

Dr. David A. Minton

Associate Professor

Purdue University • Department of Earth, Atmospheric, and Planetary Sciences
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Employment

2018–Pres. **Associate Professor with Tenure**, Purdue University, West Lafayette, IN.
2011–2018 **Assistant Professor**, Purdue University, West Lafayette, IN.
2009–2011 **Research Scientist**, Southwest Research Institute, Boulder, CO.

Education

2005–2009 **Ph.D. in Planetary Sciences**
The University of Arizona, Tucson, AZ.
Dissertation: *Dynamical History of the Asteroid Belt and Implications for Terrestrial Planet Bombardment*
Advisor: Renu Malhotra
2003–2005 University of Maryland, College Park, MD.
Project: *Magnetohydrodynamic control of incipient boundary layer separation in supersonic flow*
Advisors: Mark Lewis and David Van Wie
2001–2003 **B.S. in Aerospace Engineering - Summa Cum Laude**
North Carolina state University, Raleigh, NC.
1999–2000 **A.S. in College Transfer**
Central Piedmont Community College, Charlotte, NC.

Internships

2003 NASA Langley Aerospace Research Summer Scholar, Hampton, VA.

Refereed Publications

Co-authors under direct advisement: ^P=Post-doc; ^G= Graduate student; ^U= Undergraduate student

- [43] Du^P J., Minton D.A., Blevins^G A.M., Fassett C.I., Huang Y.H. (2025). Spectral Analysis of the Morphology of Fresh Lunar Craters II: Two-Dimensional Surface Elevations of the Continuous Ejecta, Wall, and Floor *Journal of Geophysical Research: Planets*. In Review.
- [42] Ćuk M., Anand^G, K.P., Minton D.A. (2025). Two Possible Orbital Histories of Phobos. *Planetary Science Journal*. 6:89. doi: [10.3847/PSJ/adc1ba](https://doi.org/10.3847/PSJ/adc1ba)
- [41] Blevins^G A.M., Minton D.A., Huang Y.H., Du^P J., Tremblay, M.M., Fassett, C.I. (2025). Apollo Impact Melts Record a Rapidly Declining Impact Rate in the Late Imbrian. *Journal of Geophysical Research: Planets*. 130, e2024JE008722. doi: [10.1029/2024JE008722](https://doi.org/10.1029/2024JE008722)
- [40] Hirabayashi M, Fassett C.I., Costello E.S., Minton D.A., (2024). Crater Equilibrium State Characterization given Crater Production from a Single Power Law. *Planetary Science Journal* 5:250. doi: [10.3847/PSJ/ad8883](https://doi.org/10.3847/PSJ/ad8883)

