

# J. MICHAEL BATTALIO

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Updated: May 5, 2020

## EMPLOYMENT HISTORY

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<b>Postdoctoral Associate</b> Yale University · New Haven, CT	<i>October 2019–present</i>
<b>Postdoctoral Fellow</b> Harvard-Smithsonian Center for Astrophysics · Cambridge, MA	<i>October 2017–September 2019</i>
<b>Graduate Assistant</b> Texas A&M University · College Station, TX <i>Kenneth P. Pipes</i> Endowed Fellow	<i>August 2012–May 2017</i> <i>August 2014–July 2016</i>
<b>Graduate Assistant</b> Mississippi State University · Starkville, MS <i>American Meteorological Society 21st Century</i> Fellow	<i>August 2010–May 2012</i> <i>August 2010–July 2011</i>

## EDUCATION

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<b>Ph.D. Atmospheric Sciences</b> Texas A&M University · College Station, TX Dissertation: <i>Wave Energetics of the Atmosphere of Mars</i> Committee co-chairs: Istvan Szunyogh and Mark Lemmon	<i>May 2017</i>
<b>M.S. Geoscience</b> Mississippi State University · Starkville, MS	<i>May 2012</i>
<b>B.S. Physics &amp; B.S. Geoscience (Professional Meteorology)</b> <b>minors in Mathematics, Communication, and Music</b> Mississippi State University · Starkville, MS	<i>May 2010</i>

## FUNDED RESEARCH PROPOSALS

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**Co-Investigator** (PI of Yale subcontract)  
*“Improved Climatology of Lower and Middle Atmospheric Gravity Wave Activity at Mars.”*  
funded by NASA Mars Data Analysis Program  
PI: Nicholas Heavens, Space Science Institute  
Funded 2019-2022. (Amount to Yale = \$160,075)

## PUBLICATIONS

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### Peer-Reviewed Articles (First author)

1. **Battalio, J. Michael** and Huiqun Wang. “Eddy Evolution during Large Dust Storms.” *Icarus* 338 (2020): 113507. doi: 10.1016/j.icarus.2019.113507.
2. **Battalio, J. Michael** and Huiqun Wang. “The Aonia-Solis-Valles Dust Storm Track in the Southern Hemisphere of Mars.” *Icarus* 321 (2019): 367–378. doi: 10.1016/j.icarus.2018.10.026.
3. **Battalio, J. Michael**, Istvan Szunyogh, and Mark Lemmon. “Wave Energetics of the Southern Hemisphere of Mars.” *Icarus* 309 (2018): 220–240. doi: 10.1016/j.icarus.2018.03.015.
4. **Battalio, J. Michael** and Jamie Dyer. “The Minimum Length Scale for Evaluating QG Omega Using High Resolution Numerical Model Data.” *Monthly Weather Review* 145 (2017): 1659–1678. doi:10.1175/MWR-D-16-0241.1.
5. **Battalio, J. Michael**, Istvan Szunyogh, and Mark Lemmon. “Energetics of the Martian Atmosphere Using the Mars Analysis Correction Data Assimilation (MACDA) Dataset.” *Icarus* 276 (2016): 1–20. doi:10.1016/j.icarus.2016.04.028.  
Corrigendum: *Icarus* 302 (2018): 565–567. doi: 10.1016/j.icarus.2017.10.001.

### (Co-author)

1. Cooper, Brittney, John Moores, **J. Michael Battalio**, Scott Guzewich, Rachel Modestino, and Michael Tabascio. “Aphelion Cloud Belt Phase Function Investigations with Mars Color Imager (MARCI).” *Planetary and Space Science* 184 (2020): 104840. doi: 10.1016/j.pss.2020.104840.
2. Shirley, James H., Richard J. McKim, **J. Michael Battalio**, and David M. Kass. “Orbit-Spin Coupling and the Triggering of the Martian Planet-Encircling Dust Storm of 2018.” (2020): (in press *Journal of Geophysical Research: Planets*).
3. Moore, Casey, John Moores, Claire Newman, Mark Lemmon, Scott Guzewich, **J. Michael Battalio**. “Vertical and Horizontal Heterogeneity of Atmospheric Dust Loading in Northern Gale Crater, Mars.” *Icarus* 329 (2019): 197–206. doi: 10.1016/j.icarus.2019.03.041.
4. Guzewich, Scott, Claire E. Newman, Michael Smith, John E. Moores, Christina L. Smith, Casey Moore, Mark I. Richardson, David Kass, Armin Kleinböhl, Michael Mischna, F. J. Martin-Torres, M-P. Zorzano-Mier, and **J. Michael Battalio**. “The Vertical Dust Profile over Gale Crater, Mars.” *Journal of Geophysical Research: Planets* 122 (2017): doi:10.1002/2017JE005420.
5. Newman, Claire, Javier Gomez-Elvira, Mark Richardson, Mercedes Marin, Sara Navarro, Josefina Torres, **J. Michael Battalio**, Scott Guzewich, Robert Sullivan, Manuel de la Torre, Ashwin Vasavada, and Nathan Bridges. “Winds Measured by

