

**CONTACT  
INFORMATION**

Earth and Environmental Science, University of Pennsylvania  
Sediment Dynamics Laboratory, 58A Hayden Hall  
240 South 33rd Street, Philadelphia  
PA 19104-6316, USA  
*E-mail:* behrooz@sas.upenn.edu  
*Research homepage:* <http://behroozf.github.io>  
*Web profiles:* [Google scholar](#), [ResearchGate](#)

---

**RESEARCH  
INTERESTS**

- Fault friction and rock mechanics, earthquake nucleation and rupture mechanics
- Earth surface dynamics, sediment transport and fluid-driven/coupled granular matter
- Fundamental mechanisms of landscape evolution (hillslope creep, slow earthflows and landslides)
- Computational methods for amorphous and disordered materials: Fluid-coupled Discrete Element Method (CFD-DEM), Molecular Dynamics, Boundary Element Method simulations
- Mechanics of disordered media, cohesionless and cohesive amorphous materials
- Statistical mechanics and nonlinear dynamics applied to Earth systems

---

**EDUCATION**

Ph.D. (Dr. sc.), Civil and Environmental Engineering, ETH Zurich, Switzerland	2014
M.Sc., Geological Engineering, Tehran Polytechnic, Iran	2010
B.Sc., Civil Engineering, University of Guilan, Iran	2007

---

**ACADEMIC COURSE**

Postdoctoral researcher Department of Earth and Environmental Science University of Pennsylvania, Philadelphia, USA	February 2015 - present
Synthesis Postdoctoral fellow National Center for Earth-surface Dynamics (NCED), Minneapolis, USA	February 2015 - present
Graduate Student and Research Assistant Department of Civil, Environmental and Geomatic Engineering ETH Zurich, Switzerland	January 2011 - November 2014
Research Assistant Institute for Infrastructure and Environment University of Edinburgh, Edinburgh, Scotland, UK	September 2010 - January 2011

---

**HONORS AND  
AWARDS**

- Harry H. Hess Postdoctoral Fellowship, Princeton University (2017).
- Nominated for ETH medal (ETH-Medaille) (2014).
- Award for best contribution, The 18<sup>th</sup> International Conference on Nonlinear Elasticity in Materials, Ascona (Centro Stefano Franscini of ETH Zurich) in Switzerland, June 9-14, 2013.  
[CSF Awards 2013](#); [photo](#)
- Scholarship from Deutsche Forschungsgemeinschaft (DFG) for attending the 17th Fall Seminar on Nonlinear Dynamics at the University of Bayreuth, October 7-10, 2012.
- Scholarship for attending the Les Houches (France) winter school on Materials Deformation:

Fluctuations, Scaling, Predictability, 22-27 January 2012.

- Swiss National Science Foundation (SNSF) fellowship for PhD studies at ETH Zürich (2011-2014)
  - 3 years fellowship for PhD studies at the University of Edinburgh (Marie Curie (EU) fellowship) (2010-2013) - Declined
  - TA/RA fellowship for PhD studies at the University of Minnesota (2010-)
  - 4 years fellowship for PhD studies at the University of Southern California (2010-2014) - Declined
- 

#### ARTICLES IN REVIEW

- B. Ferdowsi, C. P. Ortiz, M. Houssais, D. J. Jerolmack  
*River-bed armoring as a granular segregation phenomenon*  
(in review after revision) at Nature Communications, April 2017  
<http://arxiv.org/abs/1609.06673>
- B. Ferdowsi, C. P. Ortiz, D. J. Jerolmack  
*Glassy dynamics of hillslope evolution*  
(in review) at Science, March 2017
- D. B. Lee, B. Ferdowsi, D. J. Jerolmack  
*The imprint of vegetation on desert dune dynamics*  
(submitted) at Nature Communications, April 2017

