



PATRICK J. MCGOVERN

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Dr. McGovern's research focuses on the evolution of terrestrial planet surfaces, lithospheres, and interiors, with emphasis on growth and development of large volcano-tectonic structures on Mars, Venus, the Moon, and Earth. His analysis of topography, gravity, and image data from planetary missions, is used to examine global thermal history, volcano morphology, and lithospheric strain. His work involves modeling of stresses and deformation in growing volcanic edifices and the lithosphere.

EDUCATION

Ph.D., Geophysics, Massachusetts Institute of Technology, 1996

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

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

PROFESSIONAL EXPERIENCE

Science Staff, Lunar and Planetary Institute (LPI), November 1999–present

Postdoctoral Associate, Carnegie Institution of Washington, June 1996–October 1999

Research Assistant, Massachusetts Institute of Technology, September 1988–May 1996

HONORS AND APPOINTMENTS

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, Massachusetts Institute of Technology, 1986

SELECTED PROFESSIONAL SERVICE

Co-Chair, Joint NASA/ESA Venus Science Coordination Group (**VeSCoor**), 2023-2025

Organizing Committee, **Venus Surface and Atmosphere Workshop**, LPI, February 2023

NASA Venus Exploration Analysis Group (**VEXAG**) Steering Committee, July 2018-June 2022

Co-convenor of Special Session "Planetary Volcanology" at the 2017 and 2023 **IAVCEI Scientific Assemblies**

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

RECENT INVITED PRESENTATIONS

New Horizons Team Meeting 2023, Reconstructing Paleo-Pluto, with Implications for Present-day Topography and Tectonics.

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."

SELECTED NASA MISSION AND PROGRAM PARTICIPATION

Lunar Data Analysis Program (LDAP): Principal Investigator 2019-2024. Current grant: Origin and evolution of mare-bearing regions of the Moon: Constraints from integrated analysis of imaging, spectroscopy, topography, and gravity, and numerical modeling.

New Frontiers Data Analysis Program (NFDAP): Principal Investigator 2018-2022, 2023-2026. Current grant: Crustal Deformation, Tectonism, and Cryovolcanism on Pluto: New Constraints from Integrated Analysis of New Horizons Data and Mechanical Modeling.

Mars Data Analysis Program (MDAP): Principal Investigator, 2002-2013; Co-Investigator, 2021-2024. Most recent grant (as Co-I): Modeling Late Amazonian Deformation and Magmatism of the Large Tharsis Shield Volcanoes Using Paleo-Slope Indicators

Solar System Workings Program (SSW): Principal Investigator, 2018-2021. Most recent 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.

Outer Planets Research Program (OPRP): Principal Investigator, 2012-2018. Most recent grant: Copious volcanism on a compression-**dominated** planet? Insights into magma ascent and mountain building on Io from advanced numerical modeling.

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."

GRAIL Guest Scientist, 2012-2016.

NASA Lunar Science Institute (NLSI) Co-Investigator, 2009-2013. "Impact Processes in the Origin Evolution of the Moon: New Sample-driven Perspectives."

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.

SELECTED RECENT PUBLICATIONS

O'Hara, S., **P. J. McGovern** and D. vonLembke, Magma Chamber Depressurization and the Creation of Concentric Graben and Late-stage Flow Units at Sapas Mons, Venus. *J. Geophys. Res.*, in revision, 2024.

McGovern, P. J., Tectonics caused by surface loads, in *Tectonism Across the Solar System* (P. Byrne, G. Collins, C. Klimczak eds.), Elsevier, in press, 2024.

McGovern, P. J. and Nguyen, A. L., The role of Pluto's ocean's salinity in supporting nitrogen ice loads within the Sputnik Planitia basin. *Icarus*, <https://doi.org/10.1016/j.icarus.2024.115968>, 2024.

McGovern, P. J., O. L. White and P. M. Schenk, Tectonism and Enhanced Cryovolcanic Potential Around a Loaded Sputnik Planitia Basin, Pluto, *J. Geophys. Res.*, 126, e2021JE006964. <https://doi.org/10.1029/2021JE006964>, 2021.

McGovern, P., Venus: A Natural Volcanological Laboratory. *Bulletin of the AAS*, 53(4). <https://doi.org/10.3847/25c2cf6b.6da02490>, 2021.

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*, doi:10.1016/j.icarus.2020.113805, 2021.

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 M3 spectroscopy, radiative transport modeling, and GRAIL crustal thickness, *Icarus*, 300, 287-304, 2018.

- Zuber, M. T., and 27 others (including **P. J. McGovern**), 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. J. 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.
- 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.