

Stephen P. Scheidt

Associate Research Scientist

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EDUCATION

2009 Ph.D. Geology University of Pittsburgh, Department of Geology and Planetary Science
2002 M.S. Geology University of South Carolina, Department of Geological Sciences
1999 B.S. Environmental Science University of Toledo, Department of Earth, Ecological and Environmental Sciences

POSITIONS & APPOINTMENTS

Planetary Science Institute

08.2018 – current

Associate Research Scientist

Community College of Baltimore County

01.2019 – current

Adjunct Instructor

University of Arizona, Lunar and Planetary Science Laboratory

10.2015 – 08.2018

Associate Staff Scientist

10.2014 – 10.2015

Postdoctoral Scientist

Smithsonian Institution, Center for Earth and Planetary Studies (CEPS)

09.2010 – 09.2014

Postdoctoral Scientist

Northern Virginia Community College (Alexandria Campus)

08.2013 – 05.2014

Adjunct Geology Instructor

BAE Systems, Inc. (McLean, VA)

07.2012 – 02.2013

Lead Imagery Scientist

Desert Research Institute (Reno, NV)

01.2010 – 09.2010

Postdoctoral Scientist

University of Pittsburgh, Department of Geology & Planetary Science

01.2010 – 12.2012

Adjunct Research Associate

06.2004 – 12.2009

Research / Teaching Assistant

RESEARCH PROFILE

Main interests: remote sensing, geology and digital fabrication. I have enjoyed working on problems involving desert, volcanic and coastal geomorphology, aeolian surface processes, planetary geology and geologic mapping. My doctoral training focused on the analysis of multispectral and hyperspectral remote sensing data. More recently, I use airborne and low-altitude camera data to produce digital terrain models. My frequently used tools: multi-view stereophotogrammetry, spectroscopy, thermophysical modeling and GIS. Other interests: geohazards, environmental science, ecology, geologic mapping, open-source geospatial applications / software, integration of surface and subsurface geophysical data, imaging systems for unmanned aerial vehicles (UAVs, multi-rotor and fixed-wing) and kite-based platforms, woodworking, robotics, rapid prototyping using 3D printing and computer numerical control (CNC) fabrication methods. Currently designing a complete fixed-wing aircraft with differential GPS capabilities for precise aerial photogrammetric land surveying.

HONORS & AWARDS

2017 1st Place Aware for 3D-carved Mars topography in the Art of Planetary Science at LPL
2015 3rd Place Award for aerial photography entry in the Art of Planetary Science at LPL
2011 – 2012 Postdoctoral “Charles Lindbergh” Fellowship, Smithsonian Institution, CEPS
2006 – 2009 NASA Earth System Science (ESS) Graduate Student Fellowship Award Recipient

2006 Best Poster Contribution, Arts & Sciences Graduate Student Organization (ASGSO) Grad Expo, University of Pittsburgh

ARTICLES IN PRESS

- Bonnefoy LE, CW Hamilton, **SP Scheidt**, S Duhamel, Á Höskuldsson, I Jónsdóttir, T Thordarson, and U Münzer (in review). Hydrological changes associated with the 2014–2015 Holuhraun eruption in Iceland, *Journal of Volcanology and Geothermal Research*.
- JR Zimbelman and **SP Scheidt** (in review). Geologic map of the western and central regions of the Medusae Fossae Formation (MC-23 NW and MC-16 NW) on Mars, U.S. Geological Survey Scientific Investigations Map, scale 1: 2,000,000.

