

Nicholas Balasus

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Updated September 3, 2026

Education

- Ph.D., Environmental Science and Engineering
Harvard University, Advisor: Daniel Jacob
September 2021–December 2025
- B.S., Chemical Engineering
University of Maryland, Baltimore County (UMBC)
September 2017–May 2021

Research Experience

- Postdoctoral Scholar
Carbon Mapper, Advisor: Daniel Cusworth
December 2025–present
- Graduate Research Assistant
Harvard University, Advisor: Daniel Jacob
September 2021–December 2025
- Undergraduate Research Assistant
UMBC, Advisor: Christopher Hennigan
September 2017–August 2021

First-Author Publications

- **Balasus, N.**, D.H. Cusworth, J. Kim, D.J. Varon, C.E. Miller, and R.M. Duren (2026). Mapping ammonia emission plumes using shortwave infrared imaging spectroscopy. *Proc. Natl. Acad. Sci.*, <https://doi.org/10.1073/pnas.2605694123>.
- **Balasus, N.**, D.J. Jacob, A.A. Bloom, J.D. East, L.A. Estrada, S.E. Hancock, M. He, T.A. Mooring, A.J. Turner, and J.R. Worden (2026). 2019–2024 trends in African livestock and wetland emissions as contributors to the global methane rise. *Atmos. Chem. Phys.*, <https://doi.org/10.5194/acp-26-4601-2026>.
- **Balasus, N.**, D.J. Jacob, G. Maxemin, C. Jenks, H. Nesser, J.D. Maasakkers, D.H. Cusworth, T.R. Scarpelli, D.J. Varon, and X. Wang (2025). Satellite monitoring of annual US landfill methane emissions and trends. *Environ. Res. Lett.*, <https://doi.org/10.1088/1748-9326/ada2b1>.
- **Balasus, N.**, D.J. Jacob, A. Lorente, J.D. Maasakkers, R.J. Parker, H. Boesch, Z. Chen, M.M. Kelp, H. Nesser, and D.J. Varon (2023). A blended TROPOMI+GOSAT satellite data product for atmospheric methane using machine learning to correct retrieval biases. *Atmos. Meas. Tech.*, <https://doi.org/10.5194/amt-16-3787-2023>.
- **Balasus, N.**, M.A. Battaglia Jr., K. Ball, V. Caicedo, R. Delgado, A.G. Carlton, and C.J. Hennigan (2021). Urban aerosol chemistry at a land-water transition site during summer - Part 1: Impact of agricultural and industrial ammonia emissions. *Atmos. Chem. Phys.*, <https://doi.org/10.5194/acp-21-13051-2021>.

Co-Author Publications

- Gauld, K.D., D.J. Varon, **N. Balasus**, and D.H. Cusworth (submitted). Quantifying AI data center nitrogen oxide (NO_x) emissions from space.
- Zhang, D., D.J. Jacob, E.W. Lundgren, M.P. Sulprizio, **N. Balasus**, L.A. Estrada, E. Reidy, and D.J. Varon (submitted). Efficient computation of global high-resolution Jacobian matrices for analytical inversions of satellite observations of greenhouse gases.

