

Serina Diniega

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Caltech Postdoc, Jet Propulsion Laboratory

PhD, University of Arizona
MS, International Space University
BS, California Institute of Technology
Origin: Pearl City, HI, USA

Research Interests and Future Goals

- Develop simple mathematical models of planetary surface feature formation and evolution
- Using analysis and simulation, determine connections between environmental conditions and landform morphology
- Promote the education/interest of the next generation in mathematics, engineering, and science

Research Position and Education

<i>Jet Propulsion Laboratory (JPL)</i> , Science Postdoc Advisor: Suzanne Smrekar	2010-2013
<i>University of Arizona (UA)</i> , PhD in Applied Mathematics, minor in Planetary Science Dissertation: Modeling Aeolian Dune and Dune Field Evolution Advisors: Karl Glasner (Math) and Shane Byrne (Planet. Sci.)	2010
<i>University of Arizona (UA)</i> , MS in Applied Mathematics	2005
<i>International Space University (ISU; Strasbourg, France)</i> , MS in Space Studies Thesis: Regolith distribution model for sub-kilometer ellipsoidal asteroids Advisors: Akira Fujiwara and Hajime Yano (Japan. Aerospace Exploration Agency)	2004
<i>California Institute of Technology (Caltech)</i> , BS, with honors, Mathematics	2003

Current Research

<i>Inflationary lava flow model development</i> Formulate and analyze a simple model to evaluate to what extent large changes in lava flow dynamics can be driven by natural small rheological variations within the lava flow and to investigate possible connections between these dynamics and measurable lava field landforms. Focus is on terrestrial flows and Mars (using HiRISE images).	2010-present
<i>Active gullies on Martian dunes</i> Survey and monitoring of gullies located on dunes, yielding measurements of seasonal activity since 2000. We aim to define general characteristics of these gullies, explore the relationship between gullies found on dune and non-dune slopes, and identify mechanisms of gully formation and evolution; the observed timing of activity implies that CO ₂ frost drives current activity.	2009-present
<i>Dune and dune field evolution model development, analysis, and application</i> Phenomenological continuum models of dune and dune field evolution were used to explain and explore the behavior and morphology of dune fields, with special focus on identifying and quantifying influential environmental factors that create apparent characteristic dune sizes and spatial distributions.	2005-present

Professional Service

Scientific Manuscript Review: Computer Physics Comm., Earth Surface Process. and Landforms, Geomorphology
Grant Review: NASA SMD (panelist); NSF GLD, NASA LASER, NASA PG&G
Section Editor to Springer 2013 *Encyclopedia of Planetary Landforms* (mass-wasting)
Contributor to Springer 2013 *Encyclopedia of Planetary Landforms* (tumulus, gully, linear gully, barchan dune convoy)
JPL Team A panelist (science: Martian geomorphology, volcanology)
Session convener: AGU
Session chair: ICIAM, LPSC
Student paper judge: AGU
JPL education programs, mentor for undergraduate students: Summer 2011, Spring/Fall 2012

Professional Affiliations

American Geophysical Union (AGU), Mars-Dune.org Consortium, Society for Industr. and Applied Math. (SIAM)

