

Curriculum Vitae – Ronald-Louis Ballouz

Personal Information

Contact Information:

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Academic Positions

Research:

11/2018 – present Postdoc, Lunar and Planetary Lab, Tucson, AZ
08/2017 – 11/2018 Postdoc, Institute of Space and Astronautical Science, JAXA, Japan
10/2015 – 03/2016 Chateaubriand Fellow, Observatoire de la Côte d’Azur, Nice, France
01/2013 – 07/2017 Graduate Research Assistant, University of Maryland, College Park
06/2011 – 08/2011 Research Intern, Space Telescope Science Institute, Baltimore, MD
05/2008 – 05/2011 Undergraduate Research Assistant, Villanova University, Villanova, PA

Teaching:

01/2020-5/2020 Astronomy Adjunct Professor, Pima Community College, Tucson, AZ
02/2018 & 11/2018 Guest Lecturer, University of Aizu, Fukushima, Japan
08/2011-12/2012 Graduate Teaching Assistant, University of Maryland, College Park
08/2008-05/2011 Undergraduate Teaching Assistant, Villanova University, Villanova, PA

Educational Background

2013-2017	Ph.D.	Astronomy	University of Maryland, College Park
2011-2013	M.S.	Astronomy	University of Maryland, College Park
2010	Summer School	Specola Vaticana	Rome, Italy
2007-2011	B.S.	Astronomy	Villanova University
		Minor Physics	Villanova University

Research and Scholarly Activities

Refereed Journal Articles

1. *Michel, P., **Ballouz, R.-L.**, Barnouin, O.S., et al. Collisional formation of top-shaped asteroids and implications for the origins of Ryugu and Bennu. *Nature Communications* 11, 2655.
2. *Riu, L., **Ballouz, R.-L.**, Van Wal, S., et al. MARAUDERS: A mission concept to probe volatile distribution and properties at the lunar poles with miniature impactors. *Planetary & Space Science* 189, 104969.
3. Molaro, J.M., Walsh, K.J, Jawin, E., **Ballouz, R.-L.**, et al. 2020. In situ evidence of thermally induced rock breakdown widespread on Bennu’s surface. *Nature Communications* 11, 2913.

4. Bottke, W.F., Vokrouhlicky, D., **Ballouz, R.-L.**, et al. 2020. Interpreting the Cratering Histories of Bennu, Ryugu, and Other Spacecraft-explored Asteroids. *The Astronomical Journal* 160, 14.
5. Scheeres, D.J., McMahon, J.W., Brack, D.N., ..., **Ballouz, R.-L.**, et al. 2020. Particle Ejection Contributions to the Rotational Acceleration and Orbit Evolution of Asteroid (101955) Bennu. *Journal of Geophysical Research: Planets* 125, e06284.
6. Thuillet, F., Michel, P., Tachibana, S., **Ballouz, R.-L.**, and Schwartz, S.R. Numerical modeling of medium-speed impacts on a granular surface in a low-gravity environment: Application to Hayabusa2 sampling mechanism. *Monthly Notices of the Royal Astronomical Society* 491, 153.
7. Lauretta, D.S., Hergenrother, C.W., Chesley, S.R., ..., **Ballouz, R.-L.**, et al.. Episodes of particle ejection from the surface of the active asteroid (101955) Bennu. *Science* 366, 3544.
8. Çelik, O., Baresi, N., **Ballouz, R.-L.**, Ogawa, K., Wada, K., and Kawakatsu, Y., 2019. Ballistic deployment from quasi-satellite orbits around Phobos under realistic dynamical and surface environment constraints. *Planetary & Space Science*, 178, 104693.
9. ***Ballouz, R.-L.**, Baresi, N., Crites, S.T., Kawakatsu, Y., and Fujimoto, M., 2019. Surface refreshing of Martian Moon Phobos by orbital eccentricity-driven grain motion. *Nature Geoscience*, 12, 229.
10. ***Ballouz, R.-L.**, Walsh, K.J., Richardson, D.C, Michel, P., 2019. Using a geometrical algorithm to provide N-body initial conditions for the gravitational phase of asteroid family formation. *Monthly Notices of the Royal Astronomical Society*, 485, 697.
11. Walsh, K.J., Jawin, E., **Ballouz, R.-L.**, et al., 2019. Craters, boulders and regolith of (101955) Bennu indicative of an old and dynamic surface. *Nature Geoscience*, 12, 242.
12. DellaGuistina, D.N., Emery, J. P., Golish, D. R., ..., **Ballouz, R.-L.**, et al. 2019. Properties of rubble-pile asteroid (101955) Bennu from OSIRIS-REx imaging and thermal analysis. *Nature Astronomy*, 3,341.
13. Sugita, S., Honda, R., Morota, T., ..., **Ballouz, R.-L.**, et al., 2019. The geomorphology, color, and thermal properties of Ryugu: Implications for parent-body processes. *Science*, 364, 252.
14. Barnouin, O.S., Daly, M. G., Palmer, E. E. ..., **Ballouz, R.-L.**, et al. 2019. Shape of (101955) Bennu indicative of a rubble pile with internal stiffness. *Nature Geoscience*, 12, 247-252.
15. Scheeres, D.J., McMahon, J. W., French, A. S., ..., **Ballouz, R.-L.**, et al. 2019. The dynamics geophysical environment of (101955) Bennu based on OSIRIS-REx measurements 2019. *Nature Astronomy*, 3, 352.