- [39] Du^P J., **Minton D.A.**, Blevins^G A.M., Fassett C.I., Huang Y.H. (2024). Spectral Analysis of the Morphology of Fresh Lunar Craters I: Rim Crest, Floor, and Rim Flank Outlines. *Journal of Geophysical Research: Planets*. 129:11, e2024JE008357. doi: [10.1029/2024JE008357](https://doi.org/10.1029/2024JE008357)
- [38] Hayes C.W., **Minton D.A.**, Kloos J.L., Moores J.E. (2024). Topography-enhanced ultra-cold trapping at the LCROSS impact site. *Journal of Geophysical Research: Planets*. 129, e2023JE007925. doi: [10.1029/2023JE007925](https://doi.org/10.1029/2023JE007925)
- [37] Huang Y.H., Riedel C., Soderblom J.M., Krein S.B., Orgel C., Conrad J.W., Hirabayashi M., and **Minton D.A.** (2024) Global lunar crater density using buffered non-sparseness correction. *Planetary Science Journal* 5, 155. doi: [10.3847/PSJ/ad4ceb](https://doi.org/10.3847/PSJ/ad4ceb)
- [36] Osinski G.R., Melosh H. J., Andrews-Hanna J., Baker D., Denevi B., Dhingra D., Ghent R., Hayne P.O., Hill P., James P.B., Jaret S., Johnson B.C., Kenkmann T., Kring D., Mahanti P., **Minton D.A.**, Neish C.D., Neumann G., Plescia J., Potter R.W.K., Richardson J., Silber E.A., Soderblom J.M., Zanetti M. Zellner N.E.B. (2023). Lunar Impact Features and Processes. *Reviews in Mineralogy and Geochemistry*, 89(1), 339–371. doi: [10.2138/rmg.2023.89.08](https://doi.org/10.2138/rmg.2023.89.08)
- [35] Čuk M., Hamilton D.P., **Minton D.A.**, Stewart S.T. (2023). Sesquinary Catastrophe for Close-in Moons with Dynamically Excited Orbits. *Astrophysical Journal* 957, 62. doi: [10.3847/1538-4357/acf613](https://doi.org/10.3847/1538-4357/acf613)
- [34] Wishard^G C., Pouplin^G J.L.L., Elliott^G J.R., Singh^G D., Anand^G K.P., **Minton D.A.** (2023). Swiftest: An N-body Integrator for Gravitational Systems. *Journal of Open Source Software*, 8, 5409. doi: [10.21105/joss.05409](https://doi.org/10.21105/joss.05409)
- [33] Fassett C.I., Beyer R.A., Deutsch A.N., Hirabayashi M., Leight C.J., Mahanti P., Nypaver C.A., Thomson B.J., **Minton D.A.** (2022). Topographic Diffusion Revisited: Small Crater Lifetime on the Moon and Implications for Volatile Exploration. *Journal of Geophysical Research: Planets* 127, e2022JE007510. doi: [10.1029/2022JE007510](https://doi.org/10.1029/2022JE007510)
- [32] Huang^P Y.H., Soderblom J.M., **Minton D.A.**, Hirabayashi M., Melosh H.J. (2022). Bombardment history of the Moon constrained by crustal porosity. *Nat. Geosci.* 15(7) doi: [10.1038/s41561-022-00969-4](https://doi.org/10.1038/s41561-022-00969-4)
- [31] Safrit T.K., Steckloff J.K., Bosh A.S., Nesvorný D., Walsh K., Brasser R., **Minton D.A.**, (2021). The Formation of Bilobate Comet Shapes through Sublimative Torques. *Planetary Science Journal* 2, 14. doi: [10.3847/PSJ/abc9c8](https://doi.org/10.3847/PSJ/abc9c8)
- [30] Čuk M, **Minton D.A.**, Pouplin^G J.L.L., Wishard^G C. (2020). Evidence for a Past Martian Ring from the Orbital Inclination of Deimos. *Astrophysical Journal Letters*, 896, L28. doi: [10.3847/2041-8213/ab974f](https://doi.org/10.3847/2041-8213/ab974f)