*the Rover Environmental Monitoring Station (REMS) during the Mars Science Laboratory (MSL) Rover's Bagnold Dunes Campaign and Comparison with Numerical Modeling using MarsWRF.* Icarus 291 (2017): 203–231. doi:10.1016/j.icarus.2016.12.016.

### Submitted Articles

1. **Battalio, J. Michael** and Huiqun Wang. “*The Mars Dust Activity Database: Major and Minor Dust Storms.*” (in review with Icarus).
2. **Battalio, J. Michael.** “*Annular modes of variability in the atmospheres of Mars and Titan.*” (submitted to Nature Astronomy).
3. Smith, Christina L., Mark Lemmon, John Moores, Scott Guzewich, Timothy H. McConnochie, Claire E. Newman, Alain S. J. Khayat, **J. Michael Battalio**, Casey A. Moore, and Douglas Ellison. “*The Line-of-Sight Extinction record at Gale Crater as observed by MSL's Mastcam and Navcam through ~2500 sols*” (submitted to JGR-Planets)

### Articles in Preparation

1. **Battalio, J. Michael.** “*Decadal Trends in the Local Energetics.*” (in prep for submission to Journal of Climate).

### Peer-reviewed articles as “Science Team” member

1. Mahaffy P. R., C. R. Webster, J. C. Stern, A. E. Brunner, S. K. Atreya, P. G. Conrad, S. Domagal-Goldman, J. L. Eigenbrode, G. J. Flesch, L. E. Christensen, H. B. Franz, C. Freissinet, D. P. Glavin, J. P. Grotzinger, J. H. Jones, L. A. Leshin, C. Malespin, A.C. McAdam, D. W. Ming, R. Navarro-Gonzalez, P. B. Nilcs, T. Owen, A. A. Pavlov, A. Steele, M. G. Trainer, K. H. Williford, J. J. Wray, and the MSL Science Team\*. “*The imprint of atmospheric evolution in the D/H of Hesperian clay minerals on Mars.*” Science (2015) doi:10.1126/science.1260291 [\*as a member of the “MSL Science Team” identified in Supplementary Material]
2. Webster, C. R. , P. R. Mahaffy, S. K. Atreya, G. J. Flesch, M. A. Mischna, P-Y. Meslin, K. A. Farley, P. G. Conrad, L. E. Christensen, A. A. Pavlov, J. Martin-Torres, M-P. Zorzano, T. H. McConnochie, T. Owen, J. L. Eigenbrode, D. P. Glavin, A. Steele, C. A. Malespin, P. D. Archer Jr., B. Sutter, P. Coll, C. Freissinet, C. P. McKay, J. E. Moores, S. P. Schwenzer, J. C. Bridges, R. Navarro-Gonzalez, R. Gellert, M. T. Lemmon, and the MSL Science Team\*. “*Mars methane detection and variability at Gale crater.*” Science (2014) doi:10.1126/science.1261713 [\*as a member of the “MSL Science Team” identified in Supplementary Material]

### Extended Abstracts

1. Kahanpää, Henrik, Mark Lemmon, D. Reiss, J. Raack, E. Mason, **J. Michael Battalio.** “*Martian Dust Devils Observed Simultaneously by Imaging and By Meteorological Measurements.*” 49th Lunar and Planetary Science Conference, Woodlands, TX, March 2018.