16. Maurel, C., Michel, P., Biele, J., **Ballouz, R.-L.**, and Thuillet, F., 2018. Numerical Simulations of the contact between the lander MASCOT and a regolith-covered surface. *Advances in Space Research*, 62, 2099.
17. *Lu, Y., **Ballouz, R.-L.**, and Richardson, D.C., 2018. Exploring Shear-free Ringlet Formation with Direct Simulations of Saturn's B Rings. *Astronomical Journal* 156, 129.
18. Thuillet, F., Michel, P., Maurel, C., **Ballouz, R.-L.**, et al., 2018. Numerical modeling of lander interaction with a low-gravity asteroid regolith surface. *Astronomy & Astrophysics*, 615, 41.
19. Zhang, Y., Richardson, D.C., Barnouin, O.S., Michel, P., Schwartz, S. R., and **Ballouz, R.-L.**, 2018. Rotational Failure of Rubble-pile Bodies: Influences of Shear and Cohesive Strengths. *The Astrophysical Journal*, 857, 15.
20. Lauretta, D. S., Balram-Knutson, S. S., Beshore, E., ..., **Ballouz, R.-L.**, et al. 2017. OSIRIS-Rex: Sample Return from Asteroid (101955) Bennu. *Space Science Reviews*, 212, 925.
21. Zhang, Y., Richardson, D.C., Barnouin, O.S., ..., **Ballouz, R.-L.**, et al. 2017. Creep stability of the proposed AIDA mission target 65803 Didymos: I. Discrete cohesionless granular physics model. *Icarus*, 98.
22. ***Ballouz, R.-L.**, Richardson, D.C., and Morishima, R., 2017. Numerical Simulations of Saturn's B Ring: granular friction as a mediator between self-gravity wakes and viscous overstability. *Astronomical Journal*, 153, 146.
23. *Maurel, C., **Ballouz, R.-L.**, Richardson, D.C., Michel, P., and Schwartz, S.R., 2017. Numerical simulations of oscillation-driven regolith motion: Brazil-nut Effect. *Monthly Notices of the Royal Astronomical Society*, 464, 2866.
24. Perera, V., Jackson, A.P., Asphaug, E., and **Ballouz, R.-L.**, 2016. The spherical Brazil Nut Effect and its significance to asteroids. *Icarus*, 278, 194.
25. ***Ballouz, R.-L.**, Richardson, D.C., Michel, P., and Schwartz, S.R., 2015. Numerical simulations of collisional disruption of rotating gravitational aggregates: Dependence on material properties. *Planetary & Space Science*, 107, 29.
26. Yu, Y., Richardson, D.C., Michel, P., Schwartz, S.R., and **Ballouz, R.-L.**, 2015. Numerical predictions of surface effects during the 2029 close approach of Asteroid 99942 Apophis. *Icarus*, 242, 82.
27. Matsumura, S., Richardson, D.C, Michel, P., Schwartz, S.R., and **Ballouz, R.-L.**, 2014. The Brazil nut effect and its application to asteroids. 2014. *Monthly Notices of the Royal Astronomical Society*, 443, 3368.