PUBLISHED PEER-REVIEWED JOURNAL ARTICLES

- Young KE, JE Bleacher, AD Rogers, HH Schmitt, AC McAdam, WB Garry, PL Whelley, **SP Scheidt**, G Ito, CA Knudson, TG Graff, LV Bleacher, N Whelley, CA Evans, JM Hurtado Jr., TD Glotch (2018). The incorporation of field portable instrumentation into human planetary surface exploration, *Earth and Space Science*, 5, <https://doi.org/10.1029/2018EA000378>.
- Hamilton CW, PJ Mougini-Mark, MM Sori, **SP Scheidt**, AM Bramson (2018). Episodes of aqueous flooding and effusive volcanism associated with Hrad Vallis, Mars, *Journal of Geophysical Research: Planets*, 123, <https://doi.org/10.1029/2018JE005543>.
- Palafox LF, CW Hamilton, **SP Scheidt** and AM Alvarez (2016). Automated detection of geological landforms on Mars using convolutional neural networks, *Computers and Geosciences*, <http://dx.doi.org/10.1016/j.cageo.2016.12.015>.
- Zimbelman JR, **SP Scheidt**, SL de Silva, NT Bridges, MG Spagnuolo and EM Neely (2016). Aerodynamic roughness height for gravel-mantled megaripples, with implications for wind profiles near TARs on Mars, *Icarus*, 266, 306-314, doi:10.1016/j.icarus.2015.11.008.
- Lorenz RD and **SP Scheidt** (2014). Compact and inexpensive kite apparatus for geomorphological field aerial photography, with some remarks on operations, *GeoResJ*, 3, 1-8, doi:10.1016/j.grj.2014.06.001.
- Zimbelman JR and **SP Scheidt** (2014). Precision topography of a reversing sand dune at Bruneau Dunes, Idaho, as an analog for Transverse Aeolian Ridges on Mars, *Icarus*, 230, 29-37, doi:10.1016/j.icarus.2013.08.004.
- Scheidt SP** and N Lancaster (2013). The application of COSI-Corr to determine dune system dynamics in the southern Namib Desert using ASTER data, *Earth Surface Processes and Landforms*, 38, 9, 1004-1019, doi: 10.1002/esp.3383.
- Zimbelman JR and **SP Scheidt** (2012). Hesperian age for western medusae fossae formation, Mars, *Science*, 336, 6089, 1683, doi:10.1126/science.1221094.
- Scheidt SP**, N Lancaster and MS Ramsey (2011). Eolian dynamics and sediment mixing in the Gran Desierto, Mexico, determined from thermal infrared spectroscopy and remote-sensing data, *Geological Society of America Bulletin*, 123, 7-8, 1628-1644, doi:10.1130/B30338.1.
- Scheidt SP**, MS Ramsey and N Lancaster (2010). Determining soil moisture and sediment availability at White Sands Dune Field, New Mexico, from apparent thermal inertia data, *Journal of Geophysical Research: Earth Surface* (2003–2012), 115, F2, doi:10.1029.2009JF001378.
- Katra I, **SP Scheidt** and N Lancaster (2009). Changes in active eolian sand at northern Coachella Valley, California, *Geomorphology*, 105, 3-4, 277-290, doi:10.1016/j.geomorph.2008.10.004.
- Scheidt SP** (2009). *Aeolian System Dynamics Derived from Thermal Infrared Data*. Ph.D. dissertation, University of Pittsburgh. 294 p.
- Scheidt SP**, MS Ramsey and N Lancaster (2008). Radiometric normalization and image mosaic generation of ASTER thermal infrared data: An application to extensive sand sheets and dune fields, *Remote Sensing of Environment*, 112, 3, 920-933, doi:10.1016/j.rse.2007.06.020.
- Scheidt SP** (2002). *Temporal Trends and Spatial Distribution of Wet Deposition of Mercury in the Southeastern United States*. Master's thesis, University of South Carolina. 238 p.

