

DANIEL J. VARON

Curriculum Vitae | 21 November 2022

✉ danielvaron@g.harvard.edu | 🌐 varon.org

29 Oxford St | Cambridge, MA 02138

EDUCATION

- Ph.D., Atmospheric Chemistry**, Harvard University 2015 – 2020
M.Sc., Applied Mathematics
Secondary field in Computational Science & Engineering
Faculty mentor: Daniel Jacob
- B.A., English Literature**, McGill University 2010 – 2014
First Class Honours
Faculty mentor: David Hensley
- B.Sc., Physics**, McGill University 2009 – 2014
First Class Honours
Faculty mentors: Shaun Lovejoy, Tracy Webb

PROFESSIONAL EXPERIENCE

- Visiting Postdoctoral Research Associate**, Princeton University 2021 –
School of Public and International Affairs
Faculty host: Denise Mauzerall
- Postdoctoral Research Fellow**, Harvard University 2020 –
School of Engineering and Applied Sciences
Secondary appointment at GHGSat, Inc.
Faculty mentor: Daniel Jacob

PUBLICATIONS (*SUBMITTED)

h-index = 12, total citations = 718 (as of 21 November 2022 on [Google scholar](https://scholar.google.com/))

- *23. **Varon, D. J.**, Jacob, D. J., Hmiel, B., Gautam, R., Lyon, D. R., Omara, M., Sulprizio, M., Shen, L., Pendergrass, D., Nesser, H., Qu, Z., Barkley, Z. R., Miles, N. L., Richardson, S. J., Davis, K. J., Pandey, S., Lu, X., Lorente, A., Borsdorff, T., Maasakkers, J. D., and Aben, I.: Continuous weekly monitoring of methane emissions from the Permian Basin by inversion of TROPOMI satellite observations, *Atmos. Chem. Phys. Discuss.* [preprint], [doi:10.5194/acp-2022-749](https://doi.org/10.5194/acp-2022-749), in review, 2022.
- *22. Lu, X., Jacob, D. J., Zhang, Y., Shen, L., Sulprizio, M. P., Maasakkers, J. D., **Varon, D. J.**, Qu, Z., Chen, Z., Hmiel, B., Parker, R. J., Boesch, H., Wang, H., He, C., and Fan, S.: Observation-derived 2010-2019 trends in methane emissions and intensities from US oil and gas fields tied to activity metrics, *PNAS*, submitted, 2022.
- *21. Gorroño, J., **Varon, D. J.**, Irakulis-Loitxate, I., and Guanter, L.: Understanding the potential of Sentinel-2 for monitoring methane point emissions, *Atmos. Meas. Tech. Discuss.* [preprint], [doi:10.5194/amt-2022-261](https://doi.org/10.5194/amt-2022-261), in review, 2022.
20. Zhang, Z., Sherwin, E. D., **Varon, D. J.**, and Brandt, A. R.: Detecting and quantifying methane emissions from oil and gas production: algorithm development with ground-truth calibration based on Sentinel-2 satellite imagery, EGU sphere [preprint], [doi:10.5194/egusphere-2022-771](https://doi.org/10.5194/egusphere-2022-771), accepted, 2022.