28. ***Ballouz, R.-L.**, Richardson, D.C., Michel, P., and Schwartz, S.R., 2014. Rotation-dependent Catastrophic Disruption of Gravitational Aggregates. *Astrophysical Journal*, 789, 158.
29. Sion, E.M., Linell, A.P., Godon, P., and **Ballouz, R.-L.**, 2011. The Hot Components of Am CVn Helium Cataclysmics. *The Astrophysical Journal*, 741, 63.
30. Mizusawa, T., Merritt, J., **Ballouz, R.-L.**, et al., 2010. Far Ultraviolet Spectroscopy of Seven Nova-Like Variables. *Publications of the Astronomical Society of the Pacific*, 122, 299.
31. Zellem, R., Hollon, N., **Ballouz, R.-L.**, et al., 2009. Hubble Space Telescope STIS Spectroscopy of the Peculiar Nova-Like Variables BK Lyn, V751 Cygni, and V380 Oph. *Publications of the Astronomical Society of the Pacific*, 121, 942.
32. ***Ballouz, R.-L.**, and Sion, E.M. On the Accretion Rates of SW Sextantis Nova-like Variables. 2009. *The Astrophysical Journal*, 697, 1717-1724.

Selected Invited Talks

- **Ballouz, R.-L.**, Crites, S.T., Baresi, N., et al. The Shifting Sands of Phobos: The Martian moon's eccentric orbit triggers landslides on its surface. Southwest Research Institute, Boulder. Colloquium. Dec 10, 2019. Boulder, CO.
- **Ballouz, R.-L.**, Walsh, K.J., Jawin, E., et al. Modeling surface mobility mechanisms on a top-shaped near-Earth asteroid. Japan Geoscience Union. Solar System Small Bodies Session. May 29, 2019. Chiba, Japan.
- **Ballouz, R.-L.**, Crites, S.T., Baresi, N., et al. The Shifting Sands of Phobos: The Martian moon's eccentric orbit triggers landslides on its surface. Nagoya University Earth & Planetary Physics Seminar. Sept 14, 2018. Nagoya, Japan.
- **Ballouz, R.-L.**, Baresi, N., Crites, S.T., et al. The Shifting Sands of Phobos: The Martian moon's eccentric orbit triggers landslides on its surface. Japan Geoscience Union. Regolith Science Session. May 22, 2018. Chiba, Japan.
- **Ballouz, R.-L.**, Walsh, K.J., Richardson, D.C., et al. Large asteroid shapes from catastrophic disruption and reaccumulation. 9th Workshop on Catastrophic Disruption in the Solar System (CD9). May 16, 2018. Kobe, Japan.

Selected Media Coverage

“2 different asteroids visited by spacecraft may have once been part of 1 larger asteroid”
<https://us.cnn.com/2020/05/31/world/asteroids-bennu-ryugu-scn/index.html>

“A weird powder puzzle on the Martian Moon Phobos may be solved,” Space.com and foxnews.com
<https://www.space.com/mars-moon-phobos-orbit-surface-powder.html>

“The shifting sands of Phobos” Institute of Space and Astronautical Science Cosmos Blog
<http://cosmos.isas.jaxa.jp/the-shifting-sands-of-phobos/>

Dones, L. “Saturn’s Rings: what Cassini has taught us” The Planetary Report, 37, 9.