- [29] Riedel C., **Minton D.A.**, Michael G., Orgel C., van der Bogert C.H., Hiesinger H. (2020) Degradation of Small Simple and Large Complex Lunar Craters: Not a Simple Scale Dependence. *Journal of Geophysical Research: Planets*, 125, e2019JE006273. doi: [10.1029/2019JE006273](https://doi.org/10.1029/2019JE006273)
- [28] Richardson J.E., Steckloff J.K., **Minton D.A.** (2020) Impact-produced seismic shaking and regolith growth on asteroids 433 Eros, 2867 Šteins, and 25143 Itokawa. *Icarus*, 347, 113811. doi: [10.1016/j.icarus.2020.113811](https://doi.org/10.1016/j.icarus.2020.113811)
- [27] **Minton D.A.**, Fassett C.I., Hirabayashi M., Howl^U B.A., Richardson J. (2019) The equilibrium size-frequency distribution of small craters reveals the effects of distal ejecta on lunar landscape morphology. *Icarus*, 326:63. doi: [10.1016/j.icarus.2019.02.021](https://doi.org/10.1016/j.icarus.2019.02.021)
- [26] Graves^G K.J., **Minton D.A.**, Molaro J.L., Hirabayashi M. (2019). Resurfacing Asteroids from Thermally Induced Surface Degradation. *Icarus*, 322, 1–12. doi: [10.1016/j.icarus.2019.01.003](https://doi.org/10.1016/j.icarus.2019.01.003)
- [25] Hesselbrock^G A.J., **Minton D.A.** (2019). Three Dynamical Evolution Regimes for Coupled Ring-satellite Systems and Implications for the Formation of the Uranian Satellite Miranda. *The Astronomical Journal*, 157(1), 30. doi: [10.3847/1538-3881/aaf23a](https://doi.org/10.3847/1538-3881/aaf23a)
- [24] Huang^G Y.H., **Minton D.A.**, Zellner N.E.B., Hirabayashi M., Richardson J.E., Fassett C.I. (2018). No Change in the Recent Lunar Impact Flux Required Based on Modeling of Impact Glass Spherule Age Distributions. *Geophysical Research Letters*, 45(14), 6805. doi: [10.1029/2018GL077254](https://doi.org/10.1029/2018GL077254)
- [23] Elliott^U J.R., Huang^G Y.H., **Minton D.**, Freed A. (2018). The length of lunar crater rays explained using secondary crater scaling. *Icarus*, 312, 231. doi: [10.1016/j.icarus.2018.04.015](https://doi.org/10.1016/j.icarus.2018.04.015)
- [22] Hirabayashi^P M., Howl^G B.A., Fassett C.I., Soderblom J.M., **Minton D.A.**, Melosh H.J. (2018). The Role of Breccia Lenses in Regolith Generation From the Formation of Small, Simple Craters: Application to the Apollo 15 Landing Site. *Journal of Geophysical Research: Planets*, 123(2), 527. doi: [10.1002/2017JE005377](https://doi.org/10.1002/2017JE005377)
- [21] Graves^G K.J., **Minton D.A.**, Hirabayashi^P M., DeMeo F, Carry B. (2018). Resurfacing asteroids from YORP spin-up and failure. *Icarus*, 304, 162–171. doi: [10.1016/j.icarus.2017.08.025](https://doi.org/10.1016/j.icarus.2017.08.025)
- [20] Huang^G Y.H., **Minton D.A.**, Hirabayashi^P M., Elliott^U J.R., Richardson J.E., Fassett C.I., Zellner N.E.B. (2017). Heterogeneous impact transport on the Moon. *Journal of Geophysical Research: Planets*, 122(6), 1158. doi: [10.1002/2016JE005160](https://doi.org/10.1002/2016JE005160)
- [19] Fassett C.I., Crowley M.C., Leight C., Dyar M.D., **Minton D.A.**, Hirabayashi^P M., Thompson B.J., Watters, W.A. (2017). Evidence for rapid topographic evolution and crater degradation on Mercury from simple crater morphometry. *Geophysical Research Letters*, 44(11), 5326. doi: [10.1002/2017GL073769](https://doi.org/10.1002/2017GL073769)