19. Shen, L., Gautam, R., Omara, M., Zavala-Araiza, D., Maasakkers, J. D., Scarpelli, T. R., Lorente, A., Lyon, D., Sheng, J., **Varon, D. J.**, Nesser, H., Qu, Z., Lu, X., Sulprizio, M. P., Hamburg, S. P., and Jacob, D. J.: Satellite quantification of oil and natural gas methane emissions in the US and Canada including contributions from individual basins, *Atmos. Chem. Phys.*, 22, 11203–11215, [doi:10.5194/acp-22-11203-2022](https://doi.org/10.5194/acp-22-11203-2022), 2022.
 18. Chen, Z., Jacob, D. J., Nesser, H., Sulprizio, M. P., Lorente, A., **Varon, D. J.**, Lu, X., Shen, L., Qu, Z., Penn, E., and Yu, X.: Methane emissions from China: a high-resolution inversion of TROPOMI satellite observations, *Atmos. Chem. Phys.*, 22, 10809–10826, [doi:10.5194/acp-22-10809-2022](https://doi.org/10.5194/acp-22-10809-2022), 2022.
 17. Qu, Z., Jacob, D. J., Zhang, Y., Shen, L., **Varon, D. J.**, Lu, X., Scarpelli, T., Bloom, A., Worden, J., and Parker, R. J.: Attribution of the 2020 surge in atmospheric methane by inverse analysis of GOSAT observations, *Environ. Res. Lett.*, 17, 9, [doi:10.1088/1748-9326/ac8754](https://doi.org/10.1088/1748-9326/ac8754), 2022.
 16. Maasakkers, J. D., **Varon, D. J.**, Elfarsdóttir, A., McKeever, J., Jervis, D., Mahapatra, G., Pandey, S., Lorente, A., Borsdorff, T., Foorthuis, L. R., Schuit, B. J., Tol, P., van Kempen, T. A., van Hees, R., and Aben, I.: Using satellites to uncover large methane emissions from landfills, *Sci. Adv.*, 8, 32, [doi:10.1126/sciadv.abn9683](https://doi.org/10.1126/sciadv.abn9683), 2022.
 15. Jacob, D. J., **Varon, D. J.**, Cusworth, D. H., Dennison, P. E., Frankenberg, C., Gautam, R., Guanter, L., Kelley, J., McKeever, J., Ott, L. E., Poulter, B., Qu, Z., Thorpe, A. K., Worden, J. R., and Duren, R. M.: Quantifying methane emissions from the global scale down to point sources using satellite observations of atmospheric methane, *Atmos. Chem. Phys.*, 22, 9617–9646, [doi:10.5194/acp-22-9617-2022](https://doi.org/10.5194/acp-22-9617-2022), 2022.
 14. **Varon, D. J.**, Jacob, D. J., Sulprizio, M., Estrada, L. A., Downs, W. B., Shen, L., Hancock, S. E., Nesser, H., Qu, Z., Penn, E., Chen, Z., Lu, X., Lorente, A., Tewari, A., and Randles, C. A.: Integrated Methane Inversion (IMI 1.0): A user-friendly, cloud-based facility for inferring high-resolution methane emissions from TROPOMI satellite observations, *Geosci. Mod. Dev.*, 15, 5787–5805, [doi:10.5194/gmd-15-5787-2022](https://doi.org/10.5194/gmd-15-5787-2022), 2022.
 13. Sánchez-García, E., Gorroño, J., Irakulis-Loitxate, I., **Varon, D. J.**, and Guanter, L.: Mapping methane plumes at very high spatial resolution with the WorldView-3 satellite, *Atmos. Meas. Tech.*, 15, 1657–1674, [doi:10.5194/amt-15-1657-2022](https://doi.org/10.5194/amt-15-1657-2022), 2022.
 12. Guanter, L., Irakulis-Loitxate, I., Gorroño, J., Sánchez-García, E., Cusworth, D. H., **Varon, D. J.**, Cogliati, S., and Colombo, R.: Mapping methane point emissions with the PRISMA spaceborne imaging spectrometer, *Rem. Sens. Env.*, [doi:10.1016/j.rse.2021.112671](https://doi.org/10.1016/j.rse.2021.112671), 2021.
 11. Irakulis, I., Guanter, L., Liu, Y., **Varon, D. J.**, Maasakkers, J. D., Zhang, Y., Thorpe, A. K., Duren, R. M., Frankenberg, C., Lyon, D., Cusworth, D. H., Zhang, Y., Seg, K., Gorroño, J., Sánchez-García, E., Sulprizio, M. P., Cao, K., Zhu, H., Liang, J., Li, X., Aben, I., and Jacob, D. J.: Satellite-based Survey of Extreme Methane Emissions in the Permian Basin, *Sci. Adv.*, 7, 27, [doi:10.1126/sciadv.abf4507](https://doi.org/10.1126/sciadv.abf4507), 2021.
 10. Lyon, D. R., Hmiel, B., Gautam, R., Omara, M., Roberts, K. A., Barkley, Z. R., Davis, K. J., Miles, N. L., Monteiro, V. C., Richardson, S. J., Conley, S., Smith, M. L., Jacob, D. J., Shen, L., **Varon, D. J.**, Deng, A., Rudelis, X., Sharma, N., Story, K. T., Brandt, A. R., Kang, M., Kort, E. A., Marchese, A. J., and Hamburg, S. P.: Concurrent variation in oil and gas methane emissions and oil price during the COVID-19 pandemic. *Atmos. Chem. Phys.*, 21, 6605–6626, [doi:10.5194/acp-21-6605-2021](https://doi.org/10.5194/acp-21-6605-2021), 2021.
 9. **Varon, D. J.**, Jervis, D., McKeever, J., Spence, I., Gains, D., and Jacob, D. J.: High-frequency monitoring of anomalous methane point sources with multispectral Sentinel-2 satellite observations. *Atmos. Meas. Tech.*, 14, 2771–2785, [doi:10.5194/amt-14-2771-2021](https://doi.org/10.5194/amt-14-2771-2021), 2021.
- Among AMT’s most downloaded:** https://amt.copernicus.org/most_downloaded.html.