FIRST-AUTHOR CONFERENCE ABSTRACTS

- Scheidt SP**, DA Crown, DC Berman (2019). Distribution and morphology of valley networks on the flanks of Alba Mons, Mars. Lunar and Planetary Institute Science Conference Abstracts, Lunar Planet. Sci., L, abstract #2014.
- Scheidt SP**, DA Crown, DC Berman (2018). Topographic analyses of valley networks and volcanic ridges on the flanks of Alba Mons, Mars. Lunar and Planetary Institute Science Conference Abstracts, Lunar Planet. Sci., XLIX, abstract 1570.
- Scheidt SP**, JE Bleacher, CW Hamilton, PL Whelley, WB Garry, J Voigt, SS Sutton (2017). Anatomy of streamlined volcanic islands using multi-view stereophotogrammetry, Kilauea volcano, Hawaii, IAVCEI 2017 Scientific Assembly, Fostering Integrative Studies of Volcanoes, August 14-18, Portland, Oregon, U.S.A., abstract 924, p. 970.
- Scheidt SP**, LE Bonnefoy, S Sutton, P Whelley, CW Hamilton, AP deWet (2017). Remote sensing analysis of Askja pumice megaripples in the Vikursundar, Iceland as an analog for martian transverse aeolian ridges, Fifth International Planetary Dunes Workshop: From the bottom of the oceans to the outer limits of the solar system, St. George, Utah, abs. 3020.
- Scheidt SP**, PL Whelley, CW Hamilton, JE Bleacher, WB Garry (2015). The Kilauea 1974 flow: quantitative morphometry of lava flows using low altitude aerial image data using a kite-based platform in the field, 2015 Fall Meeting, American Geophysical Union, San Francisco, CA, abs. #P24A-08.
- Scheidt SP**, LF Palafox, CW Hamilton, JR Zimelman (2015), Automated detection of transverse aeolian ridges on Mars using convolutional neural networks and a field-based terrestrial orthoimage training set, Fourth International Planetary Dunes Workshop: Integrating Models, Remote Sensing and Field Data, Boise, ID (LPI Contributions No. 1843), abs. 8047.
- Scheidt SP**, CW Hamilton and JR Zimelman (2015). Generation of Ultrahigh Spatial Resolution Digital Terrain Models for a Martian Lava Flow Analog From Kilauea Volcano, Hawaii, Lunar Planet. Sci., XLVI, abs. 1055.
- Scheidt SP** and JR Zimelman (2015). Gravel-mantled aeolian bedforms from Mono-Inyo Domes, California, USA: Morphology, Characteristics, and Relevance to Mars, Lunar Planet. Sci., XLVI, abs. 1056.
- Scheidt SP**, Hamilton CW, JR Zimelman, JE Bleacher, WB Garry, AP de Wet and LS Crumpler (2014). Lava-Rise Plateaus and Inflation Pits Within the McCartys Flow, New Mexico, Lunar Planet. Sci., XLV, abs. 1491.
- Scheidt SP**, JR Zimelman and Johnson MB (2014). Multiview Stereo Photogrammetry of Mars Aeolian Analogs, Lunar and Planetary Institute Science Conference Abstracts, Lunar Planet. Sci., XLV, abs. 1446.
- Scheidt SP** (2013). A New tool for comparative planetology for almost anyone, Works-in-Progress, National Air and Space Museum, Smithsonian Institution, Washington, DC.
- Scheidt SP** (2013). Field instrumentation needs: A multispectral imaging payload for a lightweight UAV, Smithsonian Tools for Discovery Workshop, Cambridge, MA.
- Scheidt SP** (2012). Sand transport pathways of dark dunes in the Sperrgebiet: Sand composition and dune migration rates from ASTER data, Third International Planetary Dunes Workshop: Remote Sensing and Image Analysis of Planetary Dunes, Flagstaff, AZ (LPI Contributions No. 1673), 85-86, abs. 7051.
- Scheidt SP**, CG Hughes, RA Craddock, MS Ramsey and JR Zimelman (2011). A simulated HypSIRI dataset using combined ASTER and AVIRIS data of the Ka'u Desert dunes for terrestrial mapping and planetary application, 4th HypSIRI Science Workshop, August 23-25, Washington, DC.
- Scheidt SP** and JR Zimelman (2011). Preliminary Geologic Map of the MC-16 NW Quadrangle, Mars: Subdivisions of the Lower and Middle Members of the Medusae Fossae Formation, Lunar Planet. Sci., XLII, abs. 2631.
- Scheidt SP**, SL de Silva, JR Zimelman, NT Bridges and JG Viramonte (2011). The Composition of Puna Gravel Ripple Fields: A Terrestrial Analog from TIR Remote-Sensing and Spectroscopy, Lunar Planet. Sci., XLII, abs. 2706.

Scheidt SP, N Lancaster and MS Ramsey (2010). Spatial patterns of sand composition in the Gran Desierto, MX determined from thermal infrared spectroscopy and ASTER remote sensing data, 2010 GSA Denver Annual Meeting (31 October - 3 November 2010), Geological Society of America Abstracts with Programs, 42, 5, 416, Paper No. 170-6.

Scheidt SP and N Lancaster (2010). Sensitivity of the Automatic Determination of Sand Transport Direction and Rate to Dune Morphology, 2010 Fall Meeting, American Geophysical Union, San Francisco, CA, abs. #EP51A-0533.

Scheidt SP, MS Ramsey, R Mohammed and N Lancaster (2010). Performance of the proposed HypsIRI TIR bands for accurate compositional identification of eolian dust, ash and sand, 3rd HypsIRI Science Workshop, August 24-26, 2010, Pasadena, CA.

Scheidt SP, N Lancaster and MS Ramsey (2010). Sand composition of the Gran Desierto: A terrestrial analogue for thermal infrared imaging and spectroscopy techniques, Second International Planetary Dunes Workshop: Planetary Analogs-Integrating Models, Remote Sensing and Field Data, abs. 2010.

