**Victoria Meadows (University of Washington)**

**Research Interests:**

Venus and Earth observations/characterization, theoretical modeling of terrestrial planetary environments to understand factors affecting habitability, biosignature generation and false positives, and terrestrial exoplanet characterization to search for signs of habitability and life.

**Professional Preparation:**

University of Sydney, PhD (Physics/Astrophysics), 1994

University of New South Wales, B.Sc. (Physics - Class 1 Honors), 1988.

**Employment and Selected Professional Experience**

2013 – Full Professor, Astronomy, University of Washington, Seattle, WA

2011 – Director, University of Washington Astrobiology Program, Seattle, WA

2015 – Principal Investigator, NASA NExSS Virtual Planetary Laboratory Team

2017 – Adjunct Professor, Earth and Space Sciences, University of Washington, Seattle, WA

2017 – Visiting Professor, Astrobiology Center, University of Tokyo.

2001-2017 Principal Investigator & Executive Council Member, NASA Astrobiology Institute

2007-2013 Associate Professor, University of Washington, Seattle, WA

1999-2007 Lead/Associate Research Scientist, *Spitzer* Science Center, Caltech, Pasadena, CA

1996-2005 Research Scientist – Senior A, Jet Propulsion Laboratory, La Cañada, CA.

**Community Service: Leadership, Panels, Committees and Mission Support**

2021 – Co-Lead, NExSS/NfoLD Biosignatures Standards of Evidence Workshop

2020 – Co-Lead, ExoPAG Science Interest Group 3 Exoplanet/Solar System Synergies

2018 – Co-Lead, Nexus for Exoplanet System Science(NExSS) Research Coordination Network

2019 – Co-Lead JWST TRAPPIST-1 Community Initiative

2019-2021 Chair, NAS Astro2020 Science Panel on Exoplanets, Astrobiology and Solar System

2018-2019 Chair of the Scientific Organizing Committee for AbSciCon 2019

2018-2019 Chair of the NASA Exoplanet Analysis Group (ExoPAG)

2018-2019 Member of the NASA Astrophysics Advisory Council (APAC)

2017-2018 Associate Editor, *Astrobiology* Journal

2018 Member of the National Academy of Sciences Astrobiology Strategy Committee

2018 Member of the National Academy of Sciences Exoplanet Strategy Committee

2016-2018 Member, NASA LUVOIR Science and Technology Definition Team

2013-2016 Member, NASA Exo-C Science and Technology Definition Team

2015-2016 NASA Astrobiology Strategy author and reviewer

2014-2016 SETI Institute Science Advisory Board

2013-2015 Co-Director for the Santander Summer School in Astrobiology.

2007-2008 NASA Astrobiology Roadmap Revision Team

2007-2011 NASA EPOXI Mission Science Team

2005-2008 *Icarus* Editorial Board

2005-2008 Planetary Science Subcommittee of the NASA Advisory Council

2004-2006 NASA Terrestrial Planet Finder-Coronagraph Science and Technology Defn. Team

* 1. NASA Universe Roadmap Writing Team – Chair for “Habitable Planets and Life”

2004-2005, NASA Origins Subcommittee of the NASA Space Science Advisory Committee

2002-2004 NASA Terrestrial Planet Finder Science Working Group

2002-2003 NASA Astrobiology, Origins, and Shared Foundations Roadmap Teams.

2001 Venus Community Decadal Panel for the Solar System Decadal Survey – Deputy Lead

1999-2004 NASA Planetary Systems Science – Management Operations Working Group

**Selected Honors and Awards:**

2022 Fellow of the American Astronomical Society

2021 Elected to the Washington State Academy of Sciences.

2019 NASA Group Achievement Award – Astrophysics Large Mission Study Team

2018 SETI Frank Drake Award – for significant contributions to the field of Astrobiology

2015 Bok Lecture, Siding Spring, Australia.

2015 Allison Levick Memorial Lecture, Sydney, Australia

2009 NASA Group Achievement Award – 2008 Astrobiology Roadmap Team

2008-2010 National Academy of Sciences - Frontiers of Science Kavli Fellow

2007-2008 NASA Astrobiology Roadmap Revision Team

2006 NASA Group Achievement Award – Spitzer Deep Impact (DI) Support Team

1. NASA Group Achievement Award – Spitzer First Look Survey Science Team

2004 NASA Group Achievement Award – Spitzer Space Telescope Mission Ops Team

2001 The JPL Lew Allen Award for Excellence (for leadership in scientific research)

**Professional Memberships:**

American Geophysical Union (25 years), American Astronomical Society – Division of Planetary Sciences (25 years), American Astronomical Society (10 years). Washington State Academy of Sciences.