#### PEER-REVIEWED ARTICLES

8. B. Ferdowsi, M. Griffa, R. A. Guyer, P. A. Johnson, C. Marone and J. Carmeliet.  
*Acoustically-induced slip in sheared granular layers: application to dynamic earthquake triggering*  
Geophysical Research Letters, **42**(22), pp. 9750-9757, 2015.
7. B. Ferdowsi, M. Griffa, R. A. Guyer, P. A. Johnson, C. Marone and J. Carmeliet.  
*3D Discrete Element Modeling of triggered slip in sheared granular media*  
Physical Review E, **89**(4), pp. 042204(1-12), 2014.
6. B. Ferdowsi, M. Griffa, R. A. Guyer, P. A. Johnson, and J. Carmeliet.  
*Effect of boundary vibration on the frictional behavior of a dense sheared granular layer*  
Acta Mechanica, **225**(8), pp. 2227-2237, 2014.
5. P. A. Johnson, B. Ferdowsi, B. Knapthorn, M. M. Scuderi, M. Griffa, J. Carmeliet, R. A. Guyer, P.-Y. Le Bas, D. T. Trugman, and C. Marone.  
*Acceleration of acoustical emission precursors preceding failure in sheared granular material*  
Geophysical Research Letters, **40**(21), pp. 5627-5631, 2013.
4. B. Ferdowsi, M. Griffa, R.A. Guyer, P.A. Johnson, C. Marone and J. Carmeliet.  
*Microslips as precursors of large slip events in the stick-slip dynamics of sheared granular layers: a discrete element model analysis*  
Geophysical Research Letters, **40**(16), pp. 4194-4198, 2013.
3. M. Griffa, B. Ferdowsi, E. G. Daub, R. A. Guyer, P. A. Johnson, C. Marone and J. Carmeliet  
*Influence of vibration amplitude on dynamic triggering of slip in sheared granular layers*  
Physical Review E, **87**(1), pp. 012205(1-12), 2013.
2. M. Griffa, B. Ferdowsi, E. G. Daub, R. A. Guyer, P. A. Johnson, C. Marone and J. Carmeliet  
*Meso-mechanical analysis of deformation characteristics for dynamically triggered slip in a granular medium*  
Philosophical Magazine, **92**(28-30), 2012.
1. A. Soroush and B. Ferdowsi  
*Three dimensional discrete element modeling of cyclic undrained behavior of granular media: a micromechanical perspective*  
Powder Technology, **212**(1), pp. 1-16, 2011.

MANUSCRIPTS IN  
PREPARATION

- C. P. Ortiz\*, B. Ferdowsi\*, D. J. Jerolmack  
*Nature of the transition from creep to dense rapid flow in sheared frictional granular systems*  
(\*equal contributions)  
In preparation for Nature Physics (planned submission: June 2017)
  - B. Ferdowsi, D. J. Jerolmack, D. L. Goldsby  
*A granular perspective on the rate and state frictional behavior of earthquake fault gouge*  
In preparation for Review of Geophysics (planned submission: May 2017)
- 

RESEARCH  
FUNDINGS

- Southern California Earthquake Center (SCEC), Science Collaboration Grant: “Physical controls of spontaneous and triggered slow-slip and stick-slip at the fault gouge scale”; PI: Prof. David L. Goldsby (Department of Earth and Environmental Sciences, Penn); Co-I: Behrooz Ferdowsi; in collaboration with Prof. Chris Marone (Dept. of Geosciences, Pennsylvania State University) for experimental observations. (2016, \$25300, approved)
- 

TALKS AND  
CONFERENCE  
PRESENTATIONS

- March 2017, Princeton, USA - Department of Geosciences, Princeton University. *A unifying framework for slow and fast dynamics deformation and transport in Earth systems* (invited talk)
- December 2016, San Francisco, USA - American Geophysical Union Fall Meeting. *Creepy landscapes: the granular origins of soil transport on hillslopes* (talk)
- December 2016, San Francisco, USA - American Geophysical Union Fall Meeting. *Nature of transition from jamming to creep and dense flow in granular heaps* (poster)
- December 2016, San Francisco, USA - American Geophysical Union Fall Meeting. *Insights on landscape dynamics from tiny spheres in oil, or: How I learned to stop worrying and love the lab* (talk by Prof. Jerolmack)
- September 2016, Palm Springs (CA), USA - Southern California Earthquake Center (SCEC) Annual Meeting, *Physical controls of spontaneous and triggered slow-slip and stick-slip at the fault gouge scale* (poster)
- July 2016, Stonehill College, Easton (MA), USA - Gordon Research Conference and Seminar: Particulate Systems in Science and Technology. *Granular segregation in an experimental river* (GRC poster, GRS talk)
- June 2016, Université Pierre-et-Marie-Curie, Paris, France - 31<sup>st</sup> edition of the Conference on Mathematical Geophysics (CMG). *Creepy landscapes: the origins and consequences of sub-threshold transport* (invited talk given by Prof. Jerolmack)
- May 2016, USGS National Center, Reston (VA), USA - 2016 River & Regolith Erosion and Deposition Summit (Amtrak club): Amtrak Soil to Sea Meeting. *Creepy landscapes: the granular origins of soil transport on hillslopes* (presentation)
- December 2015, San Francisco, USA - American Geophysical Union Fall Meeting. *Granular controls of hillslope deformation and creep* (poster)
- December 2015, San Francisco, USA - American Geophysical Union Fall Meeting. *From surface to subsurface and back again: the contribution of subsurface particle motion to surface armoring* (Invited talk)
- December 2015, San Francisco, USA - American Geophysical Union Fall Meeting. *Controls on Dune Deformation Patterns in White Sands, New Mexico* (2<sup>nd</sup> contributor to a poster by Dylan Lee, PhD student at PennSeD)

