Serina Diniega **Ph.D. candidate: Applied Math (Planetary Science), Univ. of Arizona**
http://math.arizona.edu/~serina MS, University of Arizona
serina@math.arizona.edu 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

Education

University of Arizona (UA), Applied Mathematics, minor in Planetary Science: 2004-present
Doctoral candidate, expected graduation: Spring 2010
MS, Applied Mathematics (2005)

International Space University (ISU; Strasbourg, France): 2003-2004
MS, Space Studies

California Institute of Technology (Caltech): 1999-2003
BS, with honors, Mathematics

Current Research

Dune and dune field evolution model development, analysis, and application Fall 2005-present
The aims of this study are to develop phenomenological continuum models of dune and dune field evolution, and to use these models to explain and explore the behavior and morphology of dune fields. Special focus has been applied towards the identification and quantification of influential environmental factors that create apparent characteristic dune sizes and spatial distributions. Mathematical analysis and numerical simulation of model equations has been done to better understand dunes' interaction and the influence of environmental parameters. The effects of nivean processes have also been added to the model to explain the distinctive slipface morphology observed on martian polar dunes. This research is the focus of my dissertation and has been aided by my advisors: *Dr. Karl Glasner (UA; Math) and Dr. Shane Byrne (UA; Planet. Sci.)*.

Active gullies on martian dunes Summer 2009-present
A survey of HiRISE images of martian dune fields yielded observations of new "slope" gullies that had formed during the last martian year. A catalog of all such features was created to define general characteristics, as well as to aid the future targeting of potential active dune gullies. Gully activity was identified and used to tightly constrain timescale of current gully evolution. This work is being aided through discussions with *Dr. Alfred McEwen (UA, HiRISE; Planet. Sci.), Dr. Nathan Bridges (APL, John Hopkins; Planet. Sci.), Dr. Colin Dundas (UA; postdoc, Planet. Sci.), and Dr. Shane Byrne (UA; Planet. Sci., advisor)*.

Dune size distribution resulting from initial formation conditions Spring 2009-present
To quantitatively define the distribution of dune sizes found at the start of a dune field, before dune interactions begin to modify and organize the dune field, we consider dune size distributions throughout a dune field. This work is being aided through discussions with *Dr. Nathan Bridges (APL, John Hopkins; Planet. Sci.).*

Prior Research

Influence of orogenic faults/joining on channel orientation Fall 2008
We used numerical simulation and statistical analysis to explore the effect of small-scale bedrock defects on regional drainage channel orientation and longitudinal profiles, in the Rincon Mountains. This study was directed by *Dr. Jon Pelletier (UA, Geo. Sci.)*.

Impact ejecta distribution on a small asteroid 2004

This study determined the probable depths and locations of regolith deposits on a small monolithic asteroid, using a physics-based Matlab model of impact ejecta orbits. The model was applied to asteroid 25143 Itokawa (1998SF36), the target of JAXA spacecraft MUSES-C: Hayabusa. This work was started as the focus of my ISU master's thesis and was directed by *Dr. Akira Fujiwara and Dr. Hajime Yano (Inst. of Space & Astro. Sci., Japan. Aerospace Exploration Agency)*.

Southern-spring martian wind patterns 2002-2003

The aim of this study was to map mesoscale southern-spring wind-flow patterns for Martian south-polar region, through surveys of MOC images of the martian south pole and atmospheric circulation models. This work was directed by *Dr. Mark Richardson (Caltech, Geo. & Planet. Sci).*

Near-infrared spectra of Galilean moons Summer 2001

Using Matlab, we combined near-infrared spectra of Jupiter's inner moons, to generate "clean" spectra and identify weak absorption bands. This study was directed by *Dr. Thomas McCord (Univ. of Hawai'i, Geophys. & Planet.).*

Microplate tectonic rotation Summer 2000

For this study, we analyzed magnetometer data taken over pillow basalts near Easter Island to characterize the process of microplate tectonic rotation. This work was directed by *Dr. Richard Hey (Univ. of Hawai'I, Geo. & Geophys.).*

Peer-reviewed Publications

Diniega, S., S. Byrne, N. T. Bridges, C. M. Dundas, A. S. McEwen (submitted), Active evolution of martian S. hemisphere dune gullies. *Geophys. Res. Lett*.

C. M. Dundas, A. S. McEwen, **S. Diniega**, S. Byrne (submitted), New and recent gully activity on Mars as seen by HiRISE. *Geophys. Res. Lett*.

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

Diniega, S., K. Glasner, S. Byrne (2009), Long scale evolution of aeolian sand dune fields: influences of initial conditions and dune collisions. *Geomorphology, special edition: Planetary Dunes*. In press. doi:10.1016/j.geomorph.2009.02.010

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

Honors & Fellowships

NASA Harriett G. Jenkins Pre-doctoral Fellow	2007-present
Selected as graduate rapporteur for Planetary Decadal Survey, Mars Panel: meetings 1 - 3	2009-2010
NASA Jenkins Mini Research Award (advisor: Nathan Bridges, JPL/APL)	Summer 2009
SIAM, First place award for Educational Article: *Math Matters in Dune Modeling*	2008
VIGRE Fellow	2004, 2006
NASA Graduate Student Research Program Fellowship, *Honorable Mention*	2006
NASA Harriett G. Jenkins Pre-doctoral Fellowship Program, *Semi-finalist*	2006
NASA Space Grant/University of Arizona Graduate Fellow *(see Outreach)	2005
UA GIDP Travel Grant	2007, 2009
UA GPSC Travel Grant	2009
SIAM Graduate Travel Grant	2007
"Undergraduate Degree with Honors," awarded by committee decision	2003
Summer Undergraduate Research Fellow [SURF]	Summer 2002

SURF Presentation Perpall Finalist, top 8 of ~200 presentations Summer 2002

Conference Presentations (*presenter)

Diniega, S.*, S. Byrne, C. M. Dundas, A. McEwen (2009), Active Martian S. Hemisphere Dune Gullies. *AGU Fall Meeting*, Abstract P22A-01.

