

# Walter S. Kiefer

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## Education

Ph.D., Planetary Science and Geophysics, California Institute of Technology, 1990  
Thesis: Models for the Formation of Highland Regions on Venus  
M.S., Planetary Science, California Institute of Technology, 1986  
B.S., Physics and Astronomy, Texas Christian University, 1984, *summa cum laude*  
Honors Thesis: Fourier Transform Infrared Spectroscopy of Clay Minerals and Tar Sands

## Professional Experience

Lunar and Planetary Institute, 1993-present  
Senior Staff Scientist, 2017-present  
Manager for Geophysics and Small Bodies Group, 2019-present  
Staff Scientist, 1997-2016  
Research Scientist, 1993-1997  
National Research Council Research Associate, Goddard Space Flight Center, 1990-1993  
Graduate Research Assistant and Graduate Teaching Assistant, Division of Geological and Planetary Sciences, California Institute of Technology, 1984-1990

## Spacecraft Mission Experience

Deep Atmosphere Venus Investigation of Noble gases, Chemistry, and Imaging (DAVINCI) mission, Co-Investigator for noble gas studies of Venus volcanism rates and descent imaging studies of tessera tectonics, 2021-  
Europa Clipper Gravity and Radio Science Team Co-Investigator, 2020-  
EnVision mission – NASA representative on the ESA Phase A Science Study Team, 2018-2021.  
Gravity Recovery and Interior Laboratory (GRAIL) mission Guest Scientist, 2012-2016

## Professional Activities

Chair, Lunar and Planetary Science Conference Program Committee, 2016-  
Science Organizing Committee for EnVision International Venus Science Conference and convener of session on Venus evolution, 2020  
Convener of Special Session on “Fifty Years of Planetary Science: ‘One Giant Leap for Mankind’”, *Lunar and Planetary Science Conference 50*, 2019  
NASA Venus Landed Platform Science Working Group, Geophysics Group Leader, 2018-2021  
Member of the Focus Groups for revising the “Goal, Objectives, and Investigations for Venus Exploration” and “Roadmap for Venus Exploration” for NASA’s Venus Exploration Analysis Group, 2018-2019  
Lead convener for *Differentiation: Building the Internal Architecture of Planets*, 2018  
Seismic and Atmospheric Exploration of Venus (SAEVe) small-sat mission concept study team, 2017-2018

Guest Associate Editor, *Meteoritics and Planetary Science*, special issue on Volatiles in the Martian Interior (published November 2016)  
 Scientific Organizing Committee for *Workshop on Volatiles in the Martian Interior*, 2014  
 Member of the Leadership Team for revising “Goals, Objectives, and Investigations for Venus Exploration” for NASA’s Venus Exploration Analysis Group, 2013-2014  
 Co-convenor of Special Session on “GRAIL Explores the Moon’s Interior”, Lunar Planetary Science Conference 44, 2013  
 Science adviser for *Year of the Solar System: Digital Media for Planetary Science*, WGBH/PBS, Boston MA, 2012-2014  
 Scientific Organizing Committee for *Second Conference on the Lunar Highlands Crust*, 2012  
 Co-convenor of Special Session on “Interior Structure and Evolution of the Terrestrial Planets”, DI-33B and DI-43A, American Geophysical Union Fall Meeting 2010  
 Scientific Organizing Committee for *Workshop on Early Planetary Differentiation: A Multi-planetary and Multi-disciplinary Perspective*, 2006  
 Scientific Organizing Committee for *Conference on the Geophysical Detection of Subsurface Water on Mars*, 2001  
 American Geophysical Union, Meetings Committee, 1998-2002  
 American Geophysical Union, Committee on Study of the Earth's Deep Interior, 1996-1998  
 Service on 20+ NASA grant proposal review panels, including 6+ times as Group Chief

