

BIOGRAPHICAL INFORMATION: PATRICK J. MCGOVERN

Senior Staff Scientist, Lunar and Planetary Institute (LPI)

USRA Houston
3600 Bay Area Blvd
Houston, TX 77058
Phone: (281) 486-2187
Fax: (281) 486-2162
mcgovern@lpi.usra.edu

EDUCATION

S. B., Aeronautics and Astronautics, Massachusetts Institute of Technology, 1986.

Graduate work, Department of Earth and Space Sciences, UCLA, 1987-1988.

Ph. D., Geophysics, Massachusetts Institute of Technology, 1996. Thesis title: "Studies of Large Volcanoes on the Terrestrial Planets: Implications for Stress State, Tectonics, Structural Evolution, and Moat Filling".

EMPLOYMENT

Research Assistant, Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, MA, September 1988-May 1996.

Postdoctoral Associate, Department of Terrestrial Magnetism, Carnegie Institution of Washington, Washington, DC, June 1996-October 1999.

Science Staff, Lunar and Planetary Institute (LPI), Houston, TX, November 1999-present.

HONORS AND APPOINTMENTS

Adjunct Research Scientist, Lamont-Doherty Earth Observatory, Columbia Univ. 2015-present.

Adjunct Faculty, Dept. of Earth Science, Rice University 2004-present.

Stephen E. Dwornik Student Paper Award (Best Poster Presentation), LPSC Conference 1993.

Luis De Florez Award, Aeronautics and Astronautics, MIT 1986.

PROFESSIONAL SERVICE

Co-convener of Special Session "Planetary Volcanology" at the 2017 IAVCEI Scientific Assembly.

Co-convener of Special Session "Volcanism Associated with Impact Basins in the Solar System" at the 2011 AGU Fall Meeting.

Co-convener of Topical Session "Advances in Discontinuum Modeling in the Study of Earth Structure and Deformation" at the 2008 GSA Meeting.

Guest Editor of Special Section of *GRL*: "The Hemispheric Dichotomy of Mars", 2006.

Co-convener of Workshop on "Hemispheres Apart: The Origin and Modification of the Martian Crustal Dichotomy", LPI Sept. 30-Oct. 1, 2004.

Lunar and Planetary Science Conference (LPSC) Program Committees, 2000-2001, 2008-2009, 2011.

Judge for GSA Dwornik Student Paper Award at LPSC, 2003, 2004, 2006, 2008, 2014, 2016.

Numerous NASA grant program review panels: PIDDP, PG&G*, MDAP*, MFRP, OPRP*, SSW*.

(* indicates full or acting Group Chief service.)

PROFESSIONAL SOCIETIES

American Geophysical Union

Geological Society of America

RECENT INVITED PRESENTATIONS

- Earth-Life Science Institute (ELSI), Tokyo Institute of Technology**, 2016, 4th ELSI International Symposium on Three Experiments in Biological Origins: Early Earth, Venus, and Mars: “The Martian Crustal Dichotomy: an Ancient and Fundamental Feature.”
- Lamont-Doherty Earth Observatory** 2015, Division of Seismology, Geology, and Tectonophysics, Geodynamics Seminar: “Olympus Mons, Mars: The Ups and Downs of the Tallest Volcano.”
- AGU Joint Assembly** 2015, Special Session on Surface Expressions of Volcanism and Associated Tectonism on Venus and Implications for Interior Dynamics: “Lithospheric Flexure, Stress, and Volcanic Edifice Morphology: A Connection for a Subset of Coronae on Venus?”
- Rice University** 2011, Department of Earth Science Seminar: “Volcanism on the Moon: Paradigm-busting Results from the New Wave of Lunar Exploration.”

NASA MISSION AND PROGRAM PARTICIPATION

- GRAIL Guest Scientist**, 2012-2016.
- RAVEN (RADARSAT Venus)**: Co-Investigator on Discovery-class mission to collect high-resolution imaging and topography data for Venus.
- Lunar Advanced Science and Exploration Research Program (LASER)** Principal Investigator, 2013-2016. Current grant: “Volcanic and thermal evolution of the Moon: constraints from advanced numerical modeling and integrated analysis of remotely sensed datasets.”
- Outer Planets Research Program (OPR)** Principal Investigator, 2012-2016. Current grant: Copious volcanism on a compression-dominated planet? Insights into magma ascent and mountain building on Io from advanced numerical modeling.
- Planetary Geology and Geophysics Program (PG&G)** Principal Investigator, 2005-2016. Current grant: Growth and Evolution of Large Volcanoes on Venus: Insights from Advanced Numerical Modeling of Lithospheric Response to Volcanic Loading.
- NASA Lunar Science Institute (NLSI)** Co-Investigator, 2009-2013. “Impact Processes in the Origin Evolution of the Moon: New Sample-driven Perspectives.”
- Mars Data Analysis Program (MDAP)** Principal Investigator, 2002-2013. Most recent grant: Structural Characterization and Evolution of Large Volcanoes on Mars with Insights from Numerical Simulations.
- Mars Global Surveyor, MOLA** altimeter team: contributed to 8 team papers (3 as lead author).
- Magellan (Venus)**: analyzed radar image, topography, and gravity data, 2 papers as lead author.