Dundas, C. M.*, A. S. McEwen, **S. Diniega**, S. Byrne (2009), New and Recent Gully Activity on Mars. *AGU Fall Meeting*, Abstract P22A-02.

Diniega, S.*, S. Byrne, K. Glasner (2009), Controls on the shape and size of dunes by non-erodible, underlying topography. *7th International Conference on Geomorphology,* Melbourne, Australia.

Diniega, S.*, K. Glasner (2008), 2D Dune Interactions: moving toward a dune field model. *Planetary Dunes Workshop: a record of climate change,* Alamogordo, NM. Abstract 7016.

Diniega, S.*, K. Glasner (2007), Analysis and Simulation of Barchan Sand Dunes. *6th International Congress on Industrial and Applied Mathematics,* Zurich, Switzerland. Abstract 5699.

Diniega, S.*, K. Glasner (2007), Analysis and Simulation of Barchan Sand Dunes. *SIAM Conference on Applications of Dynamical Systems,* Snowbird, UT.

Diniega, S.* (2006) Dynamic Evolution of One-Dimensional Dune Fields. *New Mexico Tech, Graduate Student Associate Conference: Standing at a Crossroad,* Socorro, NM.

Diniega, S., H. Yano, D. Scheeres*. (2005) Simulating Regolith Deposition on 25143 Itokawa and other small asteroids. *56th International Astronautical Congress*, Fukuoka, Japan. Abstract IAC-05-A3.P.06. (poster)

Diniega, S.*, M.I. Richardson, S.P. Ewald, A.D. Toigo, S. Byrne. (2003) Martian Polar Wind Patterns Derived from Mapping of Seasonal Cap Dark Streaks. *Lunar and Planetary Science Conference*, League City, TX. Abstract 2125.

Invited Talks

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*.

University-affiliated Presentations

Applied Math., weekly Graduate Student Brown Bag Seminars: Apr. 2006, Apr. 2007, Sept. 2007, Sept. 2008
Applied Math., weekly Modeling and Computation Seminar: Nov. 2006, March 2009
Planetary Sci., weekly Colloquium: Sept. 2008
Planetary Sci., annual Lunar and Planetary Laboratory Conference: 2007, 2008, 2009
HiRISE Targeting Specialist Workshop: Oct 2009
Graduate Interdisciplinary Programs, Annual Meeting (poster, featured student): 2007

Professional Affiliations

American Geophysical Union	2009-present
Mars-Dune.org Consortium	2008-present
Society for Industrial and Applied Mathematics (SIAM):	2004-present
President	2007
Student chapter "Most active member," featured in National SIAM newsletter	
Secretary	2006
At-large, Executive Committee Member	2005
Head organizer of Tucson Kids Club outreach event	2006-2009
Organizer of/Moderator for panel discussions about post-graduation options	2007, 2008
Mars Society:	
Representative of Caltech/JPL Chapter	1999-2003

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Instruction & Outreach in Math & Science

College Algebra, instructor (Ma112, Sect 6, 26 students) Spring 2009
3rd highest of 28 sections avg. score on common final
College Algebra, instructor (Ma112, Sect 18, 31 students) Fall 2008
5th highest of 38 sections (highest for grad student-instructor) avg. score on common final
Numerical Modeling class (Ma485), mentor for undergrad. group, discrete dune model Spring 2007-2009
UA Sonia Kovalevski Day:
Organizer 2009
Presenter, spoke about being a woman mathematician 2008
Primary Organizer and Presenter for Tucson Kids Club Math Event Jan. 2006-2009
This SIAM chapter event has been commended by the National SIAM organization.
2006 -- Mental math and problem-solving; 2007 -- Tesselations and problem-solving;
2008 -- Units and scaling (application: model of Solar System); 2009 -- Polynominoes
Partial Differential Equations (Ma456), grader Spring 2008
Geology of the Solar system, unofficial teaching assistant (PTYS511) Fall 2007
Organized and held review sessions on background and course material
Solar System event supervisor/exam writer for the state-level Science Olympiad 2006, 2007
Participant in Mentoring Seminar ,for Mathematical Modeling (Ma485) Fall 2006
Presented on encouraging individual and group creativity, student assessment methods, and discussion techniques
*Designing/teaching planetary science curriculum for middle school students** 2005
Taught 180 6th-8th grade students at three schools in Tucson
*Guest Presenter at Winkelman Elem. School (99 4th-6th graders)** 2006
Founding member of Caltech Undergrad. Math Club 2002
Girl Scout Gold Award 1997
Organized two-day math workshop for 4th-7th grade girls; encouraged varied, unusual, and creative approaches to math

Non-Academic Employment & Activities

Math (HS algebra) private tutor 2006-2007
Student Coffeehouse (food service), Caltech: 2000-2003
Writing tutor, Hixon Writing Center, Caltech: 2001-2003
Assistant Office Manager for Joy of Christ Preschool: Summer 2000
Member of Caltech Fencing Team (club and NCAA, women's saber) 2000-2003
NCAA Fencing Team Captain/Club President 2003
Spreading the Aloha Spirit:
Organizer of Math Dept.'s Christmas Charity Drive (for relocated hurricane victims) 2005
Hula (Hawaiian dance) performer 1986-present