- September 2015, Palm Springs (CA), USA - Southern California Earthquake Center (SCEC) Annual Meeting, *The granular origins of rate and state friction behavior of fault gouge* (poster)
- June 2015, Clark University, Worcester (MA), USA - 13th Annual Northeastern Granular Materials Workshop. *Segregation dynamics in fluid-driven annular couette flow: contribution of subsurface processes to surface armoring in an idealized riverbed* (poster)
- May 2015, University of Delaware, USA - 2015 River & Regolith Erosion and Deposition Summit (Amtrak club): Amtrak Soil to Sea Meeting. *From surface to subsurface and back again: the contribution of subsurface particle motion to surface armoring* (poster)
- January 2015, University of Alberta (Exploration Seismology, Department of Physics, Dr. Mirko van der Baan ), Canada. *Geomechanical modeling of induced seismicity* (presentation by Behrooz)
- May 2014, Université du Maine (Group of acoustics and mechanics of materials, Lead by Dr. Vincent Tournat), France. *Acoustically-induced unjamming and slip triggering in sheared granular layers* (presentation by Behrooz)
- November 2013, Yale University (School of Engineering and Applied Science, The O'Hern group), USA. *DEM modeling of slip triggering in a sheared granular layer* (presentation by Behrooz)
- November 2013, Pennsylvania State University (Department of Geosciences), USA. Dynamic Triggering of Earthquakes, a seminar organized by Dr. P. A. Johnson (LANL) and Prof. C. Marone (Penn State). *DEM of a sheared beadpack* (presentation by Behrooz)
- June 2013, Ascona, Switzerland - The 18<sup>th</sup> International Conference of Nonlinear Elasticity of Materials. *MD simulation of slip triggering in sheared granular layers by boundary vibration* (presentation by Behrooz)
- February 2013, Les Houches, France - The 2<sup>nd</sup> winter school on "Materials Deformation: Fluctuations, Scaling, Predictability. *3D MD modeling of slip triggering in sheared granular layers by means of boundary vibration* (poster by Behrooz)
- October 2012, Bayreuth, Germany (University of Bayreuth) - The 17<sup>th</sup> Fall Seminar on Nonlinear dynamics. *How vibration changes the spontaneous stick-slip dynamics of a sheared granular layer* (poster by Behrooz)
- August 2012, Lausanne, Switzerland (EPFL) - CCMX Summer school on Multi scale modeling of materials. *Evolution of recurrence time and energy release during spontaneous and perturbed stick-slip dynamics of a granular layer* (presentation by Behrooz)
- July 2012, Graz, Austria (TU Graz) - The 8<sup>th</sup> European Solid Mechanics Conference. *How external vibration affects stick-slip dynamics in sheared granular layers: the micro- and meso-mechanics of dynamic earthquake triggering* (presentation by Behrooz)
- June 2012, Cefalù, Italy - The 17<sup>th</sup> International Conference on Nonlinear Elasticity in Materials. *3D molecular dynamics simulations of triggering of slip in stick-slipping, sheared granular media by means of external vibration: learned lessons for dynamic earthquake triggering* (presentation by Behrooz)
- April 2012, Vienna, Austria - European Geoscience Union (EGU) General Assembly Conference. *Meso-scale analysis of deformation patterns for dynamically triggered slip in sheared granular layers* (presentation by Dr. Griffo)
- January 2012, Les Houches, France - Winter school on "Materials Deformation: Fluctuations, Scaling, Predictability. *Deformation pattern and evolution of the internal structure of granular media during stick-*