Publications

- Diniega, S.**, S.E. Smrekar, S. Anderson, E. Stofan (in prep). The influence of temperature-dependent viscosity on lava flow dynamics. *JGR*.
- Diniega, S.**, C.J. Hansen, C. Hugenholtz, C.M. Dundas (in revision). A new dry hypothesis for the formation of Martian linear gullies. *Icarus*.
- Diniega, S.** and 17 co-authors (in revision). Mission to the Trojan Asteroids: lessons learned during a JPL Planetary Science Summer School mission design exercise. *Planet. Space Sci.*
- Dundas C.M., **S. Diniega**, C.J. Hansen, S. Byrne, A.S. McEwen (2012), HiRISE observations of seasonal activity and morphological changes in Martian gullies. *Icarus* **220**, no. 1, 124-143. doi:10.1016/j.icarus.2012.04.005.
- Bridges, N.T., M.C. Bourke, P.E. Geissler, M.E. Banks, C. Colon, **S. Diniega**, M.P. Golombek, C.J. Hansen, S. Mattson, A.S. McEwen, M.T. Mellon, N. Stantz, B.J. Thomson (2012), Planet-wide sand motion on Mars. *Geology* **40**, no. 1, 31-34. doi:10.1130/G32373.1.
- Hansen, C. J., M. Bourke, N.T. Bridges, S. Byrne, C. Colon, **S. Diniega**, C. Dundas, K. Herkenhoff, A. McEwen, M. Mellon, G. Portyankina, N. Thomas (2011), Seasonal erosion and restoration of Mars' northern polar dunes. *Science* **331**, no. 6017, 575-578. doi:10.1126/science.1197636.
- Diniega, S.**, S. Byrne, N.T. Bridges, C.M. Dundas, A.S. McEwen (2010), Seasonality of present-day Martian dune-gully activity. *Geology* **38**, no. 11, 1047-1050. doi:10.1130/G31287.1.
- C. M. Dundas, A. S. McEwen, **S. Diniega**, S. Byrne, S. Martinez-Alonso (2010), New and recent gully activity on Mars as seen by HiRISE. *Geophys. Res. Lett.* **37**, L07202. doi:10.1029/2009GL041351.
- Diniega, S.**, K. Glasner, S. Byrne (2010), Long scale evolution of aeolian sand dune fields: influences of initial conditions and dune collisions. *Geomorphology (special edition: Planetary Dunes)* **121**, 55-68. doi:10.1016/j.geomorph.2009.02.010.
- Pelletier, J.D., T. Engelder, D. Comeau, A. Hudson, M. Leclerc, A. Youberg, **S. Diniega** (2009), Tectonic and structural control of fluvial channel morphology in metamorphic core complexes: The example of the Catalina-Rincon core complex, Arizona. *Geosphere* **5**, 385-407. doi:10.1130/GES00221.1.
- Hey, R.N., F. Martinez, **S. Diniega**, D.F. Naar, J. Francheteau, Pito93 Scientific Team (2002), Preliminary attempt to characterize the rotation of seafloor in the Pito Deep area of the Easter Microplate using a submersible magnetometer. *Marine Geophysical Research* **23**, 1-12. doi:10.1023/A:1021257915420.

Recent Honors & Fellowships

NASA Postdoctoral Fellow (JPL, with advisor Sue Smrekar)	2010-2012
JPL Planetary Science Summer School participant	2011
NASA Harriett G. Jenkins Pre-doctoral Fellow	2007-2010
AI Scott Lecture and Prize, UA Program in Applied Math	2010
Lunar Planet. Inst. Career Development Award (LPSC)	2010
Served as rapporteur for Planetary Decadal Survey, Mars Panel: meetings 1 - 3	2009-2010
NASA Jenkins Mini Research Award (advisor: Nathan Bridges, JPL/APL)	2009
UA GIDP Travel Award (ICIAM, Geomorphology)	2007, 2009
SIAM, First place award for Educational Article: <i>Math Matters in Dune Modeling</i>	2008
LPI Mars Student Travel Award (Planet. Dune Workshops)	2008, 2010

Recent/Select Conference Presentations

- Diniega, S.**, S.E. Smrekar, S. Anderson, E. Stofan (2012). Lava flow dynamics driven by temperature-dependent viscosity variations. *LPSC43*. Ab. 2556. (poster)
- Diniega, S.**, L. Sigelmann, S. Sangha, S.E. Smrekar (2012). Identification and survey of martian lava inflationary features. *LPSC43*. Ab. 2537. (poster)

