Behrooz Ferdowsi, Ph. D. (Dr. sc. ETH Zurich)

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Last updated: August 3, 2018

Address

Dr. Behrooz Ferdowsi
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Research interests

- Soft condensed matter physics for geosciences
- Computational methods for continuous and discontinuous (e.g. amorphous and disordered) materials
- Fault friction, earthquake geophysics, and the physics of the seismic cycle
- Earth surface dynamics, aeolian and fluvial sediment transport, landscape evolution
- Statistical mechanics and nonlinear dynamics applied to Earth systems

Academic appointments

2017-present Harry H. Hess Postdoctoral Fellow
Department of Geosciences, Princeton University
Advisor: Professor Allan M. Rubin

2015[1]-2017 Postdoctoral researcher, and NCED Synthesis Postdoctoral Fellow
Department of Earth and Environmental Science, University of Pennsylvania
joint with the National Center for Earth-surface Dynamics, University of Minnesota
Advisor: Professor Douglas J. Jerolmack
NCED co-advisor: Professor Chris Paola

2011-2014 Graduate Student and Research Assistant
Department of Civil, Environmental and Geomatic Engineering, ETH Zurich, Switzerland
Advisor: Professor Jan Carmeliet
Co-advisor: Dr. Michele Griffa

2010-2011 Visiting Student, Research and Teaching Assistant
Institute for Infrastructure and Environment, University of Edinburgh, Scotland, UK
Host faculty: Professor Jin Ooi

Education

2011-2014 Ph.D. (Dr. sc.), Civil and Environmental Engineering, ETH Zurich, Switzerland
2007-2010 M.Sc., Geological Engineering, Tehran Polytechnic, Iran
2003-2007 B.Sc., Civil Engineering, University of Guilan, Iran

[1] I started my postdoctoral research at the University of Pennsylvania with 8 months delay due to US visa restrictions for Iranian nationals. That is the reason for the gap between years 2014 and 2015 in my CV. The original start date for my postdoctoral work at the University of Pennsylvania was June 1, 2014. I started at UPenn on February 1, 2015. I spent some longer time in Switzerland following my PhD defense between June and November 2014, moved to Canada in October 2014 and waited there until my US visa was issued on December 16, 2014.

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
- 4 years 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, 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 revision after review) at Earth's Future, November 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

10. B. Ferdowsi, C. P. Ortiz, D. J. Jerolmack
    Glassy dynamics of landscape evolution
    Proceedings of the National Academy of Sciences of the USA, 115 (19), pp. 4827-4832, 2018.

9. B. Ferdowsi, C. P. Ortiz, M. Houssais, D. J. Jerolmack
   River-bed armouring as a granular segregation phenomenon
   Nature Communications, 8 (1363), 2017.

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

— B. Ferdowsi, A. M. Rubin
Constitutive laws for earthquake fault friction: 1 - the cases of constant velocity and constant pressure velocity-step friction experiments
In preparation for Journal of Geophysical Research - Solid Earth

— B. Ferdowsi, A. M. Rubin
Constitutive laws for earthquake fault friction: 2 - the case of slide-hold-slide friction experiments
In preparation for Journal of Geophysical Research - Solid Earth

— B. Ferdowsi, A. M. Rubin
Non-local rheology of (granular) rocks and damaged fault zones
In preparation for Proceedings of the National Academy of Sciences of the USA

— E. J. Harrison, B. Ferdowsi, J. Willenbring
Granular/Soft-matter physics of soil transport and creep across environments
In preparation for Nature

— B. Ferdowsi, B. C. Jones, J. L. Stein, T. Shinbrot
Pattern formation in perturbed granular layers and implications for landforms on Earth and Mars
In preparation for Physical Review Fluids

— 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

Research fundings

— United States Geological Survey (USGS), Earthquake Hazards Program: "How much of rate-and-state friction can be explained by granular friction models?"; PI: Prof. Allan M. Rubin (Department of Geosciences, Princeton University); Behrooz Ferdowsi wrote first draft (2018, $99800, in review)

— 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, University of Pennsylvania); Behrooz Ferdowsi wrote first draft (2016, $25300, approved)

Invited talks, presentations, and posters

— December 2018, Washington DC, USA - American Geophysical Union Fall Meeting
Granular physics of soil production and creep (Invited talk by Emma Harrison)

— August 2018, Andover, New Hampshire, USA - 2018 Rock Deformation Gordon Research Conference, Proctor Academy
How much of rate- and state-dependent friction (of Earth materials and fault zones) can be explained by granular friction? (Invited talk)

— July 2018, Amherst, Massachusetts, USA - 3rd Annual Soft Matter Day, Physics Department at UMass Amherst
Soft Matter Physics of Real Landscapes: Complex Spatiotemporal Behavior of Hillslopes, Rivers, and Earthquake Fault Zones (Invited talk)

— July 2018, Princeton, New Jersey, USA - A two day symposium titled "Geosciences: A broad perspective from Academia and the Industry" at the Department of Geosciences, Princeton University
Modeling Earth's surface and subsurface processes across scales: from grains and asperities to geological spatiotemporal scales (poster)

— June 2018, Bristol, United Kingdom - Conference on Unifying Concepts in Glass Physics VII,
Glassy dynamics of landscape evolution (Invited talk by Prof. Douglas Jerolmack)

— May 2018, Boulder, Colorado, USA - CSDMS Annual Meeting at the University of Colorado Boulder.
Glassy dynamics of landscape evolution (poster)

— April 2018, Boulder, Colorado, USA - Coupling of Tectonic and Surface Processes (a CIG-CSDMS workshop) at the University of Colorado Boulder.
Glassy dynamics of landscape evolution (poster)

— April 2018, Pittsburgh, Pennsylvania, USA - Carnegie Mellon University.
Mechanics of Amorphous and Granular Materials for Environmental and Geolog/Geophysical Processes (talk)

— March 2018, Durham, North Carolina, USA - Duke University.
Connecting grain to riverbed to watershed scales: granular and statistical physics of subsurface-surface-water interactions (talk)

— December 2017, New Orleans, USA - American Geophysical Union Fall Meeting,
Toward a physics-based rate and state friction law for earthquake nucleation processes in fault zones with granular gouge (talk)

— December 2017, New Orleans, USA - American Geophysical Union Fall Meeting.
A Physical Interpretation of Hillslope Soil Creep as Deformation of an Amorphous Solid (talk by Prof. Douglas Jerolmack)

— November 2017, Denver, USA - Annual Meeting of the American Physical Society Division of Fluid Dynamics,
Formation and life of a granular cyclone (talk, Galley of Fluid Motion video submission)

_ 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. Douglas 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 by Prof. Douglas 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)

— 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)

Selected service

— Reviewer for:
National Science Foundation (USA) - Geomorphology and Land-use Dynamics,
Army Research Office | U.S. Army Research Laboratory,
Nature Geoscience, Physical Review Letters, Scientific Reports, Journal of Geophysical Research - Earth Surface, Journal of Geophysical Research - Solid Earth
Computers & Geosciences, Entropy, Geophysical Research Letters, CATENA
Tribology Letters, International Journal of Solids and Structures,
Powder Technology

— Lecturer for the Summer Institute for Earth-surface Dynamics, NCED2, University of Minnesota (years 2015, 2016)

— Organizer of the Solid Earth Brownbag seminars at Princeton Geosciences together with one of my postdoctoral colleagues in the department (2017-2019)

Professional affiliations

— Regular member, American Physical Society (APS), 2017-present

— 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.