

# EMMA DAHL

Department of Astronomy ◊ New Mexico State University  
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## EDUCATION

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### **New Mexico State University**

Ph.D. Candidate

M.S. awarded: Spring 2018

Expected graduation date: August 2021

*Fall 2015 - Present*

*Las Cruces, NM*

### **Whitman College**

B.A., Physics-Astronomy

*August 2011 - May 2015*

*Walla Walla, WA*

## RESEARCH EXPERIENCE

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### **New Mexico State University**

*Graduate Research Assistant*

*Fall 2015 - Present*

*Las Cruces, NM*

- Worked extensively with electric engineers to build, test, and characterize the NMSU Acousto-optic Imaging Camera (NAIC)
- Used NAIC to obtain hyperspectral image cubes of Jupiter at high spectral resolution at Apache Point Observatory in Sunspot, NM during Juno perijove passes. 14 observing runs completed to date
- Developed data reduction pipeline; calibrated data and fixed optical etaloning effects
- Conducted modeling of Jupiter's atmosphere using the NEMESIS radiative transfer software package; derived structure and color of uppermost cloud deck in order to complement Juno's measurements of the deep atmosphere
- Awarded the 2018 NASA Minority University Research Education Project (MUREP) graduate fellowship; spent subsequent summers at JPL working with NASA advisor Glenn Orton, other JPL scientists, and Juno team members to further progress and improve atmospheric modeling

### **Whitman College Astronomy Department**

*Research Assistant*

*Fall 2013 - Spring 2015*

*Walla Walla, WA*

- Contributed to star formation research by analyzing Herschel Space Observatory images to inspect the orientation of protostellar disks with respect to the gassy filaments in which they form
- Established Whitman's ongoing collaboration with local heads of the International Occultation Timing Association
- Worked as observing aide on the calibration of Whitman College's 30-inch telescope, during globular cluster data collection at Kitt Peak National Observatory, observations of asteroid occultations, etc.

### **Maria Mitchell Observatory (MMO)**

*NSF Research Experience for Undergraduates (REU) Student*

*Summer 2014*

*Nantucket, MA*

- Worked with Peter Stetson of NRC Herzberg Astronomy and Astrophysics to observe open star clusters; conducted crowded-field all-sky photometry in order to discover short-period variable stars

## TEACHING & OUTREACH EXPERIENCE

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### **New Mexico State University**

*NMSU Astronomy Outreach Coordinator*

*July 2017 - July 2018*

*Las Cruces, NM*

- Planned outreach visits with community members and local schools, organized volunteers, coordinated events and activities on and off campus

**New Mexico State University**  
*Head Campus Observatory Teaching Assistant*

January 2017 - October 2018  
*Las Cruces, NM*

- Organized and managed Campus Observatory Lab. Coordinated volunteer staff, set up telescopes, discussed night sky objects and constellations with undergraduate students

**New Mexico State University**  
*Astronomy Teaching Assistant*

August 2015 - May 2016  
*Las Cruces, NM*

- Taught weekly introductory level astronomy labs. Lectured on various topics, worked with students during lab sections, graded labs, and held office hours

**Whitman College**  
*Astronomy and Physics Lab Teaching Assistant and Private Tutor*

August 2012 - May 2015  
*Walla Walla, WA*

- Worked with students to answer questions during lab sections. Met with individual students on a weekly basis to discuss concepts or problems and to give general academic advice

**Whitman College, NMSU, & MMO**  
*Outreach Assistant*

August 2012 - Present

- Gave planetarium shows, led stargazing events, gave talks to students and the public on various topics, gave observatory tours, wrote informative posters, etc. 120+ hours of outreach and community service completed on behalf of NMSU Astronomy Department to date

## PROGRAMMING EXPERIENCE

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- Strong knowledge of Python programming syntax and practices; proficient in IDL, Fortran 95, IRAF, HTML
- Wrote, tested, and compiled complete data reduction and photometric calibration Python pipeline for NAIC hyperspectral image cubes
- Extensive experience using Non-Linear Optimal Estimator for Multivariate Spectral Analysis (NEMESIS) radiative transfer code (Fortran- and IDL-based); developed Python wrapper for implementing NEMESIS with NAIC data
- Wrote Fortran 95 dynamical n-body simulation of the formation of structure in Saturn's rings
- Pipeline and scripts are available at [github.com/dahlek](https://github.com/dahlek)

