

Dr. Stefano Nerozzi

Pronouns: He/Him/His

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Research work and interests:

I am the PI on a recently funded MDAP project that will employ a wide variety of radar sounding and geologic mapping techniques to reveal the nature of icy sedimentary deposits comprised within the so-called basal unit at the north pole of Mars. This project is the continuation of my doctoral research work.

Until recently, I was the Science PI on a selected NASA Mars Data Analysis Program (MDAP) proposal to study the fluvial and volcanic history of outflow channel systems in Utopia Planitia, Mars. This project integrated several remote sensing techniques to unravel the history of landforms shaped by ancient water flows and interactions between volcanic processes and ground ice.

I currently mentor an enthusiastic and diverse team of two undergraduate research assistants, who assist me in my primary research work and conduct exploratory investigations for future projects.

My past postdoctoral research work at UT Austin involved processing and analysis of Gamma Ray Spectrometer elemental concentration data from Mars Odyssey to reveal possible formation mechanisms of boulder halos and their spatial relationship with mapped geologic units and terrain surface composition.

My doctoral research focused on constraining which driving forces and surface processes are responsible for the initial emplacement of the north polar cap of Mars in the Late Amazonian. This work included stratigraphy and morphology mapping via orbital radar and high-resolution imagery, and climate modeling with general circulation models.

My other interests include the design and construction of electronic measurement devices for geophysical application on debris covered glaciers, such as ground temperature profilers and 3D-component seismometers for passive seismic microtremor studies.

Research funding:

PI 2022 – 2025
Reconstructing the stratigraphy, composition, and climate record of the north polar basal unit, Mars, NASA Mars Data Analysis Program (MDAP), \$411,767.

Science PI (Proposal submitted and selected as a PhD Candidate) 2019 – 2023
Investigating Magma-Cryosphere Interactions and Outflow Channel Activity in Hebrus Valles, NASA Mars Data Analysis Program (MDAP), \$384,783.

Education:

Ph.D. Geological Sciences Aug 2014 – Aug 2019
University of Texas at Austin, TX, USA. Advisor: Dr. John Holt
GPA: 4.00/4.00

M.Sc. Geology and Land Management Oct 2011 – Mar 2014
University of Bologna, Italy. Advisors: Dr. John Holt, Dr. Alessandro Amorosi
GPA: 3.93/4.00, Final grade: 110/110 cum laude

B.S. Geological Sciences

Sep 2008 – Oct 2011

University of Bologna, Italy. Advisor: Dr. Francesco Mulargia

GPA: 3.89/4.00, Final grade: 110/110 cum laude

Academic and research work experience:

Lecturer, UA Department of Geosciences

Aug 2023 – Dec 2023

Instructor for GEOS322 Introduction to Geophysics. Topics covered: planetary interiors and tectonics, EM methods, gravity and magnetic anomalies, seismology and seismic techniques. Also prepares weekly lab assignments. Assisted by a graduate TA and an undergraduate preceptor.

Postdoctoral Research Associate, UA Lunar and Planetary Laboratory

Jan 2020 – present

NASA MDAP PI: sounding radar data analysis and impact crater statistical analysis of icy sedimentary units within the Planum Boreum of Mars.

Lead of a team of two undergraduate research assistants and mentor to Dr. Jack Holt's Terrestrial And Planetary Investigations and Reconnaissance (TAPIR) group.

Research Collaborator, UA LPL

Dec 2019 – Aug 2020

Subsurface radar mapping of Terra Cimmeria and Terra Sirenum quadrants on Mars for the Subsurface Water Ice Mapping 2.0 (SWIM 2.0) project (work executed as Postdoctoral Research Associate at UA LPL).

Postdoctoral Fellow, Institute for Geophysics, UT Austin

Sep 2019 – Dec 2019

Processing and analysis of Mars Odyssey Gamma Ray Spectrometer elemental concentration maps in relation to the spatial distribution of boulder halo sites on Mars.

Graduate Research Assistant, Institute for Geophysics, UT Austin

Jun 2017 – Aug 2019

Analysis of orbital radar sounding profiles (SHARAD), high-resolution imagery (HiRISE, CTX) and global circulation models (LMD GCM) to reveal the recent history of Planum Boreum on Mars (PhD project).

Teaching Assistant, Jackson School of Geosciences, UT Austin

Sep 2016 – May 2017

GEO303 – Intro to Geology – Fall 2016: Taught 3 weekly lab sessions of 2 hours each to a total of 50 non-geoscience-major students, administered quizzes and midterm exams, graded homework.