UNIVERSITY EDUCATION AND RESEARCH

Rice University, Dept. of Earth Science:

- Taught 6 classes: ESci 214 “The Planets”, 2005-2007; ESci 524 “Advanced Topics in Earth Structure and Deformation” (Planetary Tectonics Seminar), 2009; ESci 525 “Volcanotectonics” (Seminar), 2010; ESci 529 “The Moon: Origin and Evolution” (Seminar), 2012; ESci 541 “Mars: Formation, Differentiation, Structure, and Evolution” (Seminar), 2013; ESci 456 “Planetary Volcanism” (Seminar), 2014.
- Served as M. S. thesis Co-Advisor for graduate student Lindsay (Farrell) Zivney and Ph. D. Exam Committee member for graduate student Constantin Sandu.
- Served as Ph.D. co-advisor for graduate student Matthew Weller.

Trinity College Dublin, Dept. of Geology:

- Ph.D. Viva (Thesis Defense) Examination Committee: External Examiner for Paul Byrne, “Volcano Flank Terraces on Mars”, February 2010.

Lunar and Planetary Institute Summer Intern Program:

Supervised undergraduate students Alex Dickie, 2000; Margarita Marinova, 2001; Martin Collier, 2002; Donielle Chittenden, 2003; Selby Cull, 2004; Elise Rumpf, 2006; Mairi Litherland* 2008; Jennifer Buz, 2009; Katelyn Verner, 2010; Kathryn Powell, 2011; Jessica Kalynn, 2012; Laura Corley, 2013.

* indicates winner of prestigious GSA Dwornik Award for Best Student Poster (Undergraduate Division) at the 2009 Lunar and Planetary Science Conference.

RECENT PUBLICATIONS

Corley, L., P. J. McGovern, G. Y. Kramer, M. Lemelin, D. Trang, J. J. Gillis-Davis, G. J. Taylor, K. E. Powell, W. S. Kiefer, M. Wieczorek, and M. T. Zuber, Olivine-bearing lithologies on the Moon: Constraints on origins and transport mechanisms from M³ spectroscopy, radiative transport modeling, and GRAIL crustal thickness, *Icarus*, submitted, July 2016.

Zuber, M. T., D. E. Smith, G. A. Neumann, S. Goossens, J. C. Andrews-Hanna, J. W. Head, W. S. Kiefer, S.W. Asmar, A. S. Konopliv, F. G. Lemoine, I. Matsuyama, H. J. Melosh, P. J. McGovern, F. Nimmo, R. J. Phillips, S. C. Solomon, G. J. Taylor, M. M. Watkins, M. A. Wieczorek, J. G. Williams, J. C. Jansen, B. C. Johnson, J. T. Keane, E. Mazarico, K. Miljković, R. S. Park, J. M. Soderblom, and D.-N. Yuan, Gravity Field of the Orientale Basin from the Gravity Recovery and Interior Laboratory (GRAIL) Mission, *Science*, 354, 438-440, 2016.

McGovern, P. J., M. Kirchoff, O. L. White and P. M. Schenk, Magma ascent pathways associated with large mountains on Io, *Icarus*, 272, 246-257, 2016.

Chadwick, J., P. McGovern, M. Simpson, and A. Reeves, Late Amazonian subsidence and magmatism of Olympus Mons, Mars, *J. Geophys. Res.*, 120, doi:10.1002/2015JE004875, 2015.

Le Corvec, N., P. J. McGovern, E. B. Grosfils, and G. Galgana, Effects of crustal-scale mechanical layering on magma chamber failure and magma propagation within the Venusian lithosphere, *J. Geophys. Res.*, 120, 1279–1297, doi:10.1002/2015JE004814, 2015.

Byrne, P. K., C. Klimczak, P. J. McGovern, E. Mazarico, P. B. James, G. A. Neumann, M. T. Zuber, and S. C. Solomon, Deep-seated thrust faults bound the Mare Crisium lunar mascon, *Earth Planet. Sci. Lett.*, 427, 183-190, 2015.

McGovern, P. J., E. B. Grosfils, G. A. Galgana, J. K. Morgan, M. E. Rumpf, J. R. Smith, and J. R. Zimbelman, Lithospheric flexure and volcano basal boundary conditions: keys to the structural evolution of large volcanic edifices on the terrestrial planets, in Platz, T., Massironi, M., Byrne, P. K. & Hiesinger, H. (eds) *Volcanism and Tectonism Across the Inner Solar System. Geological Society, London, Special Publications*, 401, <http://dx.doi.org/10.1144/SP401.7>, 2015.

