Stanford

Aditi Sheshadri

Assistant Professor of Earth System Science and Center Fellow, by courtesy, at the Woods Institute for the Environment

Bio

BIO

I joined Stanford's Earth System Science department as an assistant professor 2018. Prior to this, I was a a Junior Fellow of the Simons Foundation in New York, and a postdoctoral research scientist at Columbia University's Department of Applied Physics and Applied Math and the Lamont-Doherty Earth Observatory. I got my Ph.D. in Atmospheric Science at MIT's Department of Earth, Atmospheric, and Planetary Sciences, in the Program for Atmospheres, Oceans, and Climate, where I worked with R. Alan Plumb. I'm broadly interested in atmosphere and ocean dynamics, climate variability, and general circulation.

I'm particularly interested in fundamental questions in atmospheric dynamics, which I address using a combination of theory, observations, and both idealized and comprehensive numerical experiments. Current areas of focus include the dynamics, variability, and change of the mid-latitude jets and storm tracks, the stratospheric polar vortex, and atmospheric gravity waves.

ACADEMIC APPOINTMENTS

- Assistant Professor, Earth System Science
- Center Fellow (By courtesy), Stanford Woods Institute for the Environment
- Member, Bio-X

HONORS AND AWARDS

- Google scholar award, Google (2023)
- Junior Fellow, Simons Society of Fellows (2015-2017)
- Best student presentation award, AMS conference on the middle atmosphere (2015)
- Lord foundation fellowship, Massachusetts Institute of Technology (2012-2013)
- Dean of Science Fellowship, Massachusetts Institute of Technology (2010-2011)
- J.N. Tata Fellowship, J. N. Tata endowment (2007-2008)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Steering committee member, Stratospheric network for the assessment of predictability (2017 - present)

PROFESSIONAL EDUCATION

- Ph.D., Massachusetts Institute of Technology , Atmospheric Science (2015)
- S. M., Massachusetts Institute of Technology , Aeronautics and Astronautics (2009)
- B. E., R. V. College of Engineering , Mechanical Engineering (2007)

Teaching

COURSES

2025-26

- Climate Models and Data: ESS 171, ESS 271 (Spr)
- Scientific Basis of Climate Change: ESS 102, ESS 202 (Win)

2024-25

- Scientific Basis of Climate Change: ESS 102, ESS 202 (Spr)

2023-24

- Scientific Basis of Climate Change: ESS 102, ESS 202 (Spr)

2022-23

- Dynamics of the Atmosphere: ESS 348 (Win)
- Scientific Basis of Climate Change: ESS 102, ESS 202 (Spr)
- Topics in Earth System Science: ESS 301 (Aut, Win, Spr)

STANFORD ADVISEES

Doctoral (Program)

Isabella Dula Razzolini, Robert King

Publications

PUBLICATIONS

- **WxC-Bench: A Novel Dataset for Weather and Climate Downstream Tasks.** *Scientific data*
  Shinde, R., Ankur, K., Phillips, C. E., Gupta, A., Pfreundschuh, S., Roy, S., Kirkland, S., Gaur, V., Kolluru, V., Lin, A., Trital, P., Sheshadri, A., Nair, et al
  2026
- **Steady Source Gravity Wave Parameterizations and the Observed Momentum Flux Intermittency** *GEOPHYSICAL RESEARCH LETTERS*
  King, R. C., Green, B., Sheshadri, A.
  2026; 53 (3)
- **Offline Performance of a Nonlocal Deep Learning Parameterization for Climate Model Representation of Atmospheric Gravity Waves** *JOURNAL OF ADVANCES IN MODELING EARTH SYSTEMS*
  Gupta, A., Sheshadri, A., Roy, S., Anantharaj, V.
  2025; 17 (10)
- **Unified 0.25-degree gridded infrastructure-critical extreme weather for the United States from 1979 to 2100.** *Scientific data*
  Sun, T., Zanocco, C., Flora, J., Sheshadri, A., Rajagopal, R.
  2025; 12 (1): 1544
- **Connecting Tropical Cyclones, Precursor Disturbances, and the ITCZ in Aquaplanet Simulations** *JOURNAL OF ADVANCES IN MODELING EARTH SYSTEMS*
  Burnett, A. C., Sheshadri, A., Robinson, T., Lin, P.
  2025; 17 (7)
- **Machine Learning for Climate Physics and Simulations** *ANNUAL REVIEW OF CONDENSED MATTER PHYSICS*
  Lai, C., Hassanzadeh, P., Sheshadri, A., Sonnewald, M., Ferrari, R., Balaji, V.
  2025; 16: 343-365
- **Gravity Wave Momentum Fluxes from 1 km Global ECMWF Integrated Forecast System.** *Scientific data*

