

# The role of mineralogical-dependent thermal properties on the evolution of Mercury's interior

## References:

- Baumeister, Philipp, Nicola Tosi, Caroline Brachmann, John Lee Grenfell, and Lena Noack. 2023. "Redox State and Interior Structure Control on the Long-Term Habitability of Stagnant-Lid Planets." *Astronomy & Astrophysics* 675 (July):A122. <https://doi.org/10.1051/0004-6361/202245791>.
- Broquet, A., F. Rolser, A. C. Plesa, D. Breuer, and H. Hussmann. 2024. "Mercury's Crustal Porosity as Constrained by the Planet's Bombardment History." *Geophysical Research Letters* 51 (21): e2024GL110583. <https://doi.org/10.1029/2024GL110583>.
- Byrne, Paul K., Christian Klimczak, A. M. Celâl Şengör, Sean C. Solomon, Thomas R. Watters, and Steven A. Hauck, II. 2014. "Mercury's Global Contraction Much Greater than Earlier Estimates." *Nature Geoscience* 7 (4): 301–7. <https://doi.org/10.1038/ngeo2097>.
- Byrne, Paul K., Lillian R. Ostrach, Caleb I. Fassett, Clark R. Chapman, Brett W. Denevi, Alexander J. Evans, Christian Klimczak, Maria E. Banks, James W. Head, and Sean C. Solomon. 2016. "Widespread Effusive Volcanism on Mercury Likely Ended by about 3.5 Ga." *Geophysical Research Letters* 43 (14): 7408–16. <https://doi.org/10.1002/2016GL069412>.
- Clauser, Christoph, and Ernst Huenges. 1995. "Thermal Conductivity of Rocks and Minerals." In *AGU Reference Shelf*, edited by Thomas J. Ahrens, 105–26. Washington, D. C.: American Geophysical Union. <https://doi.org/10.1029/RF003p0105>.
- Di Achille, G., C. Popa, M. Massironi, E. Mazzotta Epifani, M. Zusi, G. Cremonese, and P. Palumbo. 2012. "Mercury's Radius Change Estimates Revisited Using MESSENGER Data." *Icarus* 221 (1): 456–60. <https://doi.org/10.1016/j.icarus.2012.07.005>.
- Grott, M., D. Breuer, and M. Laneuville. 2011. "Thermo-Chemical Evolution and Global Contraction of Mercury." *Earth and Planetary Science Letters* 307 (1–2): 135–46. <https://doi.org/10.1016/j.epsl.2011.04.040>.
- Guo, Xinzhan, Bo Feng, Baohua Zhang, Shuangmeng Zhai, Weihong Xue, Yunke Song, Yuping Song, and Xinxin Yan. 2024. "Effect of Iron Content on the Thermal Conductivity and Thermal Diffusivity of Orthopyroxene." *Geochemistry, Geophysics, Geosystems* 25 (6): e2023GC011419. <https://doi.org/10.1029/2023GC011419>.

- Hauck, Steven A., Andrew J. Dombard, Roger J. Phillips, and Sean C. Solomon. 2004. "Internal and Tectonic Evolution of Mercury." *Earth and Planetary Science Letters* 222 (3): 713–28. <https://doi.org/10.1016/j.epsl.2004.03.037>.
- Hauck, Steven A., Matthias Grott, Paul K. Byrne, Brett W. Denevi, Sabine Stanley, and Timothy J. McCoy. 2018. "Mercury's Global Evolution." In *Mercury*, edited by Sean C. Solomon, Larry R. Nittler, and Brian J. Anderson, 1st ed., 516–43. Cambridge University Press. <https://doi.org/10.1017/9781316650684.020>.
- Namur, Olivier, and Bernard Charlier. 2017. "Silicate Mineralogy at the Surface of Mercury." *Nature Geoscience* 10 (1): 9–13. <https://doi.org/10.1038/ngeo2860>.
- Namur, Olivier, Max Collinet, Bernard Charlier, Timothy L. Grove, Francois Holtz, and Catherine McCammon. 2016. "Melting Processes and Mantle Sources of Lavas on Mercury." *Earth and Planetary Science Letters* 439 (April):117–28. <https://doi.org/10.1016/j.epsl.2016.01.030>.
- Padovan, Sebastiano, Mark A. Wieczorek, Jean-Luc Margot, Nicola Tosi, and Sean C. Solomon. 2015. "Thickness of the Crust of Mercury from Geoid-to-topography Ratios." *Geophysical Research Letters* 42 (4): 1029–38. <https://doi.org/10.1002/2014GL062487>.
- Seipold, U. 1998. "Temperature Dependence of Thermal Transport Properties of Crystalline Rocks — a General Law." *Tectonophysics* 291 (1–4): 161–71. [https://doi.org/10.1016/S0040-1951\(98\)00037-7](https://doi.org/10.1016/S0040-1951(98)00037-7).
- Stixrude, Lars, and Carolina Lithgow-Bertelloni. 2005. "Thermodynamics of Mantle Minerals - I. Physical Properties." *Geophysical Journal International* 162 (2): 610–32. <https://doi.org/10.1111/j.1365-246X.2005.02642.x>.
- . 2024. "Thermodynamics of Mantle Minerals – III: The Role of Iron." *Geophysical Journal International* 237 (3): 1699–1733. <https://doi.org/10.1093/gji/ggae126>.
- Thomas, R. J., D. A. Rothery, S. J. Conway, and M. Anand. 2014. "Long-lived explosive volcanism on Mercury.", *Geophysical Research Letters* 41: 6084–6092. <https://doi.org/10.1002/2014GL061224>.
- Tosi, N., M. Grott, A.-C. Plesa, and D. Breuer. 2013. "Thermochemical Evolution of Mercury's Interior." *Journal of Geophysical Research: Planets* 118 (12): 2474–87. <https://doi.org/10.1002/jgre.20168>.
- Warren, Paul H. 2011. "Ejecta–Megaregolith Accumulation on Planetesimals and Large Asteroids." *Meteoritics & Planetary Science* 46 (1): 53–78. <https://doi.org/10.1111/j.1945-5100.2010.01138.x>.

Watters, Thomas R. 2021. "A Case for Limited Global Contraction of Mercury." *Communications Earth & Environment* 2 (1): 9. <https://doi.org/10.1038/s43247-020-00076-5>.

Zhang, Youyue, Takashi Yoshino, Akira Yoneda, and Masahiro Osako. 2019. "Effect of Iron Content on Thermal Conductivity of Olivine with Implications for Cooling History of Rocky Planets." *Earth and Planetary Science Letters* 519 (August):109–19. <https://doi.org/10.1016/j.epsl.2019.04.048>.