**Recent Invited Presentations at National and International Conferences:**

2021 Oct, PLATO Science Conference, virtually, organized in Europe.

2020 Feb, AAAS meeting, Seattle, WA, USA.

2020 Feb, Astrobiology Center, University of Tokyo, Japan

2019 June, plenary at the *Astrobiology Science Conference 2019*, Seattle, WA, USA.

2019 June, *TRAPPIST-1 Conference*, Liège, Belgium.

2018 October, the *High-Resolution Spectroscopy of Exoplanets Conference*, Nice, France.

2017 November, plenary at *Habitable Worlds 2017*, Laramie, WY, USA.

**The Virtual Planetary Laboratory Research Group**

Dr. Meadows started her scientific career as a Venus observer and near-infrared astronomer, and is now the Principal Investigator for the NASA Virtual Planetary Laboratory Lead (VPL) Team. Meadows founded the VPL in 2001, and under her leadership, the VPL team has developed a strongly interdisciplinary theoretical framework that combines expertise in the Solar System and exoplanet communities to understand the potential habitability and global signs of life for extrasolar planets. Her team pioneered models of the interactions between a planet, its host star, and its planetary system environment, to understand how these interactions affect a planet’s ability to support life. The VPL also simulates life’s impact on the planetary environment to better understand how to most effectively search for signs of life on distant planets. Her team has grown from 17 original members to 75 researchers at 23 institutions, with expertise spanning many subfields of biology, planetary science and astrophysics. The VPL publishes ~80 refereed journal papers a year (e.g. <https://nai.nasa.gov/media/pdf_annual_reports/NAI_TeamsAR2016-VPL-01.pdf>) and served as the inspiration for the NASA NExSS interdisciplinary research coordination network for exoplanets.

**Community Service: Students and Mentoring**

**Postdoctoral Scholars and Current Positions**

Giovanna Tinetti – Professor, University College London

John Armstrong – Professor, Weber State University

Antigona Segura – Professor, UNAM

Mark Claire – Lecturer, University of St. Andrews

Shawn Domagal-Goldman – Civil Servant Scientist, NASA GSFC

Sean Raymond – Researcher, Laboratoire d’Astrophysique de Bordeaux

Rory Barnes – Associate Professor, University of Washington

Colin Goldblatt - Assistant Professor, University of Victoria

Peter Driscoll – Staff Scientist, Carnegie Institution of Washington

Benjamin Charnay – postdoc, Observatoire de Paris, Meudon.

Kimberley Bott – postdoc, University of California, Riverside

Michael Wong – postdoc, University of Washington.

**Graduate Students and Current Positions**

Tyler Robinson (Astronomy & Astrobiology) – Assistant Professor, NAU

Aomawa Shields (Astronomy & Astrobiology) – Associate Professor, UC-Irvine

Amit Misra (Astronomy & Astrobiology) – Computer Programmer, Microsoft

Giada Arney (Astronomy & Astrobiology) – Civil Servant Scientist, NASA/GSFC

Eddie Schwieterman (Astronomy & Astrobiology) – Assistant Professor, UC-Riverside (2020)

Jacob Lustig-Yaeger (Astronomy & Astrobiology) – Postdoc, JHU Applied Physics Lab

Andrew Lincowski (Astronomy & Astrobiology) – Police Officer/Scientific Consultant, UW