- Loman, M.L., L.T. Murray, P.D. Ivatt, R. Commane, A. Hallward-Driemeier, R. Dhall, E.M. Leibensperger, **N. Balasus**, L. Estrada, M.P. Sulprizio, M.R. Sargent, and F. Vogel (submitted). Assessing the ability of stationary in situ ground-based observations to constrain local methane emissions in space and time in New York State.
- Lama, S., J.D. Maasakkers, X. Zhang, M. Girard, S. Dutt, S. Nandgaonkar, D.J. Varon, M.P. Sulprizio, L.A. Estrada, **N. Balasus**, R.J. Parker, Y. Terao, and I. Aben (submitted). Evaluating national, state, and urban Indian methane emissions using satellites.
- Baray, S., F.R. Vogel, D.J. Varon, L.A. Estrada, **N. Balasus**, D.B.A. Jones, C.A. McLinden, D. Griffin, M. Watine-Guiu, R.M. Duren, D.H. Cusworth, T.A. de Jong, and J.D. Maasakkers (submitted). Monitoring methane emissions in Western Canada from space using a constellation of satellites.
- Sharma, S., J.D. Maasakkers, M. Dogniaux, M. Girard, J. McKeever, D. Jervis, B.J. Schuit, T.A. de Jong, I. Irakulis-Loitxate, **N. Balasus**, D.J. Varon, and I. Aben (submitted). Estimating methane emissions from surface coal mines using complementary satellite observations.
- Estrada, L.A., D.J. Jacob, M. He, J.D. East, D.J. Varon, **N. Balasus**, S.E. Hancock, M. Sulprizio, K.W. Bowman, J.R. Worden, E. Reidy, and B.R.K. Runkle (2026). Quantifying national, state, and oil/gas field methane emissions and trends in the U.S. (2019–2024) through high resolution inversion of satellite observations. *Atmos. Chem. Phys.*, <https://doi.org/10.5194/acp-26-10629-2026>.
- Hancock, S.E., D.J. Jacob, R. Jimenez, A. Ardila, L. Morales-Rincon, N. Rojas, L.A. Estrada, **N. Balasus**, J.D. East, M.P. Sulprizio, X. Wang, J.L. France, L. Potyk, E. Penn, Z. Chen, D.J. Varon, C. Frankenberg, M. Baranski, A. Calcan, and R.J. Parker (2026). Applying satellite observations to improve bottom-up national emission inventories for methane: application to Colombia. *Atmos. Chem. Phys.*, <https://doi.org/10.5194/acp-26-10455-2026>.
- Chen, Z., D.J. Jacob, H. Lin, **N. Balasus**, S.E. Hancock, L.A. Estrada, J.D. East, Y. Zhang, X. Wang, M. He, M. Liu, and D.J. Varon (2026). Tropical wetland methane emissions and trends (2004–2023) inferred from Landsat-based inundated vegetation data. *Environ. Sci. Technol.*, <https://doi.org/10.1021/acs.est.6c05412>.
- He, M., D.J. Jacob, L.A. Estrada, D.J. Varon, M. Sulprizio, **N. Balasus**, J.D. East, E. Penn, D.C. Pendergrass, Z. Chen, T.A. Mooring, J.D. Maasakkers, P.G. Brodrick, C. Frankenberg, K.W. Bowman, and L. Bruhwiler (2026). Attributing 2019–2024 methane growth using TROPOMI satellite observations. *Sci. Adv.*, <https://doi.org/10.1126/sciadv.adz9007>.
- Wang, X., D.J. Jacob, H. Nesser, **N. Balasus**, L.A. Estrada, M.P. Sulprizio, D.H. Cusworth, T.R. Scarpelli, Z. Chen, J.D. East, and D.J. Varon (2026). Quantifying urban and landfill methane emissions in the United States using TROPOMI satellite data. *Sci. Adv.*, <https://doi.org/10.1126/sciadv.adz9308>.
- Varon, D., D.J. Jacob, L.A. Estrada, **N. Balasus**, J.D. East, D.C. Pendergrass, Z. Chen, M. Sulprizio, M. Omara, R. Gautam, Z.R. Barkley, F.J. Cardoso-Saldaña, E.K. Reidy, H. Kamdar, E.D. Sherwin, S.C. Biraud, D. Jervis, S. Pandey, J.R. Worden, K.W. Bowman, J.D. Maasakkers, and R.L. Kleinberg (2025). Seasonality and declining intensity of methane emissions from the Permian and nearby US oil and gas basins. *Environ. Sci. Technol.*, <https://doi.org/10.1021/acs.est.5c08745>.
- East, J.D., D.J. Jacob, D. Jervis, **N. Balasus**, L.A. Estrada, S.E. Hancock, M.P. Sulprizio, J. Thomas, X. Wang, Z. Chen, D.J. Varon, and J.R. Worden (2025). Worldwide inference of national methane emissions by inversion of satellite observations and UNFCCC prior estimates. *Nat. Commun.*, <https://doi.org/10.1038/s41467-025-67122-8>.
- Pendergrass, D.C., D.J. Jacob, **N. Balasus**, L.E. Estrada, D.J. Varon, J.D. East, M. He, T.A. Mooring, E. Penn, H. Nesser, and J.R. Worden (2025). Trends and seasonality of 2019–2023 global methane emissions inferred from a localized ensemble transform Kalman filter (CHEEREIO v1.3.1) applied to TROPOMI satellite observations. *Atmos. Chem. Phys.*, <https://doi.org/10.5194/acp-25-14353-2025>.
- Estrada, L.A., D.J. Varon, M. Sulprizio, H. Nesser, Z. Chen, **N. Balasus**, S.E. Hancock, M. He, J.D. East, T.A. Mooring, A.O. Alonso, J.D. Maasakkers, I. Aben, S. Baray, K.W. Bowman, J.R. Worden, F.J. Cardoso-Saldaña, E. Reidy, and D.J. Jacob (2025). Integrated Methane Inversion (IMI) 2.0: an improved research and stakeholder tool for monitoring total methane emissions with high resolution worldwide using TROPOMI satellite observations. *Geosci. Model Dev.*, <https://doi.org/10.5194/gmd-18-3311-2025>.
- Chen, Z., H. Lin, **N. Balasus**, A. Hardy, J.D. East, Y. Zhang, B.R.K. Runkle, S.E. Hancock, C.A. Taylor, X. Du, B.O. Sander, and D.J. Jacob (2025). Global Rice Paddy Inventory (GRPI): a high-resolution inventory of methane emissions from rice agriculture based on Landsat satellite inundation data. *Earth’s Future*, <https://doi.org/10.1029/2024EF005479>.