## Publications

**Science Publications** (55 refereed papers published, updated June 2021)

- Nagihara, S., D. R. Williams, Y. Nakamura, **W. S. Kiefer**, S. A. McLaughlin, and P. T. Taylor, Availability of previously lost data and metadata from the Apollo Lunar Surface Experiments Package (ALSEP), *Planet. Space Sci.* **191**, article 105039 (11 pages), 2020.
- Kremic, Tibor, Richard Ghail, Martha Gilmore, Gary Hunter, **Walter Kiefer**, Sanjay Limaye, Michael Pauken, and Colin Wilson, Long-duration Venus lander for seismic and atmospheric science, *Planetary Space Sci.* **190**, article 104961 (11 pages), 2020.
- Weller, Matthew B., and **Walter S. Kiefer**, The physics of changing tectonic regimes: Implications for the temporal evolution of mantle convection and the thermal history of Venus. *J. Geophys. Res.: Planets* **125**, e2019JE005960 (22 pages), 2020.
- Lepaulard, C., J. Gattacceca, M. Uehara, P. Rochette, Y. Quesnel, R. J. Macke, and **W.S. Kiefer**, A survey of the natural remanent magnetization and magnetic susceptibility of Apollo whole rocks. *Phys. Earth. Planet. Int.* **290**, 36-43, 2019.
- Nagihara, S., **W. S. Kiefer**, P. T. Taylor, D. R. Williams, and Y. Nakamura, Examination of the long-term subsurface warming observed at the Apollo 15 and 17 sites utilizing the newly restored Heat Flow Experiment data from 1975 to 1977, *J. Geophys. Res.: Planets* **123**, 1125-1139, 2018.
- Andrews-Hanna, Jeffrey C., James W. Head, Brandon Johnson, James T. Keane, **Walter S. Kiefer**, Patrick J. McGovern, Gregory A. Neumann, Mark A. Wieczorek, and Maria T. Zuber, Ring faults and ring dikes around the Orientale basin on the Moon, *Icarus* **310**, 1-20, 2018.
- Kiefer, Walter S.**, Geophysical models of the lunar interior, in *Encyclopedia of Lunar Science*, ed. Brian Cudnik, Springer International Publishing, [https://doi.org/10.1007/978-3-319-05546-6\\_79-1](https://doi.org/10.1007/978-3-319-05546-6_79-1) (7 pages), 2018.

- Corley, Laura M., Patrick J. McGovern, Georgiana Y. Kramer, Myriam Lemelin, David Trang, Jeffrey J. Gillis-Davis, G. Jeffrey Taylor, Kathryn E. Powell, **Walter S. Kiefer**, Mark Wieczorek, and Maria T. Zuber, Olivine-bearing lithologies on the Moon: Constraints on origins and transport mechanisms from M<sup>3</sup> spectroscopy, radiative transfer modeling, and GRAIL crustal thickness, *Icarus* **300**, 287-304, 2018.
- Jansen, J. C., J. C. Andrews-Hanna, Y. Li, P. G. Lucey, G. J. Taylor, S. Goossens, F. G. Lemoine, E. Mazarico, J. W. Head III, C. Milbury, **W. S. Kiefer**, J. M. Soderblom, and M. T. Zuber, Small-scale density variations in the lunar crust revealed by GRAIL, *Icarus* **291**, 107-123, 2017.
- Kiefer, Walter S.**, and Qingsong Li, Water undersaturated mantle plume volcanism on present-day Mars, *Meteoritics Planet. Sci.* **51**, 1993-2010, 2016.
- Filiberto, Justin, David Baratoux, David Beaty, Doris Breuer, Benjamin J. Farcy, Matthias Grott, John H. Jones, **Walter S. Kiefer**, Prajka Mane, Francis M. McCubbin, and Susanne P. Schwenzer, A review of volatiles in the martian interior, *Meteoritics Planet. Sci.* **51**, 1935-1958, 2016.
- Zuber, Maria T., David E. Smith, Gregory A. Neumann, Sander Goossens, Jeffrey C. Andrews-Hanna, James W. Head, **Walter S. Kiefer**, Sami W. Asmar, Alexander S. Konopliv, Frank G. Lemoine, Isamu Matsuyama, H. Jay Melosh, Patrick J. McGovern, Francis Nimmo, Roger J. Phillips, Sean C. Solomon, G. Jeffrey Taylor, Michael M. Watkins, Mark A. Wieczorek, James G. Williams, Johanna C. Jansen, Brandon C. Johnson, James T. Keane, Erwan Mazarico, Katarina Miljković, Ryan S. Park, Jason M. Soderblom, Dah-Ning Yuan, Gravity field of the Orientale basin from the Gravity Recovery and Interior Laboratory mission, *Science* **354**, 438-441, 2016.
- Matsuyama, Isamu, Francis Nimmo, James T. Keane, Ngai H. Chan, G. Jeffrey Taylor, Mark A. Wieczorek, **Walter S. Kiefer**, and James G. Williams, GRAIL, LLR, and LOLA constraints on the interior structure of the Moon, *Geophys. Res. Lett.* **43**, 8365-8375, doi:10.1002/2016GL069952, 2016.
- Gong, Shengxia, Mark A. Wieczorek, Francis Nimmo, **Walter S. Kiefer**, James W. Head, Chengli Huang, David E. Smith, and Maria T. Zuber, Thicknesses of mare basalts on the Moon from gravity and topography, *J. Geophys. Res.: Planets* **121**, 854-870, doi:10.1002/2016JE005008, 2016.
- Sori, Michael M., Maria T. Zuber, James W. Head, and **Walter S. Kiefer**, Gravitational search for cryptovolcanism on the Moon: Evidence for large volumes of early igneous activity, *Icarus* **273**, 284-295, 2016.
- Kiefer, Walter S.**, Justin Filiberto, Constantin Sandu, and Qingsong Li, The effects of mantle composition on the peridotite solidus: Implications for the magmatic history of Mars, *Geochim. Cosmochim. Acta* **162**, 247-258, 2015.
- Lillis, Robert J., Josef Dufek, **Walter S. Kiefer**, Benjamin A. Black, Michael Manga, Jacob A. Richardson, and Jacob E. Bleacher, The Syrtis Major volcano, Mars: A multidisciplinary approach to interpreting its magmatic evolution and structural development, *J. Geophys. Res.: Planets* **120**, 1476-1496, doi:10.1002/2014JE004774, 2015.
- Neumann, Gregory A., Maria T. Zuber, Mark A. Wieczorek, James W. Head, David M. H. Baker, Sean C. Solomon, David E. Smith, Frank G. Lemoine, Erwan Mazarico, Terence J. Sabaka, Sander J. Goossens, H. Jay Melosh, Roger J. Phillips, Sami W. Asmar, Alexander S. Konopliv, James G. Williams, Michael M. Sori, Jason M. Soderblom, Katarina Miljković, Jeffrey C. Andrews-Hanna, Francis Nimmo, and **Walter S. Kiefer**, Lunar impact basins

