Behrooz (Bruce) Ferdowsi, Dr. sc. ETH Zurich - CV

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Contact Information

Earth and Environmental Science, University of Pennsylvania
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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 — February 2015 - present
Department of Earth and Environmental Science
University of Pennsylvania, Philadelphia, USA

Synthesis Postdoctoral fellow — February 2015 - present
National Center for Earth-surface Dynamics (NCED), Minneapolis, USA

Graduate Student and Research Assistant — January 2011 - November 2014
Department of Civil, Environmental and Geomatic Engineering
ETH Zurich, Switzerland

Research Assistant — September 2010 - January 2011
Institute for Infrastructure and Environment
University of Edinburgh, Edinburgh, Scotland, UK

Honors and Awards

- Harry H. Hess Postdoctoral Fellowship, Princeton University (2017).
- Nominated for ETH medal (ETH-Medaille) (2014).
- Award for best contribution, The 18^{th} 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

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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 Nature, May 2017
- B. Ferdowsi, J. D. Gartner, K. N. Johnson, A. Kasprak, A. B. Limaye, K. L. Miller, W. Nardin, A. C. Ortiz, M. Perignon, A. Tejedor
  (review paper, all equal contribution)
  Earthcasting: Geomorphic prediction for society
  (in review) at Earth's Future, May 2017
- D. B. Lee, B. Ferdowsi, D. J. Jerolmack
  The imprint of vegetation on desert dune dynamics
  (in review) at Geophysical Research Letters, May 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. Kaproth, 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: July 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: June 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

— May 2017, State College, USA - Department of Geosciences, Pennsylvania State University. *Creepy landscapes: the granular origins and slow dynamics of soil transport on hillslopes* (poster)

— 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^{st} 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^{nd} 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. *Ascoustically-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^{th} 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^{nd} 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^{th} 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^{th} 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^{th} 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. *Mesoscopic scale analysis of deformation patterns for dynamically triggered slip in sheared granular layers* (presentaion by Dr. Griffa)

— 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^{th} 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^{th} 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 montonic 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, Computers & Geosciences,
  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