- Naum A. L. Potter S. L. Sayanagi K. M. **Diniega S.** and 14 co-authors (2012). TASTER: Trojan Asteroid Tour, Exploration, and Rendezvous, a JPL PSSS Mission Design Exercise. *LPSC 43*. Ab. 2857. (poster)
- Diniega, S.**, C. M. Dundas, C.J. Hansen, S. Byrne, A. McEwen (2011). Martian dune-gully seasonal activity and formation. *AGU Fall Meeting*. Ab. P21D-02. (Invited presentation)
- Diniega, S.**, S.E. Smrekar, S.W. Anderson, E.R. Stofan (2011). Lava flow dynamics driven by temperature-dependent viscosity variations. *AGU Fall Meeting*. Ab. V53A-2599. (poster)
- Diaz-Silva, R., K.M., Sayanagi, S. Gil, **S. Diniega**, and 15 co-authors (2011). TASTER: Trojan Asteroid Tour, Exploration and Rendezvous, a NASA Planetary Science Summer School Mission Design Exercise. *AGU Fall Meeting*. Ab. P23C-1723.
- Diniega, S.**, S.E. Smrekar, S. Anderson, E. Stofan (2011). Lava flow dynamics driven by temperature-dependent viscosity variations. *Am. Phys. Soc. Div. Fluid Dynamics*, Ab. H17.9 (Baltimore, MD)
- Diniega, S.**, S.E. Smrekar, S. Anderson, E. Stofan (2011). Lava flow dynamics driven by temperature-dependent viscosity variations. *GSA Annual Meeting* (Minneapolis, MN).
- Diniega, S.**, N. Bridges, C. Hansen (2011). They're alive! Present-day evolution of Martian dunes. *EPSC-DPS* (Nantes, France). (poster)
- Hansen, C.J., **S. Diniega**, C. Dundas, A. McEwen, G. Portyankina, N. Thomas (2011). Dry Ice and Dunes on Mars. *EPSC-DPS* (Nantes, France).
- Diniega, S.**, S. Byrne, C. M. Dundas, A. McEwen, N. Bridges, (2011). Present-day Martian dune gully formation. *LPSC 42*. Ab. 1540.
- Diniega, S.**, S.E. Smrekar, S. Anderson, E. Stofan (2011). Lava flow dynamics driven by temperature-dependent viscosity variations. *LPSC 42*. Ab. 1538. (poster)
- Dundas, C. M., **S. Diniega**, A. S. McEwen, S. Byrne (2011). Observations of present-day gully activity on Mars. *LPSC 42*. Ab. 2709. (poster)
- Bridges, N.T., M.C. Bourke, C.M. Colon, **S. Diniega**, P.E. Geissler; M.P. Golombek; C.J. Hansen, S. Mattson, A.S. McEwen, N. Stantzos (2011). Planet-wide sand movement on Mars as documented by the HiRISE camera. *LPSC 42*. Ab. 1215.
- Diniega S.**, Bridges N.T., Byrne S., Dundas C.M., Hansen C.J. & McEwen A.S. (2011). Seasonal activity within Martian dune gullies. *IAG Region. Conf. Geomorphology* (Addis Ababa, Ethiopia).
- Hansen, C., N. Bridges, M. Bourke, S. Byrne, **S. Diniega**, C. Dundas, K. Herkenhoff, A. McEwen, G. Portyankina, N. Thomas, C. Colon (2010). Mars' Northern Dunes: Volatiles and Geology. AAS DPS meeting **42**, Ab. 30.22.
- Diniega S.**, S. Byrne, K. Glasner (2010). Connecting aeolian and nivean processes with martian polar dune morphology. *Planetary Dunes Workshop: planetary analog* (Alamosa, CO). Ab. 2005.
- Diniega, S.**, S. Byrne, N. Bridges, C. M. Dundas, A. McEwen (2010). Present-day martian dune gully activity. *LPSC 41*. Ab. 2216.
- Dundas, C. M., A. S. McEwen, **S. Diniega**, S. Byrne (2010). New and recent gully activity on Mars as seen by HiRISE. *LPSC 41*. Ab. 2114.