*slip dynamics: micromechanics of dynamic earthquake triggering* (poster by Behrooz)

— December 2011, Enschede, Netherlands (University of Twente) - invited by the Multi-Scale Mechanics (MSM) group. *Stick-slip and anisotropy of granular structure* (talk by Behrooz)

— June 2011, Cairns, Australia - Instabilities Across the Scales III. *Granular stick-slip and the micromechanics of dynamic earthquake triggering* (invited talk given by Prof. Carmeliet)

— May 2011, Kowloon, Hong Kong (Hong Kong Polytechnic University) - The 14<sup>th</sup> Asian Regional Conference on Soil Mechanics and Geotechnical Engineering. *Study of the cyclic constant volume loading of the granular media from micromechanical aspects: effects of confining pressure and cyclic strain amplitude*

— August 2010, London, UK (Queen Mary University of London) - The 5<sup>th</sup> International Conference on Discrete Element Method. *Effect of gradation on the constant volume cyclic behavior of granular media*

— November 2009, Barcelona, Spain (Technical University of Catalonia; UPC) - Particles 2009. *Three dimensional discrete element modeling of undrained monotonic and cyclic response of granular media*

---

#### COLLABORATORS

- Prof. Douglas J. Jerolmack, Earth and Environmental Science, University of Pennsylvania, USA.
  - Dr. Carlos P. Ortiz, Earth and Environmental Science and Physics and Astronomy, University of Pennsylvania, USA.
  - Dr. Morgane Houssais, Benjamin Levich Institute, The City College of New York, USA.
  - Prof. David L. Goldsby, Earth and Environmental Science, University of Pennsylvania, USA.
  - Prof. Chris Paola, Department of Earth Sciences, University of Minnesota, USA.
  - Prof. Allan M. Rubin, Department of Geosciences, Princeton University, USA.
  - Prof. Troy Shinbrot, Department of Biomedical Engineering, Rutgers University, USA.
  - Prof. Emily E. Brodsky, Earth and Planetary Sciences, University of California Santa Cruz, USA.
  - Prof. Karen Daniels, Department of Physics, North Carolina State University, USA.
  - Prof. Dr. Jan E. Carmeliet, Mechanical and Process Engineering (D-MAVT), ETH Zürich, Switzerland.
  - Prof. Chris J. Marone, Department of Geosciences, Pennsylvania State University, USA.
  - Dr. Paul A. Johnson, Leader of Nonlinear Elasticity Team and Senior Technical Staff Member, Earth and Environmental Science Division (Geophysics), Los Alamos National Laboratory (LANL), USA.
  - Dr. Michele Griffa, Senior Research Scientist, Group Leader for 3D image analysis and simulation, Swiss Federal Laboratories for Materials Science and Technology (Empa, ETH-Domain), Dübendorf, Switzerland.
  - Prof. Robert A Guyer, Emeritus faculty at UMass Amherst, Consultant at Earth and Environmental Science Division (Geophysics), Los Alamos National Laboratory (LANL), USA.
  - Prof. Jean M. Carlson, Department of Physics, University of California Santa Barbara, USA.
-

SELECTED SERVICE — Reviewer for:  
National Science Foundation (USA) - Geomorphology and Land-use Dynamics,  
Army Research Office | U.S. Army Research Laboratory,  
Nature Geoscience, Scientific Reports, Journal of Geophysical Research - Earth Surface,  
Journal of Geophysical Research - Solid Earth, Geophysical Research Letters,  
International Journal of Solids and Structures, Powder Technology  
— Lecturer, Summer Institute for Earth-surface Dynamics (2015, 2016).

---

PROFESSIONAL AFFILIATIONS — Regular member, Southern California Earthquake Center (SCEC), 2015-present  
— Regular member, American Geophysical Union AGU, 2015-present  
— Synthesis postdoctoral fellow, National Center for Earth-surface Dynamics, 2015-present  
— Regular member, Swiss Geological Society, 2013-2015

---

REFERENCES Available upon request