Miles Currie (Astronomy & Astrobiology) – Graduate student, UW

Samantha Gilbert (Astronomy & Astrobiology) – Graduate student, UW

Hector Delgado (Astronomy & Astrobiology) – Graduate student, UW

Gabrielle Engelmann-Suissa (Astronomy & Astrobiology) – Graduate student, UW

Dr. Meadows also served on doctoral committees for PhD graduates Lucianne Walkowicz (Adler Planetarium/Library of Congress Chair of Astrobiology), Nick Cowan (Asst. Professor., McGill U.), Nate Kaib (Asst. Professor., U. Oklahoma), Mark Claire (Lecturer University of St. Andrews), Darci Snowdon (Asst. Professor, Central Wash. U.), Rika Anderson (Asst. Professor, Carleton College), Meg Smith (Aerospace Corp.), Elena Amador (Scientist, JPL), Rodrigo Luger (Postdoc, Flatiron Institute), Russell Deitrick (Postdoc, U. Bern, Switzerland), Matt Tilley (Postdoc, UW), Joshua Krissansen-Totton (Sagan Fellow, UCSC), Osa Igbinosun (Postdoc, JPL), David Fleming (Data Scientist, Bayer Crop Science) and Owen Lehmer (NASA Ames).

**Community Service: Interdisciplinary Education and Training**

Dr. Meadows is the Director of the UW Astrobiology Graduate Program, with 33 students and 14 faculty. Founded in 1998, the program now spans 11 academic units at the University of Washington, and is concentrated in Astronomy, Earth and Space Sciences, Oceanography, Biology, Microbiology, Environmental & Forest Sciences, Atmospheric Sciences, and Aeronautics & Astronautics. The UW’s Astrobiology Program is recognized as the most comprehensive and cohesive graduate program in Astrobiology in the nation, encompassing research on the origin and evolution of life on Earth, life in extreme environments, habitability and life in the Solar System, the detection and characterization of habitable exoplanets, and space exploration. As Director, Dr. Meadows designed and implemented an interdisciplinary Dual-Title PhD Degree Program in both a student’s home department & Astrobiology, which has been offered by the UW Astrobiology Program since 2012. Since inception, 32 students have graduated with the Dual-Title PhD and 30 students with an Astrobiology Graduate Certificate.

**Selected Publications:** (***Graduate Student***, *Postdoc*, ***Undergraduate*** Advisees)

(250+ publications total, over 110 in refereed journals, 4 (refereed) book chapters, 1 book edited, NASA ADS/Scopus h-index of 48, Google Scholar h-index of 56). The list below highlights key papers over the last 10 years, including those featuring collaboration with mentees.

*Lincowski, A.P*., **Meadows, V.S**., Crisp, D., Akins, A.B., Schwieterman, E.W., Arney, G.N., Wong, M.L., Steffes, P.G., Parenteau, M.N. and Domagal-Goldman, S., 2021. Claimed Detection of PH3 in the Clouds of Venus Is Consistent with Mesospheric SO2. *The Astrophysical Journal Letters*, *908*(2), p.L44.

**Meadows V. S.,** Arney G. N., Schmidt B. E., and Des Marais D. J., eds. (2020). Planetary Astrobiology. Univ of Arizona, Tucson. 534 pp. DOI: 10.2458/azu\_uapress\_9780816540068.

***Leung, M***., **Meadows, V.S**. and ***Lustig-Yaeger, J***., (2020) High-resolution Spectral Discriminants of Ocean Loss for M-dwarf Terrestrial Exoplanets. *The Astronomical Journal*, *160*(1), p.11.

***Lustig-Yaeger, J.,*** **Meadows, V. S.,** & ***Lincowski, A. P***. (2019). A Mirage Of The Cosmic Shoreline: Venus-Like Clouds As A Statistical False Positive For Exoplanet Atmospheric Erosion. The Astrophysical Journal, 887 (1), L11. <https://doi.org/10.3847/2041-8213/ab5965>.

***Lincowski, A. P., Lustig-Yaeger, J***., & **Meadows, V. S.** (2019). Observing Isotopologue Bands In Terrestrial Exoplanet Atmospheres With The James Webb Space Telescope: Implications For Identifying Past Atmospheric And Ocean Loss. *The Astronomical Journal*, 158 (1), 26. <https://doi.org/10.3847/1538-3881/ab2385>.

***Lustig-Yaeger, J.,* Meadows, V. S.,** & ***Lincowski, A. P.*** (2019). The Detectability And Characterization Of The Trappist-1 Exoplanet Atmospheres With JWST. *The Astronomical Journal*, 158 (1), 27. <https://doi.org/10.3847/1538-3881/ab21e0>.