Scheidt SP and N Lancaster (2010). Sensitivity of automatic determination of sand transport direction and rate to dune morphology in the Namib Sand Sea, Second International Planetary Dunes Workshop: Planetary Analogs-Integrating Models, Remote Sensing and Field Data (LPI Contributions No. 1552), Alamosa, CO, abs. 2024.

Additional 40+ coauthored presentations and conference abstracts

TEACHING

<i>Institution</i>	<i>Date</i>	<i>Role</i>	<i>Courses</i>
<i>Community College of Baltimore County, Catonsville, MD</i>	Spring 2019	Lab Instructor	Guide activities on 2D/3D design, orientation to the FabLab, supervise laser cutter, 3D printing and CNC router applications
<i>University of Arizona</i>	Spring 2016	Guest lecturer	Geology and Geophysics of the Solar System (PTYS 411)
<i>Northern Virginia Community College</i>	Spring 2014	Guest lecturer	Historical Geology (GOL 106)
	Fall 2013	Instructor	Physical Geology (GOL 105)
<i>University of Pittsburgh</i>	2007-2010	Guest lecturer	Natural Disasters (GEOL 0820), Introduction to Remote Sensing (GEOL 1460), Advanced Geohazards and Risk Management (GEOL 2640)
	2005-2006	Lab Instructor	Natural Disasters (GEOL 0820)
<i>University of South Carolina</i>	2000-2002	Lab Instructor	Environment of the Earth (GEOL 103), Intro to the Earth (GEOL 101) and Environment (ENVR 101)

PROFESSIONAL DEVELOPMENT

2014 Preparing for an Academic Career in the Geosciences: Workshop for Graduate Students and Post-Doctoral Fellows, University of Pittsburgh, Pittsburgh, PA.

2013 Online Instruction 101 workshop, Extended Learning Institute, Northern Virginia Community College.

MENTORING

Undergraduate

2016 Co-advising a University of Arizona Space Grant Program student, UAV remote sensing engineering and virtual reality (VR) environments for Mars analogs.

2016 Co-advised six students in the field on geology and UAV remote-sensing of lava flows southwest of Laki in Vatnajökull National Park and the Holuhraun lava flow field south of Askja, Iceland. <http://www.keckgeology.org/tephrastratigraphy-in-iceland-3>.

2014 Co-advised University of Pittsburgh graduate student on 3D data analysis of volcanic dome texture.

- 2014 Co-advised Arizona Space Grant Program student, data visualization of 3D data for mobile devices. Contributed to 2015 LPSC presentation.
Co-advised Arizona Space Grant Program student, ArcGIS and fieldwork documentation in Iceland.
- 2006 University of Pittsburgh, undergraduate advisement on a satellite remote-sensing project using ASTER image data on a project to create a multispectral mosaic of the Sahara Desert.

Graduate and Postgraduate

- 2010 *Redha Mohammad* (University of Pittsburgh): External Committee Member. Dissertation: “Using thermal infrared (TIR) data to characterize dust storms and their sources in the Middle East.” Currently at Kuwait University as an assistant professor.

CURRENT PROJECT PARTICIPATION

1. *NASA Mars Data Analysis Program (MDAP)*

Geologic evolution of the western flank of Alba Mons, Mars

PI: David Crown, Planetary Science Institute

Role: Digital terrain analysis and mapping of fluvial morphology 10.2016 – present

2. *NASA Solar System Workings (SSW)*

Details in the devils: Using physical characteristics of dust-laden vortices to remotely determine ambient meteorological conditions on Earth and Mars

PI: Lori Fenton, SETI Institute

Role: Co-I 3.2019 – present

PAST PROJECT PARTICIPATION

NASA/ Remote, In Situ and Synchrotron Studies for Science and Exploration (RIS4E)

Node of the Solar System Exploration Research Virtual Institute (SSERVI) Program

PI: Timothy Glotch and Co-I: Jacob Bleacher

Role: Collaborator

2014 – 2019

ESA Colour and Stereo Surface Imaging System – CaSSIS

Co-I: Alfred McEwen, University of Arizona

Role: Assist with image processing and digital terrain model generation 01.2018 – 06.2018

High Resolution Imaging Science Experiment (HiRISE) mission at the University of Arizona

PI: Alfred McEwen, University of Arizona

Role: Assist validation of stereo-derived digital terrain models 10.2015 – 06.2017

NASA Planetary Geology and Geophysics Program (PGG)