Podcast Interview with Prof. Harold C Connoly Jr.
<https://podcasts.apple.com/us/podcast/podcast-episode-24-astronomy-in-lebanon-interview-ronald/id1202375757?i=1000455196616>

Mentoring

- 2017-2019: Sokendai University PhD student Onur Çelik: co-authored a paper in Planetary & Space Science on the deployment of a small lander on the surface of Phobos.
- 2017-2018: University of Tokyo PhD student Yota Ishigaki: efficiency of core sampling in the low-gravity environment of Phobos.
- 2015-2017: University of Maryland Undergraduate student Lucy Lu: co-authored a paper on large-scale structure in Saturn’s dense rings.
- 2013-2015: ISAE-Supaero Masters student Clara Maurel (now EAPS MIT): co-authored two papers on granular convection and spacecraft interaction with asteroid surfaces.

Service

- Asteroid Day 2020 Virtual Panelist. Seeing is Believing: The Art of Asteroid Computer Simulations.
- Science Organizing Committee for EPSC 2020 meeting (current)
- Science Organizing Committee for AAS DPS 2020 meeting (current)
- 2017-2018: Co-authored the Japanese Aerospace Exploration Agency (JAXA)’s proposal to become an international associate member in the Solar System Exploration Virtual Institute (SSERVI). Proposal was approved and JAXA became an Associate member in July 2019.
- Nov 2019: Science Organization Committee for Asteroid Science in the Age of Hayabusa 2 and OSIRIS-REx Workshop.
- Since 2015: Reviewer for Icarus, Monthly Notices of the Royal Astronomical Society, Astronomical Journal, Astronomy & Astrophysics, Planetary & Space Science, Journal of Geophysical Research: Planets, Progress in Earth and Planetary Science, and Nature Scientific Reports.
- Since 2016: Served in four review panels (1 external) for NASA programs.

Past, Current, and Pending Grants

Research Grants

- 2015-16. *Embassy of France in the US: Chateaubriand Fellowship*, Studying the Physical Structure of Asteroids through Numerical Simulations of Impacts. (PI)
- 2017-18. *Japanese Aerospace Exploration Agency: Aerospace Project Research Fellowship*, Spacecraft interaction with planetary surfaces in low gravity. (PI)
- 2020-23 Pending. *NASA Solar System Workings*. The Shifting Sands of Phobos: Surface refreshing of Martian moon Phobos by orbital eccentricity-driven grain motion. (PI).
- 2021-23 Pending. *NASA Yearly Opportunities for Research in Planetary Defense*. The evolution of the strength of monolithic Near-Earth Objects against impacts (PI).
- 2020 Pending. *US Department of Defense: Newton Award for Transformative Ideas during the COVID-19 Pandemic*. The Strength of Uncharted Potentially Hazardous Asteroids. (PI)
- 2021-23 Pending. *NASA Emerging Worlds*. Collisional disruption and the formation of small icy bodies in the early Solar System. (Co-I).

Computing Grants

- 2015-16, *Johns Hopkins University Bluecrab*. Planetary Rings. 1 million SUs. (Co-I)
- 2017-18, *Johns Hopkins University Bluecrab*. Planetary Rings. 1 million SUs. (Co-I)
- 2018-19, *Johns Hopkins University Bluecrab*. Chariklo Rings. 1 million SUs. (Co-I)
- 2019-20, *Johns Hopkins University Bluecrab*. Asteroid Formation. 1 million SUs. (PI)

Space Mission Teams

OSIRIS-REx Regolith Development Working Group Postdoc
Hayabusa2 ONC-T collaborator
HERA International Co-I
MMX Co-I ESA/DLR Rover
MMX Co-I Surface Science Team
Asteroid Sailor Mission Concept Team Co-I

Selected Awards

- Dean's Merit Fellowship. University of Maryland. 2015
- John Chi-Lin Wang Award for Academic Excellence. University of Maryland. 2013
- Distinguished Teaching Assistant Award. University of Maryland. 2013
- Cardelli Award for Outstanding Research. Villanova University. 2011
- Falvey Scholar: Outstanding Undergraduate Research. Villanova University. 2011
- Jenkins Scholarship Award. Villanova University. 2008
- Bailey Scholarship Award. Villanova University. 2008