*Tilley, M.A.*, Segura, A., **Meadows, V.**, Hawley, S. and Davenport, J., (2019). Modeling repeated M dwarf flaring at an Earth-like planet in the habitable zone: atmospheric effects for an unmagnetized planet. *Astrobiology*, *19*(1), pp.64-86.

**Meadows, V.S.**, Reinhard, C.T., ***Arney, G.N.,*** Parenteau, M.N., ***Schwieterman, E.W***., Domagal-Goldman, S.D., ***Lincowski, A.P***., Stapelfeldt, K.R., Rauer, H., DasSarma, S. and Hegde, S., Siegler, N., ***Lustig-Yaeger, J***., (2018). Exoplanet Biosignatures: Understanding Oxygen as a Biosignature in the Context of Its Environment, *Astrobiology*, 18(6), 630-662.

**Meadows, V.S.,** ***Arney, G.N., Schwieterman, E.W., Lustig-Yaeger, J., Lincowski, A.P., Robinson, T.,*** *Domagal-Goldman, S.D., Barnes,* R.K., Fleming, D.P**., *Deitrick, R. and Luger, R*.** et al., (2018). The Habitability of Proxima Centauri b: Environmental States and Observational Discriminants, *Astrobiology,* 18(2), 133-189.

***Lustig-Yaeger, J***., **Meadows, V. S**., ***Mendoza, G. T***., Schwieterman, E. W., Fujii, Y., Luger, R., & Robinson, T. D. (2018). Detecting Ocean Glint on Exoplanets Using Multiphase Mapping. *The Astronomical Journal*, *156*(6), 301.

***Lincowski, A.P.,* Meadows, V.S.,** Crisp, D., *Robinson, T.D.,* Luger, R., ***Lustig-Yaeger, J.,* *Arney, G. N.,*** (2018) Evolved Climates and Observational Discriminants for the TRAPPIST-1 Planetary System. *The Astrophysical Journal*, *867*(1), p.76.

*Bott, K*., Bailey, J., Cotton, D.V., Kedziora-Chudczer, L., Marshall, J.P. and **Meadows, V.S**., (2018) The polarization of the planet-hosting WASP-18 system. *The Astronomical Journal*, *156*(6), p.293.

**Meadows, V.S., (**2017) Reflections on O2 as a Biosignature in Exoplanetary Atmospheres, *Astrobiology*, 17(10), 1022-1052.

***Arney, G.N.***, **Meadows, V.S.**, Domagal-Goldman, S.D., Deming, D., Robinson, T.D., ***Tovar, G***., Wolf, E.T. and Schwieterman, E., 2017. Pale orange dots: the impact of organic haze on the habitability and detectability of Earthlike exoplanets. *The Astrophysical Journal*, *836*(1), p.49.

***Shields, A.,*** *Barnes, R*., Agol, E., *Charnay, B*., Bitz, C., **Meadows, V. S**., (2016) The effect of orbital configuration on the possible climates and habitability of Kepler-62f. *Astrobiology* 16(6) 443-464

***Arney, G.,*** *Domagal-Goldman, S.D****.,* Meadows, V.S*.,*** Wolf, E.T***., Schwieterman, E.,*** *Charnay, B., Claire, M****., Hébrard, E. and Trainer, M.G*.,** (2016)**.** The pale orange dot: the spectrum and habitability of hazy Archean Earth**.** *Astrobiology*,*16*(11), pp.873-899.

***Schwieterman, E.W***., Meadows, V. S., *Domagal-Goldman, S. D*., Deming, D., ***Arney, A. N.,*** ***Luger, R.***, Harman, C., ***Misra, M****., Barnes, R*., (2016), Identifying Planetary Biosignature Impostors: Spectral features of CO and O4 resulting from abiotic O2/O3 production. *Ap. J. Lett.*, 819: L13.

Barnes, R., **Meadows, V. S**., & ***Evans, N***. (2015). Comparative habitability of transiting exoplanets. *The Astrophysical Journal*, *814*(2), 91.

*Charnay, B.,* **Meadows, V.S.**, ***Misra, A.***, Leconte, J., ***Arney, G*.**  (2015) 3D modeling of GJ1214b's atmosphere: formation of inhomogeneous high clouds and observational implications. *ApJL*, **813**: L1.