Sinuuous channels in volcanic provinces on the Earth and Mars

PI: Christopher Hamilton

Role: Postdoctoral Researcher

2014 – 2015

Smithsonian Grand Challenges Award

Multi-Instrument Approach to the 3D Characterization of Martian Analogs: Hawaii

PI: Gareth Morgan

Role: Co-I

10.2012 – 10.2013

Smithsonian Postdoctoral Earth and Planetary Sciences Fellowship

Remote sensing of sand dunes

Role: Postdoctoral scientist, proposal authorship

08.2011 – 03.2014

NASA/ Planetary Geology and Geophysics

Geologic mapping of the Medusae Fossae Formation on Mars

PI: James Zimbelman

Role: Postdoctoral scientist, technical and science contributor

08.2010 – 08.2011

NASA EPSCoR

Exploring Planetary Surfaces: Earth, Moon and Mars

PI: Wendy Calvin and Co-I: Nicholas Lancaster

Role: Postdoctoral scientist 01.2010 – 08.2010
NASA/ Earth and Space Science Fellowship (NESSF)
 Using multi-sensor data fusion to estimate dust aerosol composition and its effect on longwave radiative forcing
 PI: Dr. Michael Ramsey (Graduate Advisor)
 Role: GSR, proposal authorship, award recipient, science and technical lead 2006 – 2009
NASA/ Solid Earth and Natural Hazards Program
 Eolian processes in arid regions: Tracking land surface change using orbital data
 PI: Dr. Nicholas Lancaster
 Role: GSR, science and technical contributor 2004 – 2008

RESEARCH FIELD ACTIVITIES

Aerial and ground-based photogrammetry and topographic surveying of: arid lands vegetation at *Santa Rita Experimental Range, Tucson, Arizona* • aeolian megaripples at *Askja, Iceland* • dunes at *Great Sand Dunes National Park, CO* • aeolian megaripples and volcanic terrain at *Mono-Inyo Craters, CA* • UAV remote sensing and digital terrain creation, volcanic morphology at *Holuhraun, Iceland* • *Vatnajökull National Park, Iceland* • *Hawai'i Volcanoes National Park* • *Raudholar, near Reykjavik, Iceland* • *El Mapais National Monument, NM* • *Craters of the Moon, ID* • and dunes at *Bruneau Dunes State Park, ID*. Additional fieldwork and remote sensing validation: aeolian megaripples, *Puna Desert, Argentina* • playa mineralogy, *Ash Meadows, NV* • dusty Saharan air layer, *Izaña Atmospheric Observatory in Tenerife, Spain* • dunes, *Gran Desierto, Sonora, Mexico* and *White Sands, NM* • *SMEX02, Ames, Iowa*. Geologic mapping: Capistrano stratigraphy, Exxonmobile field seminar in *La Jolla, CA* • maar craters *Sierra Pinacate, Sonora, MX* • Au/mineral deposits, *Harquahala Mountains in La Paz, AZ*. Hydrogeological fieldwork and environmental remediation [*Multiple sites in eastern U.S.A.*]. Coastal geomorphic mapping and environmental surveys: *Persian Gulf Coast, Saudi Arabia* • *Georgetown, SC* • *Lewes, DE*.

SKILLS & QUALIFICATIONS

- Digital geological mapping using topography and visible, infrared and thermal remote sensing data of Earth (SRTM, airborne LiDAR, AVIRIS, MASTER, ASTER, Worldview, Quickbird) and Mars (MOLA, THEMIS, HiRISE, CTX, HRSC, MOC, MOLA and TES)
- Geological mapping of morphology, rock and sediment composition and stratigraphy in the field, including remote sensing ground-truth and validation
- Interpretation of multi- and hyper- spectral data phenomenology and exploitation
- Code/algorithm development for hyperspectral and multispectral image processing
- 2D/3D spatial map generation using Geographic Information Systems
- Topographic surveying using Differential Global Position Systems (DGPS)
- 3D photogrammetry, point cloud manipulation and geologic model creation
- Thermal emission spectroscopy and imaging
- Kite / UAV aerial photogrammetry, mapping and 3D terrain mapping
- Software proficiency: Fusion360, ESRI ArcMap, QGIS, Surfer, Blender, Sketchup, Meshlab, Matlab, JMARS, ENVI/IDL, Pix4D, Photoscan, PCL, VisualSFM, Integrated Software for Imagers and Spectrometers (ISIS), Google Earth, Adobe Photoshop/Illustrator, some Python.
- 2D/3D digital design and fabrication using CNC routing, laser cutters and 3D printers
- Unix/Linux systems administration, networking and shell scripting / automation for data processing