SHANNON MACKENZIE

shannon.mackenzie@jhuapl.edu
(240) · 592 · 1521

11100 Johns Hopkins Road
Mailstop 200-W230 Laurel, MD 20723

Dr. MacKenzie is a planetary scientist interested processes that create and rework the surfaces of icy satellites. She has investigated sediments on Titan since 2012—working with data from Cassini's Visual and Infrared Mapping Spectrometer, RADAR, and Imaging Science Subsystem—with the aim of understanding how sediments play a role in habitability and prebiotic chemistry. She serves as a Co-I on the Dragonfly mission concept, assisting in the defining and implementation of the science goals and objectives as a science theme lead. She most recently led a team of over 50 scientists to NASA's call for pre-Decadal Survey mission concept studies to propose a study of large-class missions to Saturn's moon Enceladus.

EDUCATION

Ph.D. Physics University of Idaho	December 2017
M.Sc. Physics University of Idaho	August 2015
B.S. Physics University of Louisville	May 2012

PROFESSIONAL & MISSION EXPERIENCE

Post-doctoral fellow, Johns Hopkins University Applied Physics Lab	1/2018-present
Dragonfly NF4 Mission concept, Co-I and Science Theme Lead	3/2016-present
Oceanus NF4 Proposal, Student collaborator	5/2016 – 4/2017
JPL Planetary Science Summer School, Principal Investigator	5/2015- 8/2015

PUBLICATIONS

MacKenzie, S. M., J. M. Lora, and R. D. Lorenz. "A Thermal Inertia Map of Titan" *Journal of Geophysical Research: Planets* https://doi.org/10.1029/2019JE005930

MacKenzie, S. M., J. W. Barnes, J. D. Hofgartner, S. P. D. Birch, M. M. Hedman, A. Lucas, S. Rodriguez, E. P. Turtle, and C. Sotin. "The case for seasonal surface changes at Titan's lake district." *Nature Astronomy* (2019): 1.

Barnes, J.W., **S. M. MacKenzie**, R. D. Lorenz, and E. P. Turtle. "Titan's Twilight and Sunset Solar Illumination." *The Astronomical Journal* 156, no. 5 (2018): 247.

Turtle, E. P., J. E. Perry, J. M. Barbara, A. D. Del Genio, S. Rodriguez, S. Le Mouélic, C. Sotin J. M. Lora, S. Faulk, P. Corlies, J. Kelland, **S. M. MacKenzie**, R. A. West, A. S. McEwen, J. I. Lunine, J. Pitesky, T . L. Ray, M. Roy. "Titan's meteorology over the Cassini mission: Evidence for extensive subsurface methane reservoirs." *Geophysical Research Letters* 45, no. 11 (2018): 5320-5328.

Hatchett, W. T., J. W. Barnes, J. P. Ahlers, **S. M. MacKenzie**, and M. M. Hedman. "A pilot investigation to constrain the presence of ring systems around transiting exoplanets." *New Astronomy* 60 (2018): 88-94.

Lorenz, R. D., E. P. Turtle, J. W. Barnes, M. G. Trainer, D. S. Adams, et al including **S. M. MacKenzie**. "Dragonfly: a Rotorcraft Lander Concept for scientific exploration at Titan." *John Hopkins APL Technical Digest*, (2017), 34, 3

Barnes, J. W., **S. M. MacKenzie**, E. F. Young, L. E. Trouille, S. Rodriguez, T. Cornet, B. K. Jackson, M. Ádámkovics, C. Sotin, and J. M. Soderblom. "Spherical Radiative Transfer in C++ (SRTC++): A Parallel Monte Carlo Radiative Transfer Model for Titan." *The Astronomical Journal* 155, no. 6 (2018): 264.

Birch, S. P. D., A. G. Hayes, P. Corlies, E. R. Stofan, J. D. Hofgartner, et al including **S. M. MacKenzie**. "Morphological evidence that Titan's southern hemisphere basins are paleoseas." *Icarus* 310 (2018): 140-148.

MacKenzie, S. M., T. E. Caswell, C. M. Phillips-Lander, E. N. Stavros, J. D. Hofgartner, V. Z. Sun, K. E. Powell et al. "THEO concept mission: testing the habitability of Enceladus's Ocean." *Advances in Space Research* 58, no. 6 (2016): 1117-1137.

MacKenzie, S. M., and J. W. Barnes. "Compositional similarities and distinctions between Titan's evaporitic terrains." *The Astrophysical Journal* 821, no. 1 (2016): 17.

Cordier, D., T. Cornet, J. W. Barnes, **S. M. MacKenzie**, T. Le Bahers, et al. "Structure of Titan's evaporites." *Icarus* 270 (2016): 41-56.

Neish, C. D., J.W. Barnes, C. Sotin, **S. M. MacKenzie** et al "Spectral properties of Titan's impact craters imply chemical weathering of its surface." *Geophysical Research Letters* 42.10 (2015): 3746-3754.

Vixie, G., J. W. Barnes, B. Jackson, S. Rodriguez, S. Le Mouélic, et al including **S. M. MacKenzie**. "Possible temperate lakes on Titan." *Icarus* 257 (2015): 313-323.

MacKenzie, S. M., J. W. Barnes, C. Sotin, J. M. Soderblom, S. Le Mouélic, S. Rodriguez, K. H. Baines et al. "Evidence of Titan's climate history from evaporite distribution." *Icarus* 243 (2014): 191-207.

Pipino, A., T. Szabo, E. Pierpaoli, **S. M. MacKenzie**, & F. Dong. "The properties of brightest cluster galaxies in the Sloan Digital Sky Survey Data Release 6 adaptive matched filter cluster catalogue". *Monthly Notices of the Royal Astronomical Society*, 417(2011), 2817-2830.