Krissansen-Totton, J., ***Schwieterman, E. W***., *Charnay, B*., ***Arney, G.,*** Robinson, T. D., **Meadows, V**., & Catling, D. C. (2016). Is the Pale Blue Dot unique? Optimized photometric bands for identifying Earth-like exoplanets. *The Astrophysical Journal*, *817*(1), 31.

*Domagal-Goldman, S.D., Segura, A., Claire, M.W., Robinson, T.D.,* **Meadows, V.S** (2014) Abiotic Ozone and Oxygen in Atmospheres Similar to Prebiotic Earth, *Ap. J.,* 792, 90.

***Schwieterman, E. W.,*** Robinson, T. D., **Meadows, V. S**., Misra, A., & Domagal-Goldman, S. (2015). Detecting and constraining N2 abundances in planetary atmospheres using collisional pairs. *The Astrophysical Journal*, *810*(1), 57.

*Robinson, T.D*., Ennico, K., **Meadows, V.S**., Sparks, W., Bussey, D.B.J., ***Schwieterman, E.W.,***

***Breiner, J.*** (2014) Detection of Ocean Glint and Ozone Absorption Using LCROSS Earth Observations, *Ap. J*., 787, 171.

***Arney, G*., Meadows, V**., Crisp, D., Schmidt, S.J., Bailey, J., *Robinson, T*. (2014) Spatially resolved measurements of H2O, HCl, CO, OCS, SO2, cloud opacity, and acid concentration in the Venus near-infrared spectral windows, *JGR (Planets)* 119, 1860-1891

***Misra, A.,* Meadows, V**., & Crisp, D. (2014). The effects of refraction on transit transmission spectroscopy: application to Earth-like exoplanets. *The Astrophysical Journal*, *792*(1), 61.

***Shields, A. L***., Bitz, C. M., Meadows, V. S., Joshi, M. M., & *Robinson, T. D*. (2014). Spectrum-driven planetary deglaciation due to increases in stellar luminosity. *The Astrophysical Journal Letters*, *785*(1), L9.

***Misra, A***., **Meadows, V.,** Claire, M., & Crisp, D. (2014). Using dimers to measure biosignatures and atmospheric pressure for terrestrial exoplanets. *Astrobiology*, *14*(2), 67-86.

***Shields, A. L***., Meadows, V. S., Bitz, C. M., Pierrehumbert, R. T., Joshi, M. M., & *Robinson, T.* D. (2013). The effect of host star spectral energy distribution and ice-albedo feedback on the climate of extrasolar planets. *Astrobiology*, *13*(8), 715-739.

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*Domagal-Goldman, S.*, **Meadows, V. S.**, *Claire, M****.***, Kasting, J., 2011, Using biogenic sulfur gases as remotely detectable biosignatures on anoxic planets, *Astrobiology*, 11(5) pp419-441.

***Robinson, T. D.,*** **Meadows, V. S.**, Crisp, D., Deming, D., A’Hearn, M. F., Charbonneau, D., Livengood, T. A., Seager, S., Barry, R. K., Hearty, R., Hewagama, T., Lisse, C. M., McFadden, L. A., Wellnitz, D. D., 2011, Earth as an Extrasolar Planet: Earth Model Validation Using EPOXI Earth Observations, *Astrobiology*, 11(5) pp393-408.

***Robinson, T. D.***, **Meadows, V. S**., Crisp, D. (2010) Detecting Oceans on Extrasolar Planets Using the Glint Effect, *ApJ* **721** L67-L71

*Segura, A.*, *Walkowicz, L*., **Meadows, V.**, Kasting, J., Hawley, S., (2010), The Effect of a Strong Stellar Flare on the Atmospheric Chemistry of an Earth-like Planet Orbiting an M dwarf, *Astrobiology*, 10(7), 751-771.

*Segura, A.*, **Meadows, V. S**., Kasting, J. F., Crisp, D., Cohen, M. (2007) Abiotic formation of O2 and O3 in high-CO2 terrestrial atmospheres, *A&A*, 472(2), pp.665-679

*Segura, A*., J.F. Kasting, **V. Meadows**,M.Cohen, J. Scalo,. D. Crisp, *R. A. H. Butler*, *G. Tinetti*, (2005) Biosignatures from Earth-like planets around M dwarfs, *Astrobiology*, 5(6): 706.