- [18] Hesselbrock^G A.J., **Minton D.A.** (2017). An ongoing satellite–ring cycle of Mars and the origins of Phobos and Deimos. *Nature Geoscience*, 10(4), 266–269. doi: [10.1038/ngeo2916](https://doi.org/10.1038/ngeo2916)
- [17] Hirabayashi^P M., **Minton D.A.**, Fassett C.I. (2017). An analytical model of crater count equilibrium. *Icarus*, 289, 134. doi: [10.1016/j.icarus.2016.12.032](https://doi.org/10.1016/j.icarus.2016.12.032)
- [16] Johnson B.C., Collins G.S., **Minton D.A.**, Bowling T.J., Simonson B.M., Zuber M.T. (2016). Spherule layers, crater scaling laws, and the population of ancient terrestrial impactors. *Icarus*, 271, 350. doi: [10.1016/j.icarus.2016.02.023](https://doi.org/10.1016/j.icarus.2016.02.023)
- [15] Johnson B.C., Walsh K.J., **Minton D.A.**, Krot A.N., Levison H.F. (2016). Timing of the formation and migration of giant planets as constrained by CB chondrites. *Science Advances*, 2(12), e1601658–e1601658. doi: [10.1126/sciadv.1601658](https://doi.org/10.1126/sciadv.1601658)
- [14] Morbidelli A., Walsh K.J., O'Brien D.P., **Minton D.A.**, Bottke, W.F. (2015). The Dynamical Evolution of the Asteroid Belt. In *Asteroids IV* (pp. 493–507). University of Arizona Press. Tucson. doi: [10.2458/azu_uapress_9780816532131-ch026](https://doi.org/10.2458/azu_uapress_9780816532131-ch026)
- [13] Steckloff J.K., Johnson B.C., Bowling T.J., Melosh H.J., **Minton D.A.**, Lisse C.M., Battams K. (2015). Dynamic sublimation pressure and the catastrophic breakup of Comet ISON. *Icarus*, 258, 430–437. doi: [10.1016/j.icarus.2015.06.032](https://doi.org/10.1016/j.icarus.2015.06.032)
- [12] **Minton D.A.**, Richardson J.E., Fassett C.I. (2015). Re-examining the main asteroid belt as the primary source of ancient lunar craters. *Icarus*, 247(0), 172. doi: [10.1016/j.icarus.2014.10.018](https://doi.org/10.1016/j.icarus.2014.10.018)
- [11] Johnson B.C., **Minton D.A.**, Melosh H.J., Zuber M.T. (2015). Impact jetting as the origin of chondrules. *Nature*, 517(7), 339–341. doi: [10.1038/nature14105](https://doi.org/10.1038/nature14105)
- [10] **Minton D.A.**, Levison H.F. (2014). Planetesimal-driven migration of terrestrial planet embryos. *Icarus*, 232(0), 118–132. doi: [10.1016/j.icarus.2014.01.001](https://doi.org/10.1016/j.icarus.2014.01.001)
- [9] Fassett C.I., **Minton D.A.** (2013). Impact bombardment of the terrestrial planets and the early history of the Solar System. *Nat. Geosci.*, 6(7), 520. doi: [10.1038/ngeo1841](https://doi.org/10.1038/ngeo1841)
- [8] Yue Z., Johnson B.C., **Minton D.A.**, Melosh H.J., Di K., Hu W., Liu Y. (2013). Projectile remnants in central peaks of lunar impact craters. *Nature Geoscience*, 6(6), 435. doi: [10.1038/ngeo1828](https://doi.org/10.1038/ngeo1828)
- [7] Bottke W.F., Vokrouhlický D., **Minton D.A.**, Nesvorný D., Morbidelli A., Brasser R., Simonson B., Levison H.F. (2012). An Archaean heavy bombardment from a destabilized extension of the asteroid belt. *Nature*, 485(7396), 78. doi: [10.1038/nature10967](https://doi.org/10.1038/nature10967)
- [6] **Minton D.A.**, Malhotra R. (2011). Secular Resonance Sweeping of the Main Asteroid Belt During Planet Migration. *Astrophysical Journal*, 732(1), 53–64. doi: [10.1088/0004-637X/732/1/53](https://doi.org/10.1088/0004-637X/732/1/53)
- [5] **Minton D.A.**, Malhotra R. (2010). Dynamical erosion of the asteroid belt and implications for large impacts in the inner Solar System. *Icarus*, 207(2), 744–757. doi: [10.1016/j.icarus.2009.12.008](https://doi.org/10.1016/j.icarus.2009.12.008)