- revealed by Gravity Recovery and Interior Laboratory measurements, *Science Advances* 1, e1500852, 2015 (10 pages).
- Jawin, Erica R., **Walter S. Kiefer**, Caleb I. Fassett, D. Benjamin J. Bussey, Joshua T.S. Cahill, M. Darby Dyar, Samuel J. Lawrence, and Paul D. Spudis, The relationship between radar scattering and surface roughness of lunar volcanic features, *J. Geophys. Res.: Planets* **119**, 2331-2348, doi:10.1002/2014JE004668, 2014.
- Andrews-Hanna, Jeffrey C., Jonathan Besserer, James W. Head III, Carly J. A. Howett, **Walter S. Kiefer**, Paul J. Lucey, Patrick J. McGovern, H. Jay Melosh, Gregory A. Neumann, Roger J. Phillips, Paul M. Schenk, David E. Smith, Sean C. Solomon, and Maria T. Zuber, Structure and evolution of the lunar Procellarum region as revealed by GRAIL gravity data, *Nature* **514**, 68-71, 2014.
- Williams, James G., Alexander S. Konopliv, Dale H. Boggs, Ryan S. Park, Dah-Ning Yuan, Frank G. Lemoine, Sander Goossens, Erwan Mazarico, Francis Nimmo, Renee C. Weber, Sami W. Asmar, H. Jay Melosh, Gregory A. Neumann, Roger J. Phillips, David E. Smith, Sean C. Solomon, Michael M. Watkins, Mark A. Wieczorek, Jeffrey C. Andrews-Hanna, James W. Head, **Walter S. Kiefer**, Isamu Matsuyama, Patrick J. McGovern, G. Jeffrey Taylor, and Maria T. Zuber, Lunar interior properties from the GRAIL mission, *J. Geophys. Res.: Planets* **119**, 1546-1578, doi:10.1002/2013JE004559, 2014.
- Besserer, Jonathan, Francis Nimmo, Mark A. Wieczorek, Renee C. Weber, **Walter S. Kiefer**, Patrick J. McGovern, Jeffrey C. Andrews-Hanna, David E. Smith, and Maria T. Zuber, GRAIL gravity constraints on the vertical and lateral density structure of the lunar crust, *Geophys. Res. Lett.* **41**, 5771-5777, doi:10.1002/2014GL060240, 2014.
- Kiefer, Walter S.**, Gravity constraints on the subsurface structure of the Marius Hills: The magmatic plumbing of the largest lunar dome complex, *J. Geophys. Res.: Planets* **118**, 733-745, doi:10.1029/2012JE004111, 2013.
- Potter, Ross W.K., David A. Kring, Gareth S. Collins, **Walter S. Kiefer**, and Patrick J. McGovern, Numerical modeling of the formation and structure of the Orientale impact basin, *J. Geophys. Res.: Planets* **118**, 963-979, doi:10.1002/jgre.20080, 2013.
- Spudis, Paul D., Patrick J. McGovern, and **Walter S. Kiefer**, Large shield volcanoes on the Moon, *J. Geophys. Res.: Planets* **118**, 1063-1081, doi:10.1002/jgre.20059, 2013.
- Wieczorek, Mark A., Gregory A. Neumann, Francis Nimmo, **Walter S. Kiefer**, G. Jeffrey Taylor, H. Jay Melosh, Roger J. Phillips, Sean C. Solomon, Jeffrey C. Andrews-Hanna, Sami W. Asmar, Alexander S. Konopliv, Frank G. Lemoine, David E. Smith, Michael M. Watkins, James G. Williams, and Maria T. Zuber, The crust of the Moon as seen by GRAIL, *Science* **339**, 671-675, 2013.
- Andrews-Hanna, Jeffrey C., Sami W. Asmar, James W. Head III, **Walter S. Kiefer**, Alexander S. Konopliv, Frank G. Lemoine, Isamu Matsuyama, Erwan Mazarico, Patrick J. McGovern, H. Jay Melosh, Gregory A. Neumann, Francis Nimmo, Roger J. Phillips, David E. Smith, Sean C. Solomon, G. Jeffrey Taylor, Mark A. Wieczorek, James G. Williams, and Maria T. Zuber, Ancient igneous intrusions and early expansion of the Moon revealed by GRAIL gravity gradiometry, *Science* **339**, 675-678, 2013.
- Kiefer, Walter S.**, Robert J. Macke, Daniel T. Britt, Anthony J. Irving, and Guy J. Consolmagno, The density and porosity of lunar rocks, *Geophys. Res. Lett.* **39**, L07201, doi:10.1029/2012GL051319, 2012 (5 pages).
- Kiefer, Walter S.**, Lunar heat flow experiments: Science objectives and a strategy for minimizing the effects of lander-induced perturbations, *Planet. Space Sci.* **60**, 155-165, 2012.