8. Jervis, D., McKeever, J., Durak, B. O. A., Sloan, J. J., Gains, D., **Varon, D. J.**, Ramier, A., Strupler, M., and Tarrant, E.: The GHGSat-D Imaging Spectrometer. *Atmos. Meas. Tech. Discuss.*, 14, 2127–2140, [doi:10.5194/amt-14-2127-2021](https://doi.org/10.5194/amt-14-2127-2021), 2021.
7. Cusworth, D. H., Duren, R. M., Thorpe, A. K., Pandey, S., Maasakkers, J. D., Aben, I., Jervis, D., **Varon, D. J.**, Jacob, D. J., Randles, C. A., Smith, M., Gautam, R., Omara, M., Schade, G., Dennison, P. E., Frankenberg, C., Gordon, D., Lopinto, E., and Miller, C. E.: Multi-satellite imaging of a gas well blowout enables quantification of total methane emissions. *Geophys. Res. Lett.*, 48, 2, [doi:10.1029/2020GL090864](https://doi.org/10.1029/2020GL090864), 2020.
6. **Varon, D. J.**, Jacob, D. J., McKeever, J., and Jervis, D.: Quantifying time-averaged methane emissions from individual coal mine vents with GHGSat-D satellite observations. *Environ. Sci. Tech.*, 54, 16, 10246–10253, [doi:10.1021/acs.est.0c01213](https://doi.org/10.1021/acs.est.0c01213), 2020.
5. Zhang, Y., Gautam, R., Pandey, S., Omara, M., Maasakkers, J. D., Sadavarte, P., Lyon, D., Nesser, H., Sulprizio, M. P., **Varon, D. J.**, Zhang, R., Houweling, S., Zavala-Araiza, D., Alvarez, R. A., Lorente, A., Hamburg, S. P., Aben, I., and Jacob, D. J.: Quantifying methane emissions from the largest oil producing basin in the U.S. from space. *Science Advances*, 6, 17, [doi:10.1126/sciadv.aaz5120](https://doi.org/10.1126/sciadv.aaz5120), 2020.
4. Cusworth, D. H., Jacob, **D. J.**, **Varon, D. J.**, Chan Miller, C., Liu, X., Chance, K., Thorpe, A. K., Duren, R. M., Miller, C. E., Thompson, D. R., Frankenberg, C., Guanter, L., and Randles, C. A.: Potential of next-generation imaging spectrometers to detect and quantify methane point sources from space, *Atmos. Meas. Tech.*, 12, 5655–5668, [doi:10.5194/amt-12-5655-2019](https://doi.org/10.5194/amt-12-5655-2019), 2019.
3. **Varon, D. J.**, McKeever, J., Jervis, D., Maasakkers, J. D., Pandey, S., Houweling, S., Aben, I., Scarpelli, T., and Jacob, D. J.: Satellite discovery of anomalously large methane point sources from oil/gas production. *Geophys. Res. Lett.*, 46, 22, [doi:10.1029/2019GL083798](https://doi.org/10.1029/2019GL083798), 2019.
Extensive media coverage: <https://wiley.altmetric.com/details/69396084>.
2. **Varon, D. J.**, Jacob, D. J., McKeever, J., Jervis, D., Durak, B. O. A., Xia, Y., and Huang, Y.: Quantifying methane point sources from fine-scale satellite observations of atmospheric methane plumes. *Atmos. Meas. Tech.*, 11, 5673–5686, [doi:10.5194/amt-11-5673-2018](https://doi.org/10.5194/amt-11-5673-2018), 2018.
1. Lovejoy, S., Schertzer, S., and **Varon, D. J.**: Do GCMs predict the climate... or macro-weather? *Earth System Dynamics* 4, 439–454. [doi:10.5194/esd-4-439-2013](https://doi.org/10.5194/esd-4-439-2013), 2013.