FELLOWSHIPS AND GRANTS

Cassini Data Analysis Program	2019-2022
NASA Earth and Space Science Fellowship	2014-2017
Leonard Halland Centennial Scholarship	2015-2016
Glen E. and Jean K. Nielsen Science Scholarship	2014-2015
Idaho Space Grant Consortium Research Fellowship	2013
Barry M. Goldwater Scholarship	2011

FIRST AUTHOR PRESENTATIONS

Lunar and Planetary Science Conference March 2019

"A Thermal Inertia Map of Titan and the Effect on a Dry Climate" (talk)

"Titan's Surface from Dragonfly: Bridging the Gap Between Composition

and Environment" (poster)

American Geophysical Union Fall Meeting December 2018
"Near-infrared characteristics of Titan's north polar cap" (talk)

Geological Society of America Annual Meeting November 2018
"Near-infrared characteristics of Titan's north polar cap" (invited talk)
"Dragonfly: a rotorcraft-lander to explore Titan's prebiotic chemistry and habitability" (talk)

50th Meeting of the Division of Planetary Sciences October 2018
"On the nature of Titan's north polar cap" (talk)

Titan Surface Working Group May 2018
"A Thermal Inertia Map of Titan" (talk)

49th Meeting of the Division of Planetary Sciences November 2017
"A bright intra-dune feature on Titan and its implications for sand formation and transport" (poster)

Titan Surface Working Group October 2017
"Phantom Lakes at the North Pole" (talk)

Cassini VIMS Team Meeting September 2017
"Characteristics of the Bright Fensal Feature" (talk)

5th International Planetary Dunes Workshop May 2017
"A new candidate sand source in Titan's equatorial region?" (talk)

Titan Surface Working Group November 2016
"Spherical Radiative Transfer in C++" (talk)

48th Meeting of the Division of Planetary Sciences October 2016
"Compositional mapping of Titan's North Pole with VIMS" (talk)

Outer Planets Assessment Group Meeting August 2016
"Titan's North Pole: Defining the Spectral Units" (poster)

International Association of Sedimentology May 2016
"Exploring Titan's Dynamic Surface with Evaporites" (talk)

Cassini VIMS Team Meeting May 2016
"North Polar Mapping with VIMS" (talk)

Outer Planets Assessment Group Meeting February 2016
"THEO Concept Mission: Testing the Habitability of Enceladus's Ocean" (poster)

47th Meeting for the Division for Planetary Science — November 2015
"THEO Concept Mission: Testing the Habitability of Enceladus's Ocean" (poster)

4th International Planetary Dunes Workshop — May 2015
"The Lake-Dune Connection: Investigating Titan's Sand Sources" (talk)

46th Meeting for the Division for Planetary Science — November 2014
"Characteristics of the 5-um-bright spectral unit from spectral analysis of Tui Regio" (talk)

Titan Surface Working Group — October 2014
"Is all 5-μm-bright material the same?" (talk)

45th Meeting for the Division for Planetary Science — October 2013
"Evidence of Titan's Climate History from Evaporite Distribution" (talk)

Titan Through Time — April 2014
"Spectral Characteristics of Titan's 5-μm-bright Material" (poster)

Cassini Titan Surface Meeting — August 2013
"Evidence of Titan's Climate History from Evaporite Distribution" (talk)

HONORS AND AWARDS

Walter G. Berl Award for Outstanding Paper in JHU APL Technical Digest — April 2018
JHU APL Bumblebee Award for Championing Revolutionary Capabilities — April 2018
University of Idaho Dean's Graduate — May 2017
Division for Planetary Sciences Hartmann Student Travel Award — October 2017
University of Idaho 3 Minute Thesis Competition 1st Place — April 2016
University of Idaho College of Science Innovation Showcase 3rd Place — April 2016
University of Idaho College of Science Video Competition 1st Place — April 2016
NSF Graduate Research Fellowship Program Honorable Mention — 2012
University of Louisville College of Arts and Sciences Woodcock Medalist — 2012
University of Louisville Honors Scholar Suma Cum Laude — 2012
University of Louisville Department of Physics and Astronomy Graduating Senior — 2012
William Marshal Bullitt Award in Astronomy — 2012
Barry M. Goldwater Scholarship — 2011

COMMUNITY EXPERIENCE

Conference organizer
- DPS SOC — 2018
- Titan Surface Working Group Meeting — 2015

Member of Roadmap to Ocean Worlds Committee — 2016

Reviewer for *Icarus* since 2017
Reviewer for NASA mission and grant proposals as
Executive Secretary, External Reviewer since 2015

MISSION EXPERIENCE

Dragonfly New Frontiers 4 Proposal since March 2016
Co-Investigator: co-wrote the science section of the proposal, created maps for landing site selection, geology science team lead

Oceanus New Frontiers 4 Proposal May - April 2016
Student collaborator: assisted in the design and writing of evaporite investigation, science section of the proposal, and STM development

Jet Propulsion Laboratory Planetary Science Summer School May - August 2015
Principal Investigator: led the design, planning, and execution of a mock mission; presented poster at several conferences; wrote manuscript

FIELD EXPERIENCE

Veevers Crater, Western Australia July 2016
Assisted in OSL and photographic data collection
United Arab Emirates April 2014
Assisted in OSL, GPR, and photographic data collection

SHORT COURSES

Sensors & Software GPR short course at GSA November 2018
NASA Astrobiology Institute Astrobiology Summer School June 2018
JPL Planetary Science Summer School June – August 2015

TEACHING EXPERIENCE

Graduate Teaching Assistant August - December 2015
University of Idaho Department of Physics
Undergraduate Teaching Assistant August - December 2011
University of Louisville Department of Physics and Astronomy