- Sandu, Constantin, and **Walter S. Kiefer**, Degassing history of Mars and the lifespan of its magnetic dynamo, *Geophys. Res. Lett.* **39**, L03201, doi:10.1029/2011GL050225, 2012 (5 pages).
- Potter, Ross W.K., Gareth S. Collins, **Walter S. Kiefer**, Patrick J. McGovern, and David A. Kring, Constraining the size of the South Pole-Aitken basin impact, *Icarus* **220**, 730-743, 2012.
- Potter, Ross W.K., David A. Kring, Gareth S. Collins, **Walter S. Kiefer**, and Patrick J. McGovern, Estimating transient crater size using the crustal annular bulge: Insights from numerical modeling of lunar basin-scale impacts, *Geophys. Res. Lett.* **39**, L18203, doi:10.1029/2012GL052981, 2012 (5 pages).
- Filiberto, Justin, Rajdeep Dasgupta, **Walter S. Kiefer**, and Allan H. Treiman, High pressure, near-liquidus phase equilibria of the Home Plate basalt Fastball and melting in the Martian mantle, *Geophys. Res. Lett.* **37**, L13201, doi:10.1029/2010GL/043999, 2010 (4 pages).
- Kiefer, Walter S.**, and Qingsong Li, Mantle convection controls the observed lateral variations in lithospheric thickness on present-day Mars, *Geophys. Res. Lett.* **36**, L18203, doi:10.1029/2009GL039827, 2009 (5 pages).
- Li, Qingsong, and **Walter S. Kiefer**, Mantle convection and magma production on present-day Mars: Effects of temperature-dependent rheology, *Geophys. Res. Lett.* **34**, L16203, doi:10.1029/2007GL030544, 2007 (5 pages).
- O'Neill, C., A. Lenardic, A.M. Jellinek, and **Walter S. Kiefer**, Melt propagation and volcanism in mantle convection simulations, with applications for Martian volcanic and atmospheric evolution, *J. Geophys. Res.* **112**, E07003, doi:10.1029/2006JE002799, 2007 (17 pages).
- Kiefer, Walter S.**, and Laura C. Swafford, Topographic analysis of Devana Chasma, Venus: Implications for rift system segmentation and propagation, *J. Struc. Geol.* **28**, 2144-2155, 2006.
- Musselwhite, Donald S., Heather A. Dalton, **Walter S. Kiefer**, and Allan H. Treiman, Experimental petrology of the basaltic shergottite Yamato-980459: Implications for the thermal structure of the Martian mantle, *Meteoritics Planet. Sci.* **41**, 1271-1290, 2006.
- Kiefer, Walter S.**, Buried mass anomalies along the hemispheric dichotomy in eastern Mars: Implications for the origin and evolution of the dichotomy, *Geophys. Res. Lett.* **32**, L22201, doi:10.1029/2005GL024260, 2005 (4 pages).
- Kiefer, Walter S.**, Gravity evidence for an extinct magma chamber beneath Syrtis Major, Mars: A look at the magmatic plumbing, *Earth Planet. Sci. Lett.* **222**, 349-361, 2004.
- Kiefer, Walter S.**, Melting in the Martian mantle: Shergottite formation and implications for present-day mantle convection on Mars, *Meteoritics Planet. Sci.* **38**, 1815-1832, 2003.
- Kiefer, Walter S.**, and Kelly Peterson, Mantle and crustal structure in Phoebe Regio and Devana Chasma, Venus, *Geophys. Res. Lett.* **30** (1), article 1005, doi:10.1029/2002GL015762, 2003 (4 pages).
- Kiefer, Walter S.**, and Louise H. Kellogg, Geoid anomalies and dynamic topography from time-dependent, spherical axisymmetric mantle convection, *Physics of the Earth and Planetary Interiors* **106**, 237-256, 1998.
- Smrekar, Suzanne E., **Walter S. Kiefer**, and Ellen R. Stofan, Large volcanic rises on Venus, in *Venus II: Geology, Geophysics, Atmosphere, and Solar Wind Environment*, edited by S.W. Bougher, D.M. Hunten, and R.J. Phillips, University of Arizona Press, 845-878, 1997.
- Kiefer, Walter S.**, Bruce G. Bills, and R. Steven Nerem, An inversion of gravity and topography for mantle and crustal structure on Mars, *J. Geophys. Res.* **101**, 9239-9252, 1996.