2. Lemmon, Mark, C. E. Newman, N. Renno, E. Mason, **J. Michael Battalio** and others. “*Dust Devil Activity at the Curiosity Mars Rover Field Site.*” Lunar and Planetary Science Conference XLVIII, Woodlands, TX, March 2017.
3. **Battalio, J. Michael**, I. Szunyogh, M. T. Lemmon. “*Eddy Energetics of the Southern Hemisphere of Mars from the Mars Analysis Correction Data Assimilation (MACDA).*” Sixth International Workshop on the Mars Atmosphere: Modeling and Observations, Granada, Spain, January 2017.

## PUBLISHED DATASETS

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1. Battalio, J. Michael, and Helen Wang, 2019: *The Mars Dust Activity Database (MDAD)*. *Harvard Dataverse*, doi: 10.7910/DVN/F8R2JX.
2. Wang, Helen, J. Michael Battalio, and Zachery Huber, 2018: *Mars MRO MARCI Daily Global Weather Maps v1*. *NASA Planetary Data System*.

## PRESENTATIONS

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### Invited Oral Presentations

1. “*Regional Atmospheric Dynamics and the Mars Dust Activity Database*” Department of Geology and Geophysics, Yale University, New Haven, CT, 11/14/2020.
2. “*Observations of Martian Dust Storms from Global to Micro-scale*” Department of Geology and Geophysics, Postdoc Luncheon, New Haven, CT, 11/13/2019.
3. “*The Solstitial Pause, Dust, and Baroclinic Instability in the Martian Atmosphere*” Department of Atmospheric Sciences, Texas A&M University, College Station, Texas, 1/26/2016.
4. “*Effects of the Martian Global Dust Storm on the Energetics of the Martian Atmosphere*” Department of Atmospheric Sciences, Texas A&M University, College Station, Texas, 1/24/2015.

### Contributed Oral Presentations

1. “*Atmospheric Circulation and Dust Activity on Mars.*” **J. M. Battalio**, H. Wang. American Geophysical Union 2018 Meeting, Washington DC, November 2018
2. “*Development Histories of Martian Dust Storms.*” **J. M. Battalio**, H. Wang. Harvard-CfA Postdoc Symposium, Cambridge, MA, October 2017.
3. “*The Energetics of Transient Eddies in the Martian Northern Hemisphere.*” **J. M. Battalio**, I. Szunyogh, M. T. Lemmon. The Dynamical Martian Atmosphere, 48th DPS Meeting, Pasadena, CA, October 2016.
4. “*Reduced Baroclinicity During Martian Global Dust Storms.*” **J. M. Battalio**, I. Szunyogh, M. T. Lemmon. Mars’s Atmosphere and Surface, 47th DPS Meeting, National Harbor, MD, November 2015.

5. *“Energetics of the Northern Hemisphere of Mars.”* **J. M. Battalio**, I. Szunyogh. Atmospheric Science Graduate Council Seminar, Texas A&M University, March 2014.
6. *“Application of QG Theory to Assess Model Initialization.”* **J. M. Battalio**, J. L. Dyer, 10th Southeast Severe Storm Symposium, Starkville, MS, March 2012.

### Contributed Poster Presentations

1. *“Major and Minor Dust Storm Sequences on Mars.”* **J. M. Battalio**, H. Wang. American Geophysical Union 2019 Meeting, San Francisco, CA, December 2019.
2. *“An Important Dust Storm Track in the Southern Hemisphere of Mars.”* **J. M. Battalio**, H. Wang. 50th DPS Meeting, Pasadena, Knoxville, TN, October 2018.
3. *“The Minimum Horizontal Length Scale When Evaluating Quasi-Geostrophic Omega.”* **J. M. Battalio**, J. L. Dyer. 28th Conference on Weather Analysis and Forecasting / 24th Conference on Numerical Weather Prediction, American Meteorological Society Meeting, Seattle, WA, January 2017.
4. *“A Comparison of Martian Transient Wave Energetics in High and Low Optical Depth Environments.”* **J. M. Battalio**, I. Szunyogh, M. T. Lemmon. Current Processes in the Atmosphere of Mars I, American Geophysical Union 2016 Meeting, San Francisco, CA, December 2016.
5. *“Using Recent Inter-Annual Variability in Mars Atmospheric Dynamics to Consider Past Climates.”* **J. M. Battalio**. Astrobiology Graduate Conference, Boulder, CO, July 2016.
6. *“Necessity of Convection Parameterization in Simulating an MCS at High Resolution.”* **J. M. Battalio**, K. Pitts, M. Herrera. 30th Conference on Hydrology, Precipitation Processes and Observations for Atmospheric, Land Surface, and Hydrological Modeling, American Meteorological Society Meeting, New Orleans, LA, January 2016.
7. *“An Investigation of the Local Energetics of the Martian Atmosphere.”* **J. M. Battalio**, I. Szunyogh, M. T. Lemmon. Current Processes in the Atmosphere of Mars I, American Geophysical Union 2014 Meeting, San Francisco, CA, December 2014.
8. *“Quantitative Analysis and 3D Visualization of NWP Data Using Quasi-Geostrophic Equations.”* **J. M. Battalio**, J. L. Dyer. 28th Conference on Interactive Information Processing Systems American Meteorological Society Annual Meeting, New Orleans, LA, January 2012.
9. *“Visualization of Vorticity and Divergence in Three Dimensions.”* **J. M. Battalio**, J. L. Dyer. 36th Annual Meeting National Weather Association Conference, Birmingham, AL, October 2011.