GEO325J & GEO391 – Intro to Geoscience Computation – Spring 2017: Assisted undergraduate and graduate students during Matlab lab sessions, graded homework.

Graduate Research Assistant, Institute for Geophysics, UT Austin

Sep 2014 – Aug 2016

Includes Jackson School Entry Fellowship for 1 year. Analysis of orbital radar sounding profiles (SHARAD), high-resolution imagery (HiRISE, CTX) and global circulation models (LMD GCM) to reveal the recent history of Planum Boreum on Mars (PhD project).

Laboratory Assistant I, Institute for Geophysics, UT Austin

Jun 2013 – Nov 2013

Analysis of orbital radar sounding profiles (SHARAD) to reveal the early evolution of the North Polar Layered Deposits on Mars (M.Sc. project).

Undergraduate Research Assistant, Institute for Geophysics, UT Austin

Sep 2012 – May 2013

Analysis of orbital radar sounding profiles (SHARAD) to reveal the early evolution of the North Polar Layered Deposits on Mars (M.Sc. project).

Publications:

- Voigt, J., Hamilton, C.W., Steinbruegge, G., Christoffersen, M.S., **Nerozzi, S.**, Kerber, L., Holt, J.W., Carter, L., *in press*, Revealing Elysium Planitia's Young Geologic History: Constraints on Lava Emplacement, Areas, and Volumes, *Journal of Geophysical Research: Planets*, 2023JE007947.
- Nerozzi, S.**, Christoffersen, M.S., Holt, J.W., Hamilton, C.W., 2023, Evidence of Widespread Volcanic Activity near Hebrus Valles on Mars Revealed by SHARAD, *Remote Sensing*, 15, 4967. doi:10.3390/rs15204967.
- Putzig, N.E., Morgan, G.A., Sizemore, H.G., Baker, D.M.H., Petersen, E.I., Pathare, A.V., Dundas, C.M., Bramson, A.M., Courville, S.W., Perry, M.R., **Nerozzi, S.**, Bain, Z.M., Hoover, R.H., Campbell, B.A., Mastrogioseppe, M., Mellon, M.T., Seu, R., Smith, I.B., 2023. Ice Resource Mapping on Mars. In Badescu, V., Zacny, K., Bar-Cohen, Y. (Eds.), *Handbook of Space Resources*, Springer Nature Switzerland AG.
- Putzig, N.E., Campbell, B.A., Christoffersen, M.S., Foss II, F.J., Holt, J.W., Mueller, I.H., **Nerozzi, S.**, Perry, M.R., Russell, A.T., Sava, P.C., Smith, I.B., 2022, New Views of the Internal Structure of Planum Boreum from Enhanced 3D Imaging of Mars Reconnaissance Orbiter Shallow Radar Data, *Planet. Sci. J.* 3:259, 14 pp. doi:10.3847/PSJ/ac9d3b.
- Becerra, P., Smith, I. B., Diniega, S., Andres, C., Bapst, J., Bramson, A., Buhler, P., Coronato, A., Emmett, J., Grau Galofre, A., Herny, C., Hibbard, S., Kahre, M., Knightly, J.P., **Nerozzi, S.**, et al., 2021, Past, Present and Future of Mars Ice Research: Conclusions and outlook from the 7th International Conference on Mars Polar Science and Exploration.
- Nerozzi, S.**, Ortiz, M.R., and Holt, J.W., 2021, The north polar basal unit of Mars: An Amazonian record of surface processes and climate events: *Icarus*, p. 114716, doi:10.1016/j.icarus.2021.114716.
- Smith, I.B., Lalach, D., Rezza, C., Horgan, B., Whitten, J.L., **Nerozzi, S.**, Holt, J.W., 2021, A Solid Interpretation of Bright Radar Reflectors Under the Mars South Polar Ice, *Geophysical Research Letters*.
- Moore, K., Courville, S., Ferguson, S., Schoenfeld, A., Llera, K., Agrawal, R., Buhler, P., Brack, D., Connour, K., Czaplinski, E., DeLuca, M., Deutsch, A., Hammond, N., Kuettel, D., Marusiak, A., **Nerozzi, S.**, Stuart, J., Tarnas, J., Thelen, A., Castillo-Rogez, J., Smythe, W., Landau, D., Mitchell, K., Budney, C., 2020. Bridge to the stars: A mission concept to an interstellar object. *Planetary and Space Science*, 105137, doi:10.1016/j.pss.2020.105137
- Ojha, L., Karimi, S., Buffo, J., **Nerozzi, S.**, Holt, J.W., Smrekar, S., and Chevrier, V. Martian Mantle Heat Flow Estimate from the Lack of Lithospheric Flexure in the South Pole of Mars: Implications for Planetary Evolution and Basal Melting, *Geophysical Research Letters*, p. e2020GL091409, doi:10.1029/2020GL091409.
- Ojha, L., **Nerozzi, S.**, and Lewis, K., 2019, Compositional Constraints on the North Polar Cap of Mars from Gravity and Topography: *Geophysical Research Letters*, doi:10.1029/2019GL082294.
- Nerozzi, S.**, and Holt, J.W., 2019, Buried ice and sand caps at the north pole of Mars: revealing a record of climate change in the cavi unit with SHARAD: *Geophysical Research Letters*, doi:10.1029/2019GL082114.
- Nerozzi, S.**, and Holt, J.W., 2018, Earliest Accumulation History of the North Polar Layered Deposits, Mars from SHARAD, *Icarus*. doi:10.1016/j.icarus.2017.05.027
- Gaullini, L., and **Nerozzi, S.**, 2014, Polar Layered Deposits, *in Encyclopedia of Planetary Landforms*, Springer New York, p. 1–14.