- Kiefer, Walter S.**, Mantle viscosity stratification and flow geometry: Implications for surface motions on Earth and Venus, *Geophys. Res. Lett.* **20**, 265-268, 1993.
- Kiefer, Walter S.**, and Bradford H. Hager, Geoid anomalies and dynamic topography from convection in cylindrical geometry: Applications to mantle plumes on Earth and Venus, *Geophysical Journal International* **108**, 198-214, 1992.
- Kiefer, Walter S.**, and Bradford H. Hager, A mantle plume model for the Equatorial Highlands of Venus, *J. Geophys. Res.* **96**, 20,947-20,966, 1991.
- Kiefer, Walter S.**, and Bradford H. Hager, Mantle downwelling and crustal convergence: A model for Ishtar Terra, Venus, *J. Geophys. Res.* **96**, 20,967-20,980, 1991.
- Kiefer, Walter S.**, A reexamination of the spreading center hypothesis for Ovda and Thetis Regiones, Venus, *Geophys. Res. Lett.* **17**, 1373-1376, 1990.
- Bills, Bruce G., **Walter S. Kiefer**, and Robert L. Jones, Venus gravity: A harmonic analysis, *J. Geophys. Res.* **92**, 10,335-10,351, 1987.
- Kiefer, Walter S.**, and Bruce C. Murray, The formation of Mercury's smooth plains, *Icarus* **72**, 477-491, 1987.
- Shepherd, Robert A., **Walter S. Kiefer**, and W.R.M. Graham, Characterization of the Circle Cliffs Tar Sands: 1. Application of the FTIR technique to mineral matter, *Fuel* **65**, 1261-1264, 1986.
- Kiefer, Walter S.**, Mark A. Richards, Bradford H. Hager, and Bruce G. Bills, A dynamic model of Venus's gravity field, *Geophys. Res. Lett.* **13**, 14-17, 1986.
- Walker, David, and **Walter S. Kiefer**, Xenolith digestion in large magma bodies, *Proc. Lunar and Planetary Sci. Conf. 15, J. Geophys. Res. (supplement)* **90**, C585-C590, 1985.

