Dr Johanna M. Vos

Postdoctoral Fellow
American Museum of Natural History
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Professional Appointments

Postdoctoral Fellow 2018 – Present
Department of Astrophysics, American Museum of Natural History
Advisor: Dr Jacqueline Faherty

Education

Institute for Astronomy, University of Edinburgh 2014-2018
PhD in Astronomy
Thesis: "Characterising Weather and Rotation on Substellar Worlds"
Advisor: Prof. Beth A. Biller

Trinity College Dublin 2010-2014
BA (Mod) Physics with Astrophysics
Thesis: "Sunspots and Solar Flares: The Role of Flows"
Advisor: Prof. Peter T. Gallagher
Graduated with First Class Honours

Research Interests

Atmospheres of brown dwarfs and extrasolar planets
Spectroscopic variability monitoring from ground and space
Disentangling clouds, aurorae and magnetic atmospheric phenomena

Grants & Awards

A case study for JWST: Disentangling Auroral and Cloud Variability 2019
Hubble Space Telescope General Observer Grant, STSci, **PI**

A Search for Transiting Exoplanets and Exomoons Orbiting L and T Dwarfs 2019
NASA Exoplanets Research Program (XRP), Co-I

Other Worlds Lab, UC Santa Cruz, *Heising-Simons Foundation* 2019

Cool Stars 20 Conference Grant, *Boston University* 2018

Winton Astronomy Thesis Prize, *University of Edinburgh* 2018

Principal's Go Abroad Fund, *University of Edinburgh* 2018

Exoclipse Conference Grant, *Boise State University* 2017

Principal's Career Development Scholarship, *University of Edinburgh* 2014

First Class Book Prize, *Trinity College Dublin* 2011, 2012, 2013

Invited Talks and Seminars

The Young and the Restless: Stormy Atmospheres of Giant Planet Analogs 2021
Seminar, University of Texas at Austin

Let The Great World Spin: Revealing the Turbulent, Stormy Atmospheres of Giant Planet Analogs 2020
Seminar, Center for Computational Astrophysics, Flatiron Institute, NY

Characterising Cool Atmospheres with Variability Monitoring 2020
Seminar, NASA/Goddard Space Flight Center, MD

Probing the Turbulent Atmospheres of Young Giant Planet Analogs 2019
Invited Talk, Brown Dwarf to Exoplanet Connection, University of Delaware

Weather and Rotation on Substellar Worlds 2019
Seminar, Dublin Institute for Advanced Studies, Ireland

	Weather and Rotation on Substellar Worlds *Seminar, American Museum of Natural History, NY, USA*	2019
	Exometeorology: Characterising Weather on Substellar Worlds *Seminar, Royal Observatory of Edinburgh*	2017
	The First Search for Weather Patterns on Exoplanet Analogues *Invited Talk, European Southern Observatories, Santiago, Chile*	2017
Conference Talks	Let The Great World Spin: Revealing the Turbulent, Stormy Atmospheres of Giant Planet Analogs *Contributed Talk, American Astronomical Society Meeting 237*	2021
	Probing Cloudy Atmospheres: Lessons for the JWST Era *Contributed Talk, Exo-Webb Seminar Series*	2020
	Young L Dwarf Variability in the Mid-IR *Contributed talk, American Astronomical Society Meeting 235, Honolulu, HI*	2020
	Variability on Young Brown Dwarfs *Contributed Talk, Other Worlds Laboratory, UC Santa Cruz, CA*	2019
	Detecting Weather Patterns on Low-Gravity Brown Dwarfs *Dissertation Talk, American Astronomical Society Meeting 233, Seattle, WA*	2019
	Weather Patterns on Exoplanet Analogs *Plenary Talk, Cool Stars 20, Boston, MA*	2018
	The Viewing Angle of Exoplanet Analogues Influences Their Observed Colours and Amplitudes *Contributed Talk, Exoclipe, Boise, ID*	2017
	The Effect of Viewing Angle on the Observed Properties of Brown Dwarfs *Contributed Talk, Scottish Exoplanet and Brown Dwarf Meeting*	2017
Workshops Attended	Tackling the Complexities of Substellar Objects *Lorentz Centre, Universiteit Leiden*	2020
	Other Worlds Laboratory Summer Program *University of California Santa Cruz*	2019
	Multi-Dimensional Characterization of Distant Worlds *University of Michigan*	2019
Selected Telescope Time	The Young and the Restless: Constraining the Viewing Angles of Young, Cloudy Brown Dwarfs *Gemini-N/GNIRS & Gemini-S/IGRINS (30 hr),* ***PI***	2020-2021
	A case study for JWST: Disentangling auroral and cloud variability in early L dwarfs *Hubble Space Telescope (16 orbits) & Very Large Array (27.6 hr),* ***PI***	2019
	Mapping Atmospheric Structures in Brown Dwarfs *Gemini/IGRINS, 31 hr,* ***PI***	2019-2021
	Spatial Cloud Map of a Planetary-Mass Companion *Spitzer Space Telescope Director's Discretionary Time, 33.1 hr,* ***PI***	2019
	Weather and Rotation of Young Brown Dwarfs *Spitzer Space Telescope Medium Program, 70 hr,* ***PI***	2018
	High Contrast Imaging of Exoplanets and Exoplanetary Systems with JWST *James Webb Space Telescope Early Release Science, 39 hr, Collaborator*	2017
	Rotational Velocities of Exoplanet Analogs *Gemini/GNIRS and IRTF/iSHELL program, 10 nights,* ***PI***	2016-2018