## OBSERVING PROPOSALS

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- **Observations of Jupiter in support of the Juno mission - Apache Point Observatory 3.5-m telescope, Sunspot, NM**  
E. Dahl, N. Chanover, D. Voelz, R. Hull, H. Gallamore; 36 half-nights in total awarded from 2016-2020, 14 separate observing campaigns completed
- **Mapping Trace Gases in Jupiter's Atmosphere - Atacama Large Millimeter/submillimeter Array (ALMA)**  
A. Thelen, V. Allen, M. Cordiner, E. Dahl, C. Nixon, 2019, project code 2019.2.00178.S

## PUBLICATIONS

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- **Vertical Structure and Color of Jovian Latitudinal Cloud Bands during the Juno Era**  
Dahl, E. K., Chanover, N. J., Orton, G. S., Baines, K. H., Sinclair, J. A., Voelz, D. G., Wijerthna, E. A., Strycker, P. D., & Irwin, P. J. G. 2021, Planet. Sci. J. 2 16 (<https://doi.org/10.3847/PSJ/abd400>)

- **Ice Giant Atmospheric Science**  
Dahl, E. K., Brueshaber, S. R., Cosentino, R., Palotai, C., Rowe-Gurney, N., Sankar, R., Sayanagi, K., et al. 2020, White Paper in support of NASA's 2023-2032 Planetary Science and Astrobiology Decadal Survey; arXiv e-prints, arXiv:2010.08617. (<https://arxiv.org/abs/2010.08617>)
- **QUEST: A New Frontiers Uranus Orbiter Mission Concept Study**  
Jarmak, S., Leonard, E., Akins, A., Dahl, E., Cremons, D. R., et al. 2020, Acta Astronautica, Volume 170, p. 6-26.
- **Correction of etaloning effects in ground-based hyperspectral image cubes of Jupiter**  
Wijerthna, E., Dahl, E., Voelz, D., Chanover, N. J. 2020: Journal of Astronomical Telescopes, Instruments, and Systems, Volume 6, id. 028002

## CONFERENCE PROCEEDINGS

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- **An Investigation into Jupiter's 2019 Equatorial Zone Disturbance: Modifying the Crème Brûlée Model**  
Dahl, E. K., Chanover, N. J., Orton, G. S., Baines, K. H., Sinclair, J. A., Voelz, D. G., & Irwin, P. J. G. 2020, American Geophysical Union Meeting, A076-01
- **Focus questions for Ice Giant atmospheric studies in the next decade**  
Sankar, R., Dahl, E. K., Brueshaber, S. R., Cosentino, R., Palotai, C., Rowe-Gurney, N., Sayanagi, K. 2020, American Geophysical Union Meeting, P066-0006
- **Vertical Structure and Color of Jovian Latitudinal Cloud Bands during the Juno Era: Implications for a Universal Chromophore**  
Dahl, E. K., Chanover, N. J., Orton, G. S., Baines, K. H., Sinclair, J. A., Voelz, D. G., Wijerthna, E. A., Strycker, P. D., & Irwin, P. J. G., 2020, AAS/Division for Planetary Sciences Meeting Abstracts, 52, 100.07
- **Temporal evolution of the color of Jupiter's storm Oval BA**  
Gallamore, H., Chanover, N. J., Dahl, E., Voelz, D., & Hull, R., 2020, AAS/Division for Planetary Sciences Meeting Abstracts, 52, 100.05
- **Radiative Transfer Analysis of Hyperspectral Image Cubes of Jupiter Acquired During Juno's 5th Perijove Pass**  
Dahl, E., Chanover, N. J., Orton, G., Baines, K., Voelz, D., Wijerthna, E., Hull, R., & Irwin, P. J. G. 2019, European Planetary Science Congress, 1148
- **QUEST: A New Frontiers Uranus Orbiter Concept Study**  
Jarmak, S., Leonard, E., Schurmeier, L., Akins, A., Cofield, S., Cremons, D. R., Curtis, A., Dahl, E., et al. 2019, 50th Lunar and Planetary Science Conference. LPI Contribution No. 2132, id.1621
- **Correction of etaloning effects in ground-based hyperspectral image cubes of Jupiter**  
Wijerathna, E., Dahl, E., Voelz, D., & Chanover, N. 2019 IEEE Aerospace Conference, Big Sky, MT, USA, 2019, pp. 1-7, doi: 10.1109/AERO.2019.8742115.
- **Radiative Transfer Analysis of Hyperspectral Image Cubes of Jupiter Acquired During Juno's 13th Perijove Pass**  
Dahl, E., Chanover, N. J., Voelz, D., Kuehn, D. M., Hull, R., Strycker, P. D., & Baines, K. H. 2018, American Geophysical Union Meeting, P33F-3899
- **Preliminary Radiative Transfer Analysis of Hyperspectral Image Cubes of Jupiter Acquired During Juno's 13th Perijove Pass**  
Dahl, E., Chanover, N. J., Voelz, D., Kuehn, D. M., Hull, R., Strycker, P. D., & Baines, K. H. 2018, AAS/Division for Planetary Sciences Meeting Abstracts, 50, 114.17