## Mission Planning and Instrument Design Documents

- Ghail, Richard, Veronique Ansan, Francesca Bovolo, Doris Breuer, Bruce Campbell, **Walter Kiefer**, Goro Komatsu, Alice Le Gall, Philippa Mason, Thomas Widemann, Colin Wilson, Scott Hensley, Lorenzo Bruzzone, Jörn Helbert, Ann Carine Vandaele, Emmanuel Marcq, Caroline Dumoulin, Pascal Rosenblatt, Thomas Voirin, Dmitri Titov, Ana Rugina, Jens Romstedt, Jayne Lefort, Arno Wielders, and Christopher Buck, *EnVision: Understanding why Earth's Closest Neighbor is so Different*, European Space Agency ESA-SCI(2021)1, 111 pages, 2021. [https://sci.esa.int/documents/34375/36249/EnVision\\_YB\\_final.pdf](https://sci.esa.int/documents/34375/36249/EnVision_YB_final.pdf)
- O'Rourke, Joseph, Allan Treiman, Giada Arney, Paul Byrne, Lynn Carter, Darby Dyar, James Head, Candace Gray, Stephen Kane, **Walter Kiefer**, Kevin McGouldrick, Laurent Montesi, Chris Russell, and Suzanne Smrekar. *Venus Goals, Objectives, and Investigations*, NASA Venus Exploration Analysis Group, 30 pages, 2019. [https://www.lpi.usra.edu/vexag/reports/VEXAG\\_Venus\\_GOI\\_Current.pdf](https://www.lpi.usra.edu/vexag/reports/VEXAG_Venus_GOI_Current.pdf)
- Cutts, James A., Michael Amato, Tibor Kremic, Candace Gray, Scott Hensley, Gary Hunter, Noam Izenberg, **Walter Kiefer**, Kevin McGouldrick, Joseph O'Rourke, and Suzanne Smrekar. *Roadmap for Venus Exploration*, NASA Venus Exploration Analysis Group, 29 pages, 2019. [https://www.lpi.usra.edu/vexag/reports/VEXAG\\_Venus\\_Roadmap\\_Current.pdf](https://www.lpi.usra.edu/vexag/reports/VEXAG_Venus_Roadmap_Current.pdf)
- Kremic, Tibor, Richard Ghail, Martha Gilmore, Gary Hunter, **Walter Kiefer**, Sanjay Limaye, Michael Pauken, and Colin Wilson, *Seismic and Atmospheric Exploration of Venus (SAEVe) Final Report* (long-duration Venus lander mission concept study), 40 pages, 2018. <https://www.lpi.usra.edu/vexag/reports/SAEVe-6-25-2018.pdf>
- Stevenson, David, James Cutts, David Mimoun, Stephen Arrowsmith, Bruce Banerdt, Philip Blom, Emily Brageot, Quentin Brissaud, Gordon Chin, Peter Gao, Raphael Garcia, Jeffery

Hall, Gary Hunter, Jennifer Jackson, Viktor Kerzhanovich, **Walter Kiefer**, Attila Komjathy, Christopher Lee, Phillipe Lognonné, Ralph Lorenz, Walid Majid, Mohammed Mojarradi, Guust Nolet, Joseph O'Rourke, Lucie Rolland, Gerald Schubert, Mark Simons, Christophe Sotin, Tom Spilker, and Victor Tsai, *Probing the Interior Structure of Venus*, Keck Institute of Space Studies, California Institute of Technology, 85 pages, 2015.