Exometeorology: Characterising Weather on a Young, Free-Floating Planet 2016
Hubble Space Telescope (5 orbits) & Spitzer Space Telescope (17.6 hr), Co-I

The First Search for Exoplanet Weather 2014-2017
ESO New Technology Telescope, 29 nights, ***PI***

Teaching

Instructor 2019-2020
Stars - After School Program, AMNH

Research Mentor 2018-present
Science Research Mentoring Program, AMNH

Head Teaching Assistant 2016-2018
Physics 1B Experimental Lab, University of Edinburgh
Observational Astronomy Lab, University of Edinburgh

Teaching Assistant 2014-2018
Maths for Physics 1, University of Edinburgh
Introductory Astrophysics, University of Edinburgh

Research Mentoring

Undergraduate Students

Jose Adorno (Queen's College, now at NASA Goddard) 2020
Allison McCarthy (University of Alabama, now at Boston University) 2019

High-school students

Azul Ruiz Diaz (Brooklyn Technical High School) 2020
Jai Glazer (The Dalton School) 2020
Sophia Ameneyo Fourcade (University Neighborhood High School) 2020
Izzy Lapidus (Fiorello H. LaGuardia High School) 2019
Otis McCallum (The Beacon School) 2019
William McCartney (New Explorations Into Science and Technology + Math) 2019
Elko Gerville-Reache (School of The Future) 2018
Raunak Amanna (Brooklyn Technical High School) 2018
Nima Brivanlou (Lycée Français de New York) 2018

Service

Journal Referee 2019-Present
ApJ, ApJL, AJ

External reviewer for national grant allocation 2021
Time Allocation Committee member for space-based observatory 2020
Time Allocation Committee member for ground-based observatory 2019-2020

Scientific Organizing Committee member 2021
CloudCon, University of Heidelberg

Seminar Organizer 2018-2020
Department of Astrophysics, American Museum of Natural History

Astronomy Representative 2017-2018
Postgraduate Forum, The University of Edinburgh

Selected Outreach Activities

American Museum of Natural History Astronomy Online Programs 2020-2021
Question Moderator

STEM to SHTEM Summer Internship Program, Stanford University 2020
Speaker, "Ways of Seeing: Observing"

Westport Astronomical Society 2019
Speaker, "The Brown Dwarf - Exoplanet Connection"

BridgeUP: STEM, AMNH 2019
Speaker, "Weather and Rotation on Extrasolar Worlds"

StemEast, UK & Ireland 2014-2018
STEM Ambassador

Pint of Science Festival, Edinburgh UK 2017
Speaker, "Whatever the Weather"

Kickstart Summer Programme, University of Edinburgh 2015-2016
Workshop Leader: "What Should I Expect from a Physics Degree?"

Selected Media/Press

Irish Times Research Lives Interview 2020
Brown dwarf stars: What's the weather like up there?

NRAO's 2020 Astronomy Highlights with Phil Plait 2020
Measuring the Wind Speed of a Brown Dwarf a Quadrillion Miles Away

Space.com Science & Astronomy Interview 2020
How the brown dwarf blows: Wind speed of a 'failed star' measured for 1st time

First Author Publications

* denotes equal author contribution

1. A measurement of the wind speed on a brown dwarf
Allers*, K. N.; **Vos*, J. M.**; Biller*, B. A.; Williams*, P. K.G. *Science,* 368, 6487, 169-172, 2020.
2. Spitzer Variability Properties of Young Giant Planet Analogs
Vos, J. M.; Biller, B. A.; Allers, K. N.; Faherty, J. K.; Liu, Michael C.; Eriksson, S.; Best, W. M. J.; Metchev, S.; Radigan, J.; Allers, K. N.; Janson, M.; Buenzli, E.; Dupuy, T. J.; Bonnefoy, M.; Manjavacas, E.; Brandner, W.; Crossfield, I.; Deacon, N.; Henning, T.; Homeier, D.; Schlieder, J., *The Astronomical Journal,* 160(1):38, 2020.
3. A Search for Variability in Exoplanet Analogues and Low-Gravity Brown Dwarfs.
Vos, J. M.; Biller, B. A.; Bonavita, M.; Eriksson, S.; Liu, Michael C.; Best, W. M. J.; Metchev, S.; Radigan, J.; Allers, K. N.; Janson, M.; Buenzli, E.; Dupuy, T. J.; Bonnefoy, M.; Manjavacas, E.; Brandner, W.; Crossfield, I.; Deacon, N.; Henning, T.; Homeier, D.; Kopytova, T. Schlieder, J., *Monthly Notices of the Royal Astronomical Society,* 483:480-502, 2019.
4. Variability of the lowest mass objects in the AB Doradus moving group.
Vos, J. M.; Allers, K.. N.; Biller, B. A.; Liu, M. C.; Dupuy, T. J.; Gallimore, J. F.; Adenuga, I. J.; Best, W. M. J., *Monthly Notices of the Royal Astronomical Society*, 474(1):10411053, 2018.
5. The Viewing Geometry of Brown Dwarfs Influences Their Observed Colors and Variability Amplitudes
Vos, J. M.; Allers, K. N.; Biller, B. A., *The Astrophysical Journal*, 842(2):78, 2017.