Publications in preparation:

Bramson, A.M., Petersen, E.I., Bain, Z.M., Perry, M.R., **Nerozzi, S.**, and others, *in preparation*, Mars Subsurface Water Ice Mapping (SWIM) Project: Results from Mapping Radar Subsurface Reflectors.

Nerozzi, S., Spurling, R., and Hamilton, C.W., *in preparation*, Geologic Mapping of the Hebrus Valles and Hephaestus Fossae Outflow Channel Region: Evidence of a Magmatic Trigger of Water Release.

Spurling, R., **Nerozzi, S.**, and Hamilton, C.W., *in preparation*, Crater-Based Age Dating of outflow channel and tectonic activity in Hebrus Valles and Hephaestus Fossae, Mars.

Willis-Reddick, M., **Nerozzi, S.**, *in preparation*, Revealing circumpolar icy deposits and Hesperian-Amazonian lithospheric flexure at the north pole of Mars with SHARAD.

Spacecraft mission participation:

Shallow Radar (SHARAD), Mars Reconnaissance Orbiter 2012 – present
Science team collaborator. Biweekly observation targeting and planning, definition of new target zones.

International Mars Ice Mapper Instrument Definition Team Jun 2023 – July 2023
Member of the VHF subsurface radar sounder definition team. Collaborated in defining and discussing instrument design and tradeoffs to meet the reconnaissance and science goals of the IMIM mission.

International Mars Ice Mapper Measurement Definition Team Jan 2022 – July 2022
Early career lead for the measurement definition team. Collaborated in defining and discussing L-Band radar capabilities and suggested additional payloads to meet the reconnaissance and science goals of the IMIM mission.

Selected Oral Presentations:

Nerozzi, S., Spurling, R., Holt, J.W. Evidence of a Magmatic Trigger of Water Release and Widespread Volcanic Activity in the Hebrus Valles and Hephaestus Fossae Outflow Channel Region, Mars, *in 54th Lunar and Planetary Science Conference*, Abstract #2764.

Nerozzi, S., Ortiz, M.R., Tober, B.S., Holt, J.W. Revealing the Geologic and Fluvial History of Hebrus Valles and Hephaestus Fossae on Mars, *in 52nd Lunar and Planetary Science Conference*, Abstract #2590.

Nerozzi, S., Ortiz, M.R., Holt, J.W., The Basal Unit: An Amazonian Record of Mars' North Polar History, *in 51st Lunar and Planetary Science Conference*, Abstract #2461.

Nerozzi, S., Holt, J.W., Forget, F., Spiga, A., Millour, E., 2020, The Early History of Planum Boreum: An Interplay of Water Ice and Sand, *in Seventh Mars Polar Science Conference*, Abstract #6064.

Nerozzi, S., Holt, J.W., Forget, F., Spiga, A., Millour, E., 2019, Reconstructing the Climate-Driven Evolution of Planum Boreum with Sounding Radar, Visible Imagery and General Circulation Models, *in Ninth International Conference on Mars*, Abstract #6433.