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Herrick, Robert, Kevin Baines, Mark Bullock, Gordon Chin, Bob Grimm, **Walter Kiefer**, Steve Mackwell, Kevin McGouldrick, Buck Sharpton, Sue Smrekar, and Constantine Tsang, *Goals, Objectives, and Investigations for Venus Exploration*, NASA Venus Exploration Analysis Group, 15 pages, 2014.

Bullock, Mark, David Senske, Tibor Balint, Alexis Benz, Bruce Campbell, Eric Chassefiere, Anthony Colaprete, Jim Cutts, Lori Glaze, Steve Gorevan, David Grinspoon, Jeffrey Hall, George Hashimoto, Jim Head, Gary Hunter, Natasha Johnson, Victor Kerzhanovich, **Walter S. Kiefer**, Elizabeth Kowala, Tibor Kremic, Sanjay Limaye, Steve Mackwell, Mikhail Marov, Adriana Ocampo, Craig Peterson, Gerald Schubert, Ellen Stofan, Hakam Svedhem, Dimitri Titov, and Allan Treiman (Venus Science and Technology Definition Team), *Venus Flagship Mission Study*, NASA Jet Propulsion Laboratory, 282 pages, 2009.

## Commentary and Meeting Reports

**Kiefer, Walter S.**, The influence of crustal radioactivity on mantle convection and lithospheric thickness on Mars, *J. Geophys. Res.: Planets* **121**, 2463-2466, 2016.

Filiberto, Justin, David Beaty, and **Walter Kiefer**, Volatiles in Mars: Constraints, questions, and future directions, *Eos Earth and Space News* **96** (8), 10, 2015.

**Kiefer, Walter S.**, Forming the Martian great divide, *Nature* **453**, 1191-1192, 2008.

**Kiefer, Walter S.**, Venus after Magellan: Where do we go from here?, *Lunar and Planetary Information Bulletin* **74**, 2-4, Winter 1995.

## Education Publications

Ballard, Yolanda, Eve Halligan, Keliann LaConte, Stephanie Shipp, **Walter S. Kiefer**, and Allan H. Treiman, Explore: Life on Mars?, [www.lpi.usra.edu/education/explore/LifeOnMars/](http://www.lpi.usra.edu/education/explore/LifeOnMars/), 2013.

Shipp, Stephanie, Christine Shupala, Allan Treiman, David Kring, and **Walter Kiefer**, "How Did Our Moon Form?", "Our Moon in a New Light", and "To the Moon and Beyond", [www.lpi.usra.edu/education/moon\\_poster.shtml](http://www.lpi.usra.edu/education/moon_poster.shtml), 3 poster set for grades 6-9, 2009.

Nelson, Becky, Katy Buckaloo, Stephanie Shipp, **Walter S. Kiefer**, and Tomasz Stepinski, Exploring Mars: Inside and Out!, [www.lpi.usra.edu/education/explore/mars/](http://www.lpi.usra.edu/education/explore/mars/), 150 pages, 2007.

**Kiefer, Walter S.**, Robert R. Herrick, Allan H. Treiman, and Pamela B. Thompson, Exploring the Solar System: A science enrichment course for gifted elementary school students, pp. 130-132 in *Proceedings of the NASA Office of Space Science Education and Public Outreach Conference*, eds. C. Narasimhan, B. Beck-Winchatz, I. Hawkins, and C. Runyon, Astronomical Society of the Pacific Conference Series Vol. 319, 2004.

**Kiefer, Walter S.**, and Kin Leung, Image processing experiments for the classroom, pp. 318-320 in *Proceedings of the NASA Office of Space Science Education and Public Outreach Conference*, eds. C. Narasimhan, B. Beck-Winchatz, I. Hawkins, and C. Runyon, Astronomical Society of the Pacific Conference Series Vol. 319, 2004.

Treiman, Allan, and **Walter Kiefer**, *Exploring Mars Educational Brief*, NASA Publication EB-2003-06-120-HQ (8 pages), 2003.

**Kiefer, Walter S.**, Allan H. Treiman, and Stephen M. Clifford, *The Red Planet: A Survey of Mars* (40 slides and 26 page caption book), Lunar and Planetary Institute, Houston. First Edition, 1995; Second Edition, 1997.

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