PRESENTATIONS

Invited talks

- 2022 University of Wisconsin-Madison, Satellite Data for Energy Analysis and Policy conference
- 2022 MIT, Department of Earth, Atmospheric and Planetary Sciences seminar
- 2021 NASA Jet Propulsion Laboratory, Carbon Club seminar
- 2021 University of Washington, Department of Atmospheric Sciences seminar
- 2021 Stanford University, Energy Resources Engineering seminar
- 2019 American Geophysical Union Fall Meeting ([U14C-10](#))
- 2019 SRON Netherlands Institute for Space Research

Conference presentations

- 2022 American Meteorological Society 102nd Annual Meeting (AMS)
- 2020 16th International Workshop on Greenhouse Gas Measurements from Space (IWGGMS-16)
- 2020 MIT A+B Applied Energy Symposium (MITAB)
- 2019 American Geophysical Fall Meeting ([A53F-03](#))
- 2019 15th International Workshop on Greenhouse Gas Measurements from Space (IWGGMS-15)
- 2019 Industrial Methane Measurements Conference (IMM)
- 2018 14th International Workshop on Greenhouse Gas Measurements from Space (IWGGMS-14)

2017 American Geophysical Union Fall Meeting ([A32D-07](#))

Selected poster presentations

2021 American Geophysical Union Fall Meeting ([B25G-1538](#))

2018 American Geophysical Union Fall Meeting ([A43R-3443](#))

TEACHING EXPERIENCE

Teaching assistant

Atmospheric Chemistry, Harvard University

2017

- Overall teaching score of 4.7/5.0 based on student reviews
- Awarded Harvard Certificate of Distinction in Teaching
- Responsibilities included developing new class materials, leading class discussions, writing and grading all assignments, and meeting with students individually.

MENTORING

Undergraduate students

- Chevaugn Campbell (Kenyon College), 2022. Landsat methane retrievals.
- Daniel Shen (Harvard University), 2021. Sentinel-2 methane retrievals.

AWARDS AND FELLOWSHIPS

Sigma Xi Honor Society

2019

AGU Outstanding Student Presentation Award

2018

Harvard University Certificate of Distinction in Teaching

2017

Stonington Graduate Fellowship of Environmental Science and Engineering

2015

McGill University Dean's Honour List

2014

Numerous B.Sc. research fellowships

2011 – 2013

SERVICE

Convener International Measurements of Methane Emissions from the Fossil Fuel Industries, ([A015](#)) AGU Fall Meeting 2020.

Reviewer *Atmospheric Chemistry & Physics, Atmospheric Measurement Techniques, Environmental Science & Technology, Remote Sensing of Environment, Geophysical Research Letters, Nature Scientific Reports, Science of the Total Environment, One Earth, Environmental Research Letters*
NASA ACCDAM review panel, 2021.

Leader Co-chair, *Methane Subgroup*, Harvard Atmospheric Chemistry Modeling Group (ACMG)
Co-chair, *Machine Learning & Data Science Subgroup*, Harvard ACMG

Participant IPCC Expert Meeting on Use of Atmospheric Observation Data in Emission Inventories, Geneva, September 2022

Member American Geophysical Union
Diversity, Inclusion, and Belonging Subgroup, Harvard ACMG

- Organizer** *Building an inclusive community in EPS/ESE: Addressing gender-based discrimination and harassment.* Department-wide event, February 2018.
2020 #ShutdownSTEM meeting, Harvard ACMG
- Volunteer** AstroMcGill astronomy outreach program, 2014