Nerozzi, S., Holt, 2019, Buried ice and sand caps at the north pole of Mars: revealing a record of climate change in the cavi unit with SHARAD, *in IGS - International Symposium on Five Decades of Radioglaciology*, Abstract #81A3036.

Nerozzi, S., Holt, J.W., Forget, F., Spiga, A., Millour, E., 2019, Combining Radar Sounding and General Circulation Models to Reveal the Initial Accumulation of the Martian North Polar Layered Deposits, *in 50th Lunar and Planetary Science Conference*, Abstract #2854.

- Nerozzi, S.,** and Holt, J.W., 2018, Revealing the History of Polar Ice Caps within the Planum Boreum Cavi Unit with SHARAD, *in* 2018 Late Mars Workshop, LPI Contrib. 2088, #5008.
- Nerozzi, S.,** and Holt, J.W., 2018, The Ice and Sand Caps at the North Pole of Mars: Discovering a “Lost” Record of Climate Changes, *in* 2018 Mars Workshop on Amazonian Climate, LPI Contrib. 2086, #4022.
- Nerozzi, S.,** and Holt, J.W., 2018, Ice caps under sand caps under an ice cap: revealing a record of climate change on Mars with SHARAD, *in* 49th Lunar and Planetary Science Conference, Abstract #1075.
- Nerozzi, S.,** and Holt, J.W., 2017, Newly Mapped Extent, Morphology, and Internal Stratigraphy of the Martian North Polar Cavi Unit, *in* 48th Lunar and Planetary Science Conference, Abstract # 1722.
- Nerozzi, S.,** and Holt, J.W., 2016, Stratigraphic Reconstruction of the Cavi Unit-NPLD Transition with SHARAD, *in* The 6th International Conference on Mars Polar Science and Exploration, Abstract # 6080.

Invited talks:

- Special Seminar*, Hawaii Institute of Geophysics and Planetology June 2023
25th Annual International Mars Society Convention, Arizona State University Oct 2022

Student advising:

Undergraduate Research Assistant and Arizona Space Grant Intern Apr 2021 – present
 Maia Willis-Reddick, research topic: *Subsurface radar mapping of icy terrains surrounding the north polar cap of Mars*. Maia Willis-Reddick was a NASA/Arizona Space Grant intern for the Aug 2021 – May 2022 academic year.

Undergraduate Research Assistant Apr 2021 – present
 Reed Spurling, research topic: *Impact crater statistical analysis in Hephaestus Fossae and Hebrus Valles, Mars*.

Undergraduate Research Assistant and Arizona Space Grant Intern Sep 2022 – May 2023
 Madeline Procter, research topic: *Optimization and calibration of Mars Advanced Radar for Subsurface and Ionosphere Sounding (MARSIS) multiband profiles*. Madeline Procter was a NASA/Arizona Space Grant intern for the Aug 2022 – May 2023 academic year.

Undergraduate Research Assistant Apr 2021 – Aug 2022
 Leah Panzarella, research topic: *Processing and analysis of Thermal Emission Imaging System (THEMIS) decorrelation stretch mosaics of the Hephaestus Fossae and Hebrus Valles region on Mars*.

Undergraduate Research Assistant May 2019 – May 2021
 Maya Ortiz, research topics: *Orbital imaging data processing and geologic mapping of the north polar basal unit on Mars, Mars imaging data (CTX, THEMIS) selection and geologic mapping in Hebrus Valles and Hephaestus Fossae, Mars*.

Honors B.S. thesis December 2017 – May 2019
 Michael Christoffersen, thesis title: *Applying a Mass Balance Approach to Constrain Ice Thickness of Hubbard Glacier*.

Guided research project (UT Austin GEO 371C) September 2016 – May 2017
 Christopher Eason, research topic: *Geological mapping of the north polar basal unit on Mars*.

Other professional experience:

Postdoc Pathway Program Sep 2022 – May 2023
Fast-track certificate program combining training in theory and pedagogy of evidence-based teaching and an intensive, short-term co-teaching assignment with a faculty mentor.

NASA Planetary Science Summer Seminar May 2019 – Aug 2019
End-to-end design of a NASA New Frontiers-class mission to an interstellar object.
Roles and responsibilities: UV-VIS spectrometer instrument lead, Team X telecom chair, geology and geophysics science group member.

Science Communication Workshop Feb 2019
Learning to overcome communication barriers, exploring different perspectives, identifying jargon, finding points of connection, optimizing short speeches, visualizing science, science in social media, STEMprov.