Gupta, A., Sheshadri, A., Anantharaj, V.
2024; 11 (1): 903

- **Insights on Lateral Gravity Wave Propagation in the Extratropical Stratosphere From 44 Years of ERA5 Data** *GEOPHYSICAL RESEARCH LETTERS*
  Gupta, A., Sheshadri, A., Alexander, M., Birner, T.
  2024; 51 (14)
- **Data Imbalance, Uncertainty Quantification, and Transfer Learning in Data-Driven Parameterizations: Lessons From the Emulation of Gravity Wave Momentum Transport in WACCM** *JOURNAL OF ADVANCES IN MODELING EARTH SYSTEMS*
  Sun, Y., Pahlavan, H. A., Chattopadhyay, A., Hassanzadeh, P., Lubis, S. W., Alexander, M., Gerber, E. P., Sheshadri, A., Guan, Y.
  2024; 16 (7)
- **Uncertainty Quantification of a Machine Learning Subgrid-Scale Parameterization for Atmospheric Gravity Waves** *JOURNAL OF ADVANCES IN MODELING EARTH SYSTEMS*
  Mansfield, L. A., Sheshadri, A.
  2024; 16 (7)
- **Bayesian History Matching Applied to the Calibration of a Gravity Wave Parameterization** *JOURNAL OF ADVANCES IN MODELING EARTH SYSTEMS*
  King, R. C., Mansfield, L. A., Sheshadri, A.
  2024; 16 (4)
- **Gravity Wave Momentum Fluxes Estimated From Project Loon Balloon Data** *JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES*
  Green, B., Sheshadri, A., Alexander, M., Bramberger, M., Lott, F.
  2024; 129 (5)
- **Atmospheric Gravity Waves: Processes and Parameterization** *JOURNAL OF THE ATMOSPHERIC SCIENCES*
  Achatz, U., Alexander, M., Becker, E., Chun, H., Doernbrack, A., Holt, L., Plougonven, R., Polichtchouk, I., Sato, K., Sheshadri, A., Stephan, C., VAN Niekerk, A., Wrightj, et al
  2024; 81 (2): 237-262
- **Updates on Model Hierarchies for Understanding and Simulating the Climate System: A Focus on Data-Informed Methods and Climate Change Impacts** *JOURNAL OF ADVANCES IN MODELING EARTH SYSTEMS*
  Mansfield, L. A., Gupta, A., Burnett, A. C., Green, B., Wilka, C., Sheshadri, A.
  2023; 15 (10)
- **Calibration and Uncertainty Quantification of a Gravity Wave Parameterization: A Case Study of the Quasi-Biennial Oscillation in an Intermediate Complexity Climate Model** *JOURNAL OF ADVANCES IN MODELING EARTH SYSTEMS*
  Mansfield, L. A., Sheshadri, A.
  2022; 14 (11)
- **Machine Learning Gravity Wave Parameterization Generalizes to Capture the QBO and Response to Increased CO2** *GEOPHYSICAL RESEARCH LETTERS*
  Espinosa, Z., Sheshadri, A., Cain, G. R., Gerber, E. P., DallaSanta, K. J.
  2022; 49 (8)
- **Midlatitude Error Growth in Atmospheric GCMs: The Role of Eddy Growth Rate** *GEOPHYSICAL RESEARCH LETTERS*
  Sheshadri, A., Borrus, M., Yoder, M., Robinson, T.
  2021; 48 (23)
- **The Atlantic Jet Response to Stratospheric Events: A Regime Perspective** *JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES*
  Goss, M., Lindgren, E. A., Sheshadri, A., Diffenbaugh, N. S.
  2021; 126 (7)
- **Tropical cyclone frequency under varying SSTs in aquaplanet simulations** *Geophysical Research Letters*
  Burnett, A. C., Sheshadri, A., Silvers, L. G., Robinson, T.
  2021
- **Seasonal and Latitudinal Variability of the Gravity Wave Spectrum in the Lower Stratosphere** *JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES*

Lindgren, E. A., Sheshadri, A., Podglajen, A., Carver, R. W.
2020; 125 (18)