Co-Author Publications

6. A High-Contrast Search for Variability in HR 8799bc with VLT-SPHERE
Biller, B. A.; Apai, D.; Bonnefoy, M.; Desidera, S.; Gratton, R.; Kasper, M.; Kenworthy, M.; Lagrange, A.; Lazzoni, C.; Mesa, D.; Vigan, A.; **Vos, J. M.**; Wagner, K.; Zurlo, A., accepted for publication in *Monthly Notices of the Royal Astronomical Society*
7. Simultaneous Multiwavelength Variability Characterization of the Free-floating Planetary-mass Object PSO J318.5–22.

Biller, B. A.; **Vos, J. M.**; Buenzli, E.; Allers, K.; Bonnefoy, M.; Charnay, B.; Bézard, B.; Allard, F.; Homeier, D.; Bonavita, M.; Brandner, W.; Crossfield, I.; Dupuy, T.; Henning, T.; Kopytova, T.; Liu, M. C.; Manjavacas, E.; Schlieder, J., *The Astronomical Journal*, 155(2):95, 2018.

8. Variability in a young, L/T transition planetary-mass object
Biller, B. A.; **Vos, J. M.**; Bonavita, M.; Buenzli, E.; Baxter, C.; Crossfield, I. J. M.; Allers, K.; Liu, M. C.; Bonnefoy, M.; Deacon, N.; Brandner, W.; Schlieder, J. E.; Dupuy, T.; Kopytova, T.; Manjavacas, E.; Allard, F.; Homeier, D.; Henning, T., *The Astrophysical Journal Letters*, 813(2):16, 2015.

Selected White Papers & Research Notes

9. Astro2020 Science White Paper: The L/T Transition
Vos, J. M.; Allers, K.; Apai, D.; Biller, B.; Burgasser, A. J.; Faherty, J.; Gagne, J.; Helling, C.; Morley, C.; Radigan, J.; Showman, A.; Tan, .; Tremblin, P., *Bulletins of the American Astronomical Society*, 2019.

10. A Tool and Workflow for Radio Astronomical Peeling in CASA
Williams, P. K. G.; Allers, K. N.; Biller, B. A.; **Vos, J. M.**, *Research Notes of the American Astronomical Society*, 3, 110, 2019.

11. Astro2020 Science White Paper: Mapping Ultracool Atmospheres: Time-domain Observations of Brown Dwarfs and Exoplanets
Apai, D.; Biller, B.; Burgasser, A.; Girard, J. H.; Gizis, J. E.; Karalidi, T.; Kraus, Ad. L.; Lew, B. W. P.; Manjavacas, E.; Marley, M.; Miles-Paez, P. A.; Morley, C. V.; Radigan, J.; **Vos, J. M.**; Zhou, Y., *Bulletins of the American Astronomical Society* 2019.

12. Astro2020 Science White Paper: High-Resolution Spectroscopic Surveys of Ultracool Dwarf Stars & Brown Dwarfs Burgasser, A,; Apai, D.; Bardalez Gagliuffi, D.; Blake, C.; Gagne, J.; Konopacky, Q.; Martin, E.; Metchev, S.; Plavchan, P.; Reiners, A.; Schlawin, E.; Sousa-Silva, C.; **Vos, J. M.**, *Bulletins of the American Astronomical Society* 2019.

13. Astro2020 Science White Paper: Brown Dwarfs and Directly Imaged Exoplanets in Young Associations
Faherty, J.; Allers, Katelyn; Bardalez Gagliuffi, D.; Burgasser, A. J.; Gagne, J.; Gizis, J.; Kirkpatrick, J. D.; Riedel, A.; Schneider, A.; **Vos, J. M.**, *Bulletins of the American Astronomical Society* 2019.

14. Astro2020 Science White Paper: Fundamental Physics with Brown Dwarfs: The Mass-Radius Relation Burgasser A.; Baraffe I.; Browning M. ; Burrows A.; Chabrier G.; Creech-Eakman M.; Demory B.; Dieterich S.; Faherty J.; Huber D.; Lodieu N.; Plavchan P.; Michael Rich R.; Saumon D., Stassun K.; Triaud A.; van Belle G.; Van Grootel V.; **Vos, J. M.**; Yadav, R., *Bulletins of the American Astronomical Society* 2019.