- [4] **Minton D.A.**, Malhotra R. (2009). A record of planet migration in the main asteroid belt. *Nature*, 457(7233), 1109–1111. doi: [10.1038/nature07778](https://doi.org/10.1038/nature07778)
- [3] Malhotra R., **Minton D.A.** (2008). Prospects for the Habitability of OGLE-2006-BLG-109L. *Astrophysical Journal Letters*, 683(1), L67–L70. doi: [10.1086/591419](https://doi.org/10.1086/591419)
- [2] **Minton D.A.** (2008). The topographic limits of gravitationally bound, rotating sand piles. *Icarus*, 195(2), 698–704. doi: [10.1016/j.icarus.2008.02.009](https://doi.org/10.1016/j.icarus.2008.02.009)
- [1] **Minton D.A.**, Malhotra R. (2007). Assessing the Massive Young Sun Hypothesis to Solve the Warm Young Earth Puzzle. *Astrophysical Journal*, 660(2), 1700–1706. doi: [10.1086/514331](https://doi.org/10.1086/514331)

Funding

2025-Pres.	<i>Understanding how Distal Ejecta Shapes the Lunar Surface Through Observations and Modeling.</i> NASA Lunar Data Analysis Program 80NSSC25K7050 PI: David Minton · Total Budget: \$873k
2024-Pres.	<i>Origin and Evolution of the Martian Moon System.</i> NASA Emerging Worlds Program 80NSSC23K1266 PI: Matija Ćuk · Co-I Minton's Budget: \$475k
2023-Pres.	<i>Lunar Structure, Composition and Processes for Exploration (LunaSCOPE)</i> NASA Solar System Exploration Research Institute 80NSSC23M0161 PI: Alexander Evans · Co-I Minton's Budget: \$36k
2022-Pres.	<i>Using Lunar Topography Data to Model Realistic Crater Morphology</i> NASA Lunar Data Analysis Program 80NSSC21K1719 PI: David Minton · Total Budget: \$695k
2020-2024	<i>Investigating a Ring Formation Mechanism for Centaurs and TNOs</i> NASA Solar System Workings Program 80NSSC20K0857 PI: Julie Brisset · Co-I Minton's Budget: \$296k
2018-2021	<i>Constraining Lunar Bombardment History by Modeling Age Distributions of Ancient Impact Melts</i> NASA Solar System Workings Program 80NSSC19K0032 PI: Oleg Abramov · Co-I Minton's Budget: \$294k
2019-2021	<i>Early Dynamics of the Inner Solar System</i> NASA Emerging Worlds Program 80NSSC19K0512 PI: Matija Ćuk · Co-I Minton's Budget: \$105k
2017-2018	<i>Chariot to the Moons of Mars</i> NASA Planetary Science Deep Space SmallSat Program NNX17AK30G PI: David Minton · Total Budget: \$411k

- 2016-2020 *High resolution topography and radar observations of lunar craters and cratered surfaces*
 NASA Lunar Data Analysis Program NNX17AI79A
 PI: Caleb Fassett · Co-I Minton's Budget: \$104k
- 2016-2020 *Constraining lunar crater saturation by modeling GRAIL porosity*
 NASA Lunar Data Analysis Program [NNX16AN62G](#)
PI: David Minton · Total Budget: \$546k
- 2016-2019 *Stop hitting yourself: Did most terrestrial impactors originate from terrestrial planets?*
 NASA Emerging Worlds Program [NNX16AI31G](#)
 PI: Alan Jackson · Co-I Minton's Budget: \$263k
- 2016-2016 *Modeling the formation of Phobos and Deimos from a debris disk with impacts*
 NASA Earth and Space Sciences Fellowship [NNX16AP46H](#)
 Graduate Student: Andrew Hesselbrock · Total Budget: \$90k
- 2015-2020 *Modeling regolith evolution during post-basin epoch of lunar history*
 NASA Solar System Workings Program [NNX15AL41G](#)
PI: David Minton · Total Budget: \$566k
- 2015-2018 *Tidal dissipation during close encounters*
 NASA Earth and Space Sciences Fellowship [NNX15AQ99H](#)
 Graduate Student: Kevin Graves · Total Budget: \$105k
- 2015-2018 *Modeling the evolution of lunar impact glasses*
 NASA Earth and Space Sciences Fellowship [NNX15AV55H](#)
 Graduate Student: Ya Huei Huang · Total Budget: \$105k