

BIOGRAPHICAL INFORMATION: PATRICK J. MCGOVERN

Senior Staff Scientist, Lunar and Planetary Institute (LPI)

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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 (current rank: Senior Staff Scientist).

HONORS AND APPOINTMENTS

Adjunct Senior Research Scientist, LDEO, Columbia University 2015-present

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

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

Luis De Florez Award, Aeronautics and Astronautics, MIT 1986

SELECTED PROFESSIONAL SERVICE

NASA Venus Exploration Analysis Group (VEXAG) Steering Committee, July 2018-June 2021.

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.

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

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

PROFESSIONAL SOCIETIES

AGU, GSA, IAVCEI.

RECENT INVITED PRESENTATIONS

Lamont-Doherty Earth Observatory 2018, MGG/SGT Seminar: “Pluto and Charon: New Horizons for tectonics, impact activity, and (cryo)volcanism on icy bodies in the far reaches of the Solar System.”

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?”

NASA MISSION AND PROGRAM PARTICIPATION

New Frontiers Data Analysis Program (NFDAP): Principal Investigator 2018-2021. Current grant: Structural evolution of Pluto and Charon: Insights from an integrated program of New Horizons imaging data analysis and numerical modeling of lithospheric dynamics.

Solar System Workings Program (SSW): Principal Investigator, 2018-2020. Current grant: Breaking the Barriers: Time-dependent, stress-controlled growth of large volcanoes on Venus and implications for the mechanics of magma ascent, storage, and emplacement.

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, 2013-2018. Most recent 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, 2012-2018. 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. Most recent 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.

RECENT PUBLICATIONS

Stern, S. A., O. L. White, P. J. McGovern, J. T. Keane, J. W. Conrad, C. J. Bierson, C. B. Olkin, P. Schenk, J. M. Moore and K. Runyon, Pluto’s Far Side, *Icarus*, Submitted, October 2019.

Le Corvec, N., and P. J. McGovern, The Effect of Ocean Loading on the Growth of Basaltic Island Volcanoes and Their Magmatic Plumbing System, *Frontiers in Earth Science*, doi: 10.3389/feart.2018.00119, 2018.

Andrews-Hanna, J. C., J. W. Head, B. Johnson, J. T. Keane, W. S. Kiefer, P. J. McGovern, G. A. Neumann, M. A. Wicczorek, and M. T. Zuber, Ring faults and ring dikes around the Orientale basin on the Moon, *Icarus*, 310, 1-20, 2018.

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. Wicczorek, and M. T. Zuber, Olivine-bearing lithologies on the Moon: Constraints on origins and transport mechanisms from M^3 spectroscopy, radiative transport modeling, and GRAIL crustal thickness, *Icarus*, 300, 287-304, 2018.

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. Wicczorek, 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.
- 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.