### Co-authored Presentations

1. “A Multiannual Record of Gravity Wave Activity in Mars’s Lower Atmosphere of On-Planet Observations by the Mars Climate Sounder.” N. Heavens, D. Kass, A. Kleinböhl, J. Schofield, **J. M. Battalio**, A. Pankine. UK Planetary Atmospheres Meeting 2020, London, UK, February 2020.
2. “Major Dust Storms and Changes in Atmospheric Circulation on Mars.” H. Wang, **J. M. Battalio**. 42nd COSPAR Scientific Assembly, Pasadena, CA, July 2018.
3. “Meteorological properties of Martian Dust Devils as observed by MSL.” H. Kahanpää, M. T. Lemmon, E. Mason, **J. M. Battalio**. European Planetary Science Congress 2017, Riga, Latvia, September, 2017.
4. “The Vertical Profile of Dust over Gale Crater, Mars.” S. D. Guzewich, C. E. Newman, M. D. Smith, J. E. Moores, C. L. Smith, C. Moore, M. I. Richardson, D. Kass, A. Kleinböhl M. Mischna, F. J. Martin-Torres, M-P. Zorzano Mier, **J. M. Battalio**. American Geophysical Union 2017 Meeting, New Orleans, LA, December 2017.
5. “The Mars Science Laboratory Dust Storm Campaign.” S. D. Guzewich, C. E. Newman, M. De la Torre, M. Lemmon, E. Mason, **J. M. Battalio** and others. Sixth International Workshop on the Mars Atmosphere: Modeling and Observations, Granada, Spain, January 2017.
6. “Extinction Measurements of Dust Aerosol from Mars Science Laboratory Solar Images.” M. T. Lemmon, **J. M. Battalio**, and others. Current Processes in the Atmosphere of Mars I, American Geophysical Union 2016 Meeting, San Francisco, CA, December 2016.

## TEACHING EXPERIENCE

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### Graduate Mentor

*Texas A&M University*

Department of Atmospheric Sciences  
*College Station, TX*

- Texas A&M Research Experience for Undergraduates: Summer 2014 and Summer 2015

### Teaching Assistant

*Texas A&M University*

Department of Atmospheric Sciences  
*College Station, TX*

- Computer Applications in the Atmospheric Sciences (ATMO 321): Fall 2014 (1 section total)

### Instructor

*Texas A&M University*

Department of Atmospheric Sciences  
*College Station, TX*

- Atmospheric Science Lab (ATMO 202): Fall 2012, Spring 2013, Fall 2013 (7 sections total)

### Teaching Assistant

*Mississippi State University*

Department of Geosciences  
*Starkville, MS*

- Forecasting Severe Local Storms (GR 6842): Spring 2012 (1 section)

- Principles of GIS (GR 4303/6303): Summer 2011, Fall 2011 (2 sections total)
- Geography (GR 1123): Fall 2010, Spring 2011, Fall 2011, Spring 2012 (4 sections total)

**Substitute Lecturer**

*Mississippi State University*

Department of Geosciences  
Starkville, MS

- Dynamic Meteorology II (GR 4933/6933): Spring 2011, Spring 2012 (2 sections total)
- Dynamic Meteorology I (GR 4823/6823): Fall 2010, Fall 2011 (2 sections total)