Other Professional Presentations

- Predicting the formation of proto-channels and tubes within lava flows, 12 July 2012, *JPL, Postdoc. Res. Seminar*
- Present-day erosion and evolution of Martian dunes, 7 Nov 2011, *JPL, Planetary Science Seminar*.
- Pattern formation with Earth and Mars dune fields. 22 July 2011, *Caltech, Cassini Dunes Workshop*.
- Dune gullies and inflationary features, 17 Aug. 2011, *USGS Flagstaff, HiRISE Team Meeting*.
- Present-day seasonal evolution of martian gullies, 9 Dec 2010, *JPL, Mars Forum*.
- Dune and dune field evolution, 30 April 2010, *UA, Applied Math Colloquium, AI Scott Prize Lecture*.
- Present-day martian gully activity, 18 Feb. 2010, *UA, HiRISE Team Meeting*.
- Modeling dune and dune field evolution, 17 Nov. 2009, *MIT, Mathematical Physics Seminar*.
- Present-day martian gully activity, 16 Nov. 2009, *MIT, Planetary Science Seminar*.
- Dune and dune field evolution, 3 Nov. 2009, *Caltech, Mechanical Engineering Seminar*.

Instruction, Organization & Outreach (Math & Science)

<i>JPL Mars Seminar Organizer</i>	2012-present
<i>Planetary Science expert and featured scientist for JPL Education office programs</i>	2012
Presented to JPL Fall term interns, featured scientist in DIY Science Fair Project video series, assisted with developing educational materials	
<i>Invited Panelist for SDSU Career Event</i>	2012
<i>Judge at Pasadena Science Fair</i>	2012
<i>JPL Mars Seminar Organizer</i>	2012-present
<i>Panelist for 5th grade group as part of JPL Women Leadership Celebration</i>	2012
<i>Featured JPL Woman Scientist for discussion (broadcast), JPL Women Leadership Celebration</i>	2012
<i>Invited presenter at JPL's Public Earth Day Event: Spewing fire and shifting sands</i>	2011
<i>Judge at Washington Elementary School Science Fair</i>	2011
<i>NASA Student Ambassador (Virtual Community COHORT II)</i>	2009-present
<i>Geology of the Solar system (PTYS411/511), unofficial teaching assistant</i>	2007, 2010
<i>Planet. Sci. Dept. semester field trip (to NM, focus on sedimentary rocks), co-organizer</i>	2010
<i>UA Sonia Kovalevski Day, organizer:</i>	2008, 2010
Full-day workshop with high school women, promoting and showing STEM studies	
<i>College Algebra (Ma112), instructor</i>	2008-2009
Fall: 31 students, 5 th highest of 38 sections avg. score on common final	
Spring: 26 students, 3 rd highest of 28 sections avg. score on common final	
<i>Numerical Modeling class (Ma485), mentor for undergrad. group, discrete dune model</i>	2007-2009
<i>SIAM University Chapter, member:</i>	2004-2010
President/ Student chapter "Most active member," featured in National SIAM newsletter	2007
Officer	2005, 2006
Organized panel discussions about post-graduation options	2007, 2008
<i>Tucson Kids Club Math Event, organizer</i>	2006-2010
This SIAM chapter outreach event was commended by the National SIAM organization.	
<i>Partial Differential Equations (Ma456), grader</i>	2008
<i>Solar System event supervisor/exam writer for the state-level Science Olympiad</i>	2006, 2007
<i>Participant in Mentoring Seminar, for Mathematical Modeling (Ma485)</i>	2006
Presented on encouraging individual and group creativity, student assessment methods, and discussion techniques	
<i>Designed/taught planetary science curriculum for middle school students (Space Grant Fellow)</i>	2005
Taught 180 6 th -8 th grade students at three schools in Tucson	
<i>Girl Scout Gold Award</i>	1997
Organized two-day math workshop for 4 th -7 th grade girls; encouraged varied, unusual, and creative approaches to math	

Non-Academic Employment & Activities

<i>JPL Advisory Council for Women, Member-at-large and participant</i>	2011-present
Executive Board Member (Membership Chair)	2011-2013
<i>Caltech Y Board Member</i>	2012-present
<i>Women in Math (UA Noetherian Ring), Participant</i>	2008-2010
<i>Member of Caltech Fencing Team, Member of club and NCAA teams, women's saber</i>	2000-2003
NCAA Fencing Team Captain/Club President	2003
<i>Spreading the Aloha Spirit:</i>	
Organizer of Math Dept.'s Christmas Charity Drive (for relocated hurricane victims)	2005
Hula (Hawaiian dance) performer	1986-present