surface and Subsurface Ice Inside Micro Cold-Traps on Mercury's North Pole. Lunar and Planetary Science Conference, 2017.
- Rubanenko, L., Aharonson, O. Schorghofer, N., Temperature Distribution of Rough Airless Bodies and Volatile Stability, Lunar and Planetary Science Conference, 2016.

For a full list of conference talks and abstracts, please see [my website](#).