Outreach activities:

Skype a Scientist Nov 2022
Zoom call with students from the La Jolla High School Physics Club (San Diego, CA) presenting my personal path to become a scientist and overview of my research work.

Science mentor for 6th grade students at Sahuarita Middle School (AZ) Mar 2021 – May 2021
Weekly mentorship of 6th grade students in a science project involving the design of a habitable planet. Gave presentation on the main drivers of inner Solar System planetary evolution (e.g., habitable zone, magnetic field, plate tectonics and volcanism, biosphere).

AP Research Project Mentor Oct 2016 – April 2017
AP Research project by H. Kansara at Carnegie Vanguard High School, Houston, TX. Research topic: *How Would Terraforming Mars Question Society's Morals according to the Utilitarian Approach?*

UT Science Olympiad Regional Tournament Feb 2018
Prepared a test on Remote Sensing and Meteorology and served as a proctor for the regional tournament at UT Austin.

Awards, fellowships, and scholarships:

Galileo Circle Postdoc Award, College of Science, University of Arizona 2022
Best Seminar – UTIG Brown Bag, Institute for Geophysics, University of Texas at Austin 2019
Mars Student Travel Grant, Mars Exploration Program Aug 2018
Mars Student Travel Grant, Mars Exploration Program Apr 2018
Graduate School Summer 2018 Fellowship, University of Texas at Austin 2018
Endowed Presidential Scholarship, University of Texas at Austin 2017
Global Research Fellowship, University of Texas at Austin 2016
Travel grant for 6th Mars Polar Science Conference, European Geosciences Union (EGU) 2016
Jackson School of Geosciences Fellowship, University of Texas at Austin 2014
Outstanding Student Poster Award, European Geosciences Union (EGU) 2014
TASSEP scholarship, University of Bologna 2012
Certificate of Merit, Prof. Ivano Dionigi, Chancellor of the University of Bologna 2012
Certificate of Merit, Prof. Ivano Dionigi, Chancellor of the University of Bologna 2010

Review and panelist service:

Reviewer for Nature Astronomy, Science Advances, Geophysical Research Letters, Earth and Planetary Science Letters, Journal of Geophysical Research, Icarus, The Cryosphere, IEEE Transactions on Geoscience and Remote Sensing.

Panelist for NASA MDAP and FINESST, external reviewer for NASA SSW.

Field experience & Internships:

GPR, passive seismic soundings, and thermal profiling on debris covered glacier, Absaroka Range, WY	2023
GPR on aeolian sand dunes, Imperial Sand Dunes, CA	2023
GPR, passive seismic soundings on debris covered glacier, Absaroka Range, WY	2022
GPR, active and passive seismic on debris covered glacier, Wrangell-St. Elias Mtns., AK	2021
TDEM, GPR, passive seismic soundings on debris covered glacier, Absaroka Range, WY	2020
Remote sensing and geomorphology of volcanic fields, aeolian dune fields and alluvial fans, NV & CA	2016
TDEM and GPR soundings on debris covered glacier, Absaroka Range, WY	2015
TDEM soundings on debris covered glacier, Wrangell-St. Elias Mtns., AK	2014
GPR and LIDAR surveys on debris covered glacier, Uinta Mtns., UT	2013
Carbonate sequence stratigraphy, Guadalupe Mtns., TX & NM	2013
ER, FDEM, GPR, and gravimetric surveys on karst area, Austin, TX	2012
Carbonate stratigraphy and geological mapping, Western Sicily, Italy	2012
Rock mechanics, stratigraphic logging and geological mapping, Central Alps, Italy	2011
Internship: Seabed bathymetry, navigation planning on research vessel Maria Grazia, Southern Adriatic Sea, Italy	2011
Stratigraphic logging and geological mapping, Central Alps, Italy	2010

Other activities and leadership:

UT Amateur Radio Club - President Jan 2018 – Apr 2019
Manage club activities and meetings, teach amateur radio licensing classes, define club goals, recruiting, and treasury. Club member since Jan 2015, officer since Sep 2016.

Computational skills & experience:

Linux and Windows operating systems (including Linux command line and shell scripting), ArcGIS, QGIS, Seisware, Landmark DecisionSpace, JMARS, USGS ISIS, NASA Ames Stereo Pipeline, LMD General Circulation Model, Python, Matlab, Adobe suite, Office suite.

Languages:

English – fluent, full professional proficiency
Italian – native speaker
Spanish – elementary proficiency
French – elementary proficiency