- **Ground-based hyperspectral imaging and analysis of Jupiter's atmosphere during the Juno era**  
Dahl, E., Chanover, N. J., Voelz, D., Kuehn, D. M., Wijerthna, E., Hull, R., Strycker, P. D., & Baines, K. H. 2017, AAS/Division for Planetary Sciences Meeting Abstracts, 49, 115.08
- **Early Juno Era Optical Analysis of Jupiter's Atmosphere with the NMSU Acousto-optic Imaging Camera**  
Dahl, E., Chanover, N. J., Voelz, D., Kuehn, D. M., & Strycker, P. D. 2016, American Geophysical Union Meeting, P33C-2174
- **Pre-Juno Optical Analysis of Jupiter's Atmosphere with the NMSU Acousto-optic Imaging Camera**  
Dahl, E., Chanover, N. J., Voelz, D., Kuehn, D. M., & Strycker, P. D. 2016, AAS/Division for Planetary Sciences Meeting Abstracts, 48, 421.17
- **Discovering Variable Stars in the Open Clusters of Cygnus and Ophiuchus**  
Dahl, E., Stetson, P. B., & Nava, C. 2015, American Astronomical Society Meeting Abstracts, 225, 343.25

## HONORS, ACCOMPLISHMENTS, & LEADERSHIP

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- 2021 NASA Postdoctoral Program Fellow (starting Sept. 2021)
- 2018 NASA Minority University Research Experience Program (MUREP) Fellow
- Mentored junior NMSU graduate students on the use of reduction pipeline, NAIC data, and radiative transfer modeling
- Initiated and coordinated the Las Cruces, NM chapter of Astronomy on Tap
- 120+ hours of outreach and community service on behalf of NMSU Astronomy Department (pre-COVID)
- Científico Latino Graduate School Mentorship Initiative (GSMI) 2020 Mentor
- Served on 2020, 2021 NASA review panels
- Vice President and Outreach Coordinator of the NMSU Astronomy Graduate Student Organization (AGSO), 2017-2018
- AGSO Student Journalist, 2017-2019 (wrote articles for NMSU Astronomy Department website)
- Involved with several white papers in support of the 2023-2032 Decadal Survey. Led "Ice Giant Atmospheric Science"; co-signed/co-authored "Priority Questions for Jupiter System Science in the 2020s and Opportunities for Europa Clipper", "Giant Planet Atmospheres", "Exploration of the Ice Giant Systems", "A New Frontiers Class Mission for the Uranian System that Focuses on Moon, Magnetosphere, and Ring Science"

## MEETINGS AND WORKSHOPS ATTENDED

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- 2019 EPSC-DPS Joint Meeting
- 2019, 2020 Outer Planet Assessment Group Meetings
- 2018 NASA Planetary Science Summer Seminar (TeamX Science Lead)
- 2018, 2020 (virtual) NEMESIS@Oxford
- 2016, 2018, 2020 AGU Fall Meeting
- 2016 NRAO New Mexico Symposium
- 2016, 2017, 2018, 2020 AAS DPS Fall Meeting
- 2016 Dunlap Institute for Astronomy and Astrophysics Summer School on Introduction to Astronomical Instrumentation
- 2015 AAS Winter Meeting

- 2014, 2015 Whitman Undergraduate Conferences
- 2014 Conference for Undergraduate Women in Physics

## **PROFESSIONAL MEMBERSHIPS**

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- American Astronomical Society
- American Geophysical Union
- Sigma Xi Scientific Research Society