**Instructor**

*Mississippi State University*

Department of Physics  
Starkville, MS

- Physical Science Lab (PH 1011): Spring 2010 (1 section total)

**SERVICE**

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**Reviewer**

*Geophysical Research Letters, Icarus, Journal of Geophysical Research-Planets, Geoscience Data Journal, Planetary and Space Science, International Journal of Biometeorology*

**Seminar Organizing Committee Member**

*Harvard-Smithsonian Center for Astrophysics*

December 2017–September 2019

**Mentor**

MS State Famous Maroon Band Alumni Mentoring Program

**Contributor**

*NASA Mars Rover Curiosity: Mission Updates*

March–October 2017

<https://mars.jpl.nasa.gov/msl/mission/mars-rover-curiosity-mission-updates/>

**Panel Reviewer**

Solar System Workings 2018 and 2019

**External Reviewer**

- Mars Data Analysis Program Panel Review
- Solar System Workings
- Mars Data Analysis Program Panel Review
- Planetary Data Archiving, Restoration, and Tools

**Executive Secretary**

Mars Data Analysis Program Panel Review 2017

**Atmospheric Science Graduate Student Council President**

*Department of Atmospheric Sciences Texas A&M University*

June 2015–June 2017

- Recruitment Committee
- Invited Speaker Committee Chair
- Graduate Electives Committee
- Organizer for Texas A&M ATMO March for Science Demonstration Booth

**Graduate Program Committee Student Representative**

*Department of Atmospheric Sciences Texas A&M University*

August 2015–May 2017

**Atmospheric Science Graduate Student Council Vice-President**

*Department of Atmospheric Sciences Texas A&M University*

June 2013–May 2015

- IT Committee Chair
- Graduate Electives Committee Chair
- Recruitment Committee
- Texas A&M Graduate Student Council

**Judge for Student Research Week**

*Texas A&M University*

2013–2016

**Member**

- American Meteorological Society 2007–present
- National Weather Association 2007–present
- American Geophysical Union 2012–present
- American Astronomical Society (Division of Planetary Science) 2014–present

**SUBMITTED AND UNFUNDED PROPOSALS**

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1. **Primary Investigator** *“Connecting Large-Scale Atmospheric Waves to Dust Activity.”* submitted for funding 7/2020–9/2023 NASA Mars 2020 Participating Scientist Program.
2. **Primary Investigator** *“Influence of Annular Mode Dynamics on the Occurrence of Dust Storm Activity.”* NASA Mars Data Analysis Program, UNFUNDED 2020.
3. **Co-Investigator** (PI of Yale subcontract) *“Initiation and Development of Martian Regional-Scale Dust Storms in Three Spatial Dimensions and Time.”* NASA Mars Data Analysis Program, UNFUNDED 2020.  
PI: James Shirley, NASA Jet Propulsion Laboratory
4. **Primary Investigator** *“Exowater: Modeling of Warm Jupiter Atmospheres and Implications for Observations.”* NSF Astronomy and Astrophysics Postdoctoral Fellowships, UNFUNDED 2017.
5. **Primary Investigator** *“Transient Waves Within the Current Martian Climate System: Interactions with Forced, Quasi-Stationary Modes and Implications.”* NASA Postdoctoral Program Fellowship, UNFUNDED 2017.

**AWARDS**

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**Titan Through Time 5 Travel Grant**

2020

**NASA Group Achievement Award**

June 2017

*MSL Extended Mission-1 Science and Operations Team*



<b>Division of Planetary Science Travel Grant</b>	2016
<b>Claude Scruggs Scholarship</b> <i>Texas A&amp;M College of Geoscience</i>	2016
<b>Outstanding Graduate Seminar Speaker Award</b>	Spring 2014 and Fall 2015
<b>NASA Group Achievement Award</b> <i>MSL Prime Mission Science and Operations Team</i>	June 2015
<b>College Top Off Scholarship</b> <i>Texas A&amp;M College of Geoscience</i>	2013
<b>Ernestine P. Scoggins Memorial Scholarship</b> <i>Texas A&amp;M Department of Atmospheric Sciences</i>	2013
<b>National Science Foundation S-STEM Fellow</b>	2010
<b>Mississippi State University Society of Scholars</b>	2010
<b>Guillermo Salazar Rodriguez Scholarship</b> <i>American Meteorological Society Undergraduate Scholarship.</i>	2010