

## **Dr. Stefano Nerozzi**

Pronouns: He/Him/His

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### **Research work and interests:**

I am 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 integrates several remote sensing techniques to unravel the history of landforms shaped by ancient water flows and interactions between volcanic processes and ground ice.

I'm also 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.

I currently mentor an enthusiastic and diverse team of three 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 field sites, such as ground temperature profilers and 3D 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:**

Postdoctoral Research Associate, UA LPL

Jan 2020 - present

NASA MDAP Science PI: geologic mapping, sounding radar data analysis, and impact crater statistical and morphological study of the fluvial and volcanic history of Hebrus Valles and Hephaestus Fossae, Utopia Planitia, Mars.

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 three 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 2015 – Aug 2016

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:**

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., Mastrogiuseppe, M., Mellon, M.T., Seu, R., Smith, I.B., *in press*. Ice Resource Mapping on Mars. In Badescu, V., Zacny, K., Bar-Cohen, Y. (Eds.), Handbook of Space Resources, Springer Nature Switzerland AG.
- 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
- Guallini, L., and **Nerozzi, S.**, 2014, Polar Layered Deposits, *in* Encyclopedia of Planetary Landforms, Springer New York, p. 1–14.

#### **Publications in review/preparation:**

- 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., *in review*, New Views of the Internal Structure of Planum Boreum from Enhanced 3D Imaging of Mars Reconnaissance Orbiter Shallow Radar Data.
- Nerozzi, S.**, Tober, B.S., Ortiz, M.R., Holt, J.W., and Hamilton, C., *in preparation*, Subsurface investigations in Hebrus Valles and Hephaestus Fossae with SHARAD.
- 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: Radar Subsurface Reflectors.

#### **Oral Presentations:**

- 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* 50<sup>th</sup> 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* 49<sup>th</sup> 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* 48<sup>th</sup> 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.
- Nerozzi, S.,** and Holt, J.W., 2016, Reconstructing the Initial Emplacement of the North Polar Layered Deposits, Mars with SHARAD, *in* 47<sup>th</sup> Lunar and Planetary Science Conference, Abstract # 2265.
- Nerozzi, S.,** and Holt, J.W., 2015, Stratigraphic Structures and Depositional Patterns of the Lowermost NPLD, Mars, from SHARAD Mapping, *in* 46<sup>th</sup> Lunar and Planetary Science Conference, Abstract # 1670.

### **Mentorship & 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 an 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 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.*

**Awards:**

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

**Other professional experience:**

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.

**Outreach activities and relevant learning experiences:**

Science mentor for 6<sup>th</sup> grade students at Sahuarita Middle School (AZ) Mar 2021 – May 2021

Weekly mentorship of 6<sup>th</sup> 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.

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.

**Review service:**

Reviewer for Nature Astronomy, Geophysical Research 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.

**Leadership:**

UT Amateur Radio Club - President

Jan 2018 – Apr 2019

Manage club activities and meetings, teach licensing classes, define club goals, recruiting, and treasury. Club member since Jan 2015, officer since Sep 2016.

**Field experience & Internships:**

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

**Skills & Experience:**

Research

Geology (geological mapping, geomorphology, stratigraphy), geophysics and remote sensing (sounding radar, multispectral imaging, passive seismic techniques, time-domain EM, gravity, electrical resistivity), electronic circuit design, HF antenna design and construction.

Computer & Software

Linux and Windows operating systems, ArcGIS, Landmark DecisionSpace, JMARS, USGS ISIS3, NASA Ames Stereo Pipeline, LMD General Circulation Model, Python, Matlab, Illustrator, Photoshop.

Professional

Visualization, analysis and interpretation of spatial datasets, delineation of scientific goals with holistic perspective, teamwork and collaboration, team leadership, critical thinking, proposal writing, mentoring.

**Languages:**

English – fluent, full professional proficiency

Italian – native

French – elementary proficiency

Spanish – elementary proficiency