**Vineet Yadav  
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Dr. Yadav’s work centers on estimating and explaining trends and anomalies in complex systems, with a long-standing focus on inferring trace-gas emissions from atmospheric observations. For over fifteen years, he has designed algorithms that deliver spatially explicit flux estimates with minimal reliance on priors; built uncertainty-quantification frameworks to reconcile model differences; and developed inverse methods that disaggregate sectoral emissions from spatiotemporal covariance structures. Beyond this domain, he works at the intersection of optimization, simulation, time-series analysis and forecasting, geospatial analytics, and uncertainty modeling—paired with pragmatic data engineering. He has led research-to-production handoffs, run experiments, and delivered tools that inform real decisions. While much of his work has analyzed Earth systems, the same pattern—**ingest → model → explain → deploy**—translates directly to finance, operations, energy, logistics, and risk.

**Work History**

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| ***Data Scientist***  Jet Propulsion Laboratory, Pasadena, CA, USA | Sept 2014-Present |
| ***Senior Research Associate***  Carnegie Institution of Science, Stanford University, Stanford, CA USA | June 2011-Sept 2014 |
| ***Research Fellow***  Department of Civil and Environmental Engineering,  The University of Michigan, Ann Arbor, Michigan, USA | May 2008-June 2011 |

**Education**

Ph.D., *Geography*, the University of Iowa, Iowa City, USA (2008)

M. Phil (with Distinction), *GIS and Remote Sensing*, the University of Cambridge, Cambridge, UK (2003)

**Funded Project Grants:**

NIST, *LA* *Megacities*:JPL Sub-Contractor. Project Managed by Charles E. Miller (2015—ongoing)

*NASA, A synthesis and reconciliation of greenhouse gas flux estimates across the ABoVE domain*: JPL Co-Investigator 2021 (2023 – Ongoing)

*NASA, Multi-scale Methane Analytic Framework*: JPL Co-Investigator AIST 2019 (2019-2021)

*NASA, Multi-tiered Carbon Monitoring System CMS 2019*: JPL Co-Investigator (2020-2022)

*NASA, Fluorescence Based Constraints on Urban Biogenic CO2 Fluxes from OCO-2, OCO-3, and CLARS*, JPL Co-Investigator; OCO-2 STM 2017 (2018 – 2020)

*NASA, Multi-decadal time series of vegetation chlorophyll fluorescence and derived gross primary production*. JPL Co-Investigator; Total Funding ~ $3.7 Million (Measures 2017) (2018-ongoing)

*NASA, Records of fused and assimilated satellite carbon dioxide observations and fluxes from multiple instruments JPL Principal Investigator*; Total Funding ~ $3.7 Million (2018-ongoing)

*NASA, Science Team for the OCO-2 Mission, JPL-Subcontract-Principal Investigator: Quantifying Global Megacity CO2 Emission*; 2015-2017: Total Funding ~ $90, 000.

*Carnegie Institution for Washington, Intelligent CO2 Data Assimilation System*; JPL-Subcontract-Principal Investigator*:* 2015-2016: Total Funding ~ $170,000

*NASA, ARCTIC-Boreal Vulnerability Experiment, Co-Investigator: Quantifying CO2 and CH4 Fluxes from Vulnerable Arctic-Boreal Ecosystems Across Spatial and Temporal Scales*; 2015-2019

*NASA, Science Team for the OCO-2 Mission, Co-Investigator: Extension of Data Assimilation and Mapping Projects to Ingest Data from OCO-2*: Total Funding $265,949; 2011-2013

*NSF, Software Infrastructure for Sustained Innovation, Co-Investigator: SI2-SSI: Real-Time Large-Scale Parallel Intelligent CO2 Data Assimilation System*: Total Funding $1.9 Million; 2011-2014

*NASA, Atmospheric Carbon Observations from Space, Co-Investigator: CO 2.0: Assessing the Impact of a Combined in Situ and Satellite CO2 Monitoring Network on Constraining Biospheric and Anthropogenic Fluxes for North America*: Co-Investigator, Total Funding $754,760; 2010-2013

*DoE, Sandia National Laboratories: Laboratory Directed Research and Development, Co-Investigator: Kalman-Filtered Compressive Sensing for High Resolution Estimation of Anthropogenic Greenhouse Gas Emissions From Sparse Measurements*: Co-Investigator Total funding $183,900,0; 2010-2013

**Relevant Algorithms and Software:**

1. **Yadav, V**. (2013) An O(n2.5) Algorithm for Multiplication of Matrices Expressed as a Kronecker Product [see *Geoscientific Model Development*6, 3325-3342].
2. **Yadav, V**. (2013)An O(n2.5) Algorithm for Uncertainity Quantification in Geostatistical Inverse Models [see *Geoscientific Model Development*6, 3325-3342].
3. **Yadav, V**. (2016) Sparse-Sparse Matrix Multiplication Methods for Covariance Matrices in Atmospheric Inverse Problems [See *Geoscientific Model Development Discussions*, 204]

All the algorithms and