- Hancock, S.H., D.J. Jacob, Z. Chen, H. Nesser, A. Davitt, D.J. Varon, M.P. Sulprizio, **N. Balasus**, L.A. Estrada, J.D. East, E. Penn, C.A. Randles, J. Worden, I. Aben, R.J. Parker, and J.D. Maasakkers (2025). Satellite quantification of methane emissions from South American countries: A high-resolution inversion of TROPOMI and GOSAT observations. *Atmos. Chem. Phys.*, <https://doi.org/10.5194/acp-25-797-2025>.
- Oak, Y.J., D.J. Jacob, **N. Balasus**, L.H. Yang, H. Chong, J. Park, H. Lee, G.T. Lee, E.S. Ha, R.J. Park, H. Kwon, and J. Kim (2024). A bias-corrected GEMS geostationary satellite product for nitrogen dioxide using machine learning to enforce consistency with the TROPOMI satellite instrument. *Atmos. Meas. Tech.*, <https://doi.org/10.5194/amt-17-5147-2024>.
- Varon, D.J., D. Jervis, S. Pandey, S.L. Gallardo, **N. Balasus**, L.H. Yang, and D.J. Jacob (2024). Quantifying NO_x point sources with Landsat and Sentinel-2 satellite observations of NO₂ plumes. *Proc. Natl. Acad. Sci.*, <https://doi.org/10.1073/pnas.2317077121>.
- East, J.D., D.J. Jacob, **N. Balasus**, A.A. Bloom, L. Bruhwiler, Z. Chen, J.O. Kaplan, L.J. Mickley, T.A. Mooring, E. Penn, B. Poulter, M.P. Sulprizio, J.R. Worden, R.M. Yantosca, and Z. Zhang (2024). Interpreting the seasonality of atmospheric methane. *Geophys. Res. Lett.*, <https://doi.org/10.1029/2024GL108494>.
- Chen, Z., **N. Balasus**, H. Lin, H. Nesser, and D.J. Jacob (2024). African rice cultivation linked to rising methane. *Nat. Clim. Chang.*, <https://doi.org/10.1038/s41558-023-01907-x>.
- Watine-Guiu, M., D.J. Varon, I. Irakulis-Loitxate, **N. Balasus**, and D.J. Jacob (2023). Geostationary satellite observations of extreme and transient methane emissions from oil and gas infrastructure. *Proc. Natl. Acad. Sci.*, <https://doi.org/10.1073/pnas.2310797120>.
- Battaglia Jr., M.A., **N. Balasus**, K. Ball, V. Caicedo, R. Delgado, A.G. Carlton, and C.J. Hennigan (2021). Urban aerosol chemistry at a land-water transition site during summer - Part 2: Aerosol pH and liquid water content. *Atmos. Chem. Phys.*, <https://doi.org/10.5194/acp-21-18271-2021>.

Teaching Experience

- Professional Writing for Scientists and Engineers
Teaching Assistant for Fall 2023, Spring 2024, Fall 2024, Spring 2025, and Fall 2025 at Harvard University
- Confronting Climate Change: A Foundation in Science, Technology and Policy
Teaching Assistant for Fall 2022 at Harvard University
- Chemical Process Control and Safety
Teaching Assistant for Spring 2021 at UMBC
- Chemical Process Thermodynamics
Teaching Assistant for Fall 2020 at UMBC
- Chemical Engineering Problem Solving and Experimental Design Lab
Teaching Assistant for Spring 2020 at UMBC
- Chemical Engineering Analysis
Teaching Assistant for Fall 2019 at UMBC

Awards and Honors

- National Defense Science and Engineering Graduate (NDSEG) Fellowship (2022)
- UMBC Chemical, Biochemical, and Environmental Engineering Undergraduate Research Award (2021)
- NOAA Ernest F. Hollings Scholar (2019)

Service

- Reviewer for *Atmospheric Environment*, *Atmospheric Measurement Techniques*, *Earth System Science Data*, *Environmental Research: Infrastructure and Sustainability*, *Environmental Research Letters*, *Geophysical Research Letters*, *Nature Climate Change*, *Nature Communications*, and *Remote Sensing of Environment*.