Grosfils, E. B., P. J. McGovern, P. M. Gregg, G. A. Galgana, D. M. Hurwitz, S. M. Long, and S. R. Chestler, Elastic Models of Magma Reservoir Mechanics: A Key Tool for Investigating Planetary Volcanism, in Platz, T., Massironi, M., Byrne, P. K. & Hiesinger, H. (eds) *Volcanism and Tectonism Across the Inner Solar System. Geological Society, London, Special Publications*, 401, 2015.

Andrews-Hanna, J. C., J. Besserer, J. W. Head III, C. J. A. Howett, W. S. Kiefer, P. J. Lucey, P. J. McGovern, H. J. Melosh, G. A. Neumann, R. J. Phillips, P. M. Schenk, D. E. Smith, S. C. Solomon,

- and M. T. Zuber, Structure and evolution of the lunar Procellarum region as revealed by GRAIL gravity data, *Nature*, 514, 68-71, 2014.
- Besserer, J., F. Nimmo, M. A. Wieczorek, R. C. Weber, W. S. Kiefer, P. J. McGovern, J. C. Andrews-Hanna, D. E. Smith, and M. T. Zuber, GRAIL gravity constraints on the vertical and lateral density structure of the lunar crust, *Geophys. Res. Lett.*, 41, 5771-5777, 2014.
- Williams, J. G., A. S. Konopliv, D. H. Boggs, R. S. Park, D.-N. Yuan, F. G. Lemoine, S. Goossens, E. Mazarico, F. Nimmo, R. C. Weber, S. Asmar, H. J. Melosh, G. A. Neumann, R. J. Phillips, D. E. Smith, S. C. Solomon, M. M. Watkins, M. A. Wieczorek, J. C. Andrews-Hanna, J. W. Head, W. S. Kiefer, I. Matsuyama, P. J. McGovern, G. J. Taylor, and M. T. Zuber, Lunar interior properties from the GRAIL mission, *J. Geophys. Res.*, 119, doi:10.1002/2013JE004559, 2014.
- Weller, M. B., P. J. McGovern, T. Fournier, and J. K. Morgan, Eastern Olympus Mons Basal Scarp and Aureole Lobes: Structural and Mechanical Evidence for Large Scale Slope Instability, *J. Geophys. Res.*, 119, doi:10.1002/2013JE004524, 2014.
- Öhman, T., and P. J. McGovern, Circumferential graben and the structural evolution of Alba Mons, Mars, *Icarus*, 233, 114-125, 2014.
- McGovern, P. J., G. A. Galgana, K. R. Verner, and R. R. Herrick, New constraints on volcano-tectonic evolution of large edifices on Venus from stereo topography-derived strain estimates, *Geology*, 42, 59-62, 2014.
- McGovern, P. J., M. E. Rumpf, and J. R. Zimbelman, The influence of lithospheric flexure on magma ascent at large volcanoes on Venus, *J. Geophys. Res.*, 118, doi:10.1002/2013JE004455, 2013.
- Potter, R. W. K., D. A. Kring, G. S. Collins, W. S. Kiefer, and P. J. McGovern, Numerical modeling of the formation and structure of the Orientale impact basin, *J. Geophys. Res.*, doi:10.1002/jgre.20080, 2013.
- Galgana, G. A., E. B. Grosfils, and P. J. McGovern, Radial Dike Formation on Venus: Insights from Models of Uplift, Flexure and Magmatism, *Icarus*, 225, 538-547, 2013.
- Spudis, P. D., P. J. McGovern and W. S. Kiefer, Large shield volcanoes on the Moon, *J. Geophys. Res.*, 118, doi:10.1002/jgre.20059, 2013.
- Andrews-Hanna, J. C., S. W. Asmar, J. W. Head III, W. S. Kiefer, A. S. Konopliv, F. G. Lemoine, I. Matsuyama, E. Mazarico, P. J. McGovern, H. J. Melosh, G. A. Neumann, F. Nimmo, R. J. Phillips, D. E. Smith, S. C. Solomon, G. J. Taylor, M. A. Wieczorek, J. G. Williams, and M. T. Zuber, Ancient Igneous Intrusions and Early Expansion of the Moon revealed by GRAIL gravity gradiometry, *Science*, 339, 675, 2013.
- Potter, R. W. K., D. A. Kring, G. S. Collins, W. S. Kiefer, and P. J. McGovern, Estimating transient crater radius using the annular crustal bulge: Insights from numerical modeling of lunar basin-scale impacts, *Geophys. Res. Lett.*, 39, doi:10.1029/2012GL052981, 2012.
- Schwenzer, S. P., O. Abramov, C. C. Allen, J. C. Bridges, S. M. Clifford, J. Filiberto, D. A. Kring, J. Lasue, P. J. McGovern, H. E. Newsom, A. H. Treiman, D. T. Vaniman, R. C. Wiens and A. Wittmann, Gale Crater: Formation and Post-Impact Hydrous Environments, *Planet. Space Sci.*, 84-95, doi:10.1016/j.pss.2012.05.014, 2012.