- **The role of wave-wave interactions in sudden stratospheric warming formation** *Weather and Climate Dynamics*
  Lindgren, E. A., Sheshadri, A.
  2020; 1: 93-109
- **Frequency-dependent behavior of zonal jet variability** *Geophysical research letters*
  Lindgren, E. A., Sheshadri, A., Plumb, R. A.
  2020; 47: 1-8
- **The Importance of Greenland in Setting the Northern Preferred Position of the North Atlantic Eddy-Driven Jet** *GEOPHYSICAL RESEARCH LETTERS*
  White, R. H., Hilgenbrink, C., Sheshadri, A.
  2019
- **Model Hierarchies for Understanding Atmospheric Circulation** *REVIEWS OF GEOPHYSICS*
  Maher, P., Gerber, E. P., Medeiros, B., Merlis, T. M., Sherwood, S., Sheshadri, A., Sobel, A. H., Vallis, G. K., Voigt, A., Zurita-Gotor, P.
  2019; 57 (2): 250–80
- **Orography and the Boreal Winter Stratosphere: the Importance of the Mongolian mountains** *Geopysical Research Letters*
  White, R. H., Battisti, D. S., Sheshadri, A.
  2018
- **Sudden stratospheric warming formation in an idealized General Circulation Model using three types of tropospheric forcing** *Journal of Geophysical research: Atmospheres*
  Lindgren, E. A., Sheshadri, A., Plumb, R. A.
  2018; 123
- **The vertical structure of annular modes** *Journal of the Atmospheric Sciences*
  Sheshadri, A., Plumb, R. A., Lindgren, E. A., Domeisen, D. I.
  2018; 75: 3507-3519
- **Propagating Annular Modes: Empirical Orthogonal Functions, Principal Oscillation Patterns, and Time Scales** *JOURNAL OF THE ATMOSPHERIC SCIENCES*
  Sheshadri, A., Plumb, R. A.
  2017; 74 (5): 1345-1361
- **A perspective on climate model hierarchies** *Journal of Advances in Modeling Earth Systems*
  Jeevanjee, N., Hassanzadeh, P., Hill, S., Sheshadri, A.
  2017; 9 (4): 1760-1771
- **Observed Changes in the Southern Hemispheric Circulation in May** *JOURNAL OF CLIMATE*
  Ivy, D. J., Hilgenbrink, C., Kinnison, D., Plumb, R. A., Sheshadri, A., Solomon, S., Thompson, D. W.
  2017; 30 (2): 527-536
- **The Relationship between Age of Air and the Diabatic Circulation of the Stratosphere** *JOURNAL OF THE ATMOSPHERIC SCIENCES*
  Linz, M., Plumb, R. A., Gerber, E. P., Sheshadri, A.
  2016; 73 (11): 4507-4518
- **Sensitivity of the surface responses of an idealized AGCM to the timing of imposed ozone depletion-like polar stratospheric cooling** *GEOPHYSICAL RESEARCH LETTERS*
  Sheshadri, A., Plumb, R. A.
  2016; 43 (5): 2330-2336
- **Seasonal Variability of the Polar Stratospheric Vortex in an Idealized AGCM with Varying Tropospheric Wave Forcing** *JOURNAL OF THE ATMOSPHERIC SCIENCES*
  Sheshadri, A., Plumb, R. A., Gerber, E. P.
  2015; 72 (6): 2248-2266

- **Can the Delay in Antarctic Polar Vortex Breakup Explain Recent Trends in Surface Westerlies** *JOURNAL OF THE ATMOSPHERIC SCIENCES*
  Sheshadri, A., Plumb, R. A., Domeisen, D. I.
  2014; 71 (2): 566-573
- **Modeling Traveling Waves using Mode Superposition** *PROCEEDINGS OF THE ASME 29TH INTERNATIONAL CONFERENCE ON OCEAN, OFFSHORE AND ARCTIC ENGINEERING, 2010, VOL 1*
  Jaiswal, V., Sheshadri, A., Vandiver, J. K.
  2010: 521-527
- **AN EXPERIMENTAL EVALUATION OF VORTEX-INDUCED VIBRATION OF A RISER BUNDLE WITH GAPS** *OMAE 2009, VOL 5*
  Vandiver, J. K., Cheng, Y., Jaiswal, V., Sheshadri, A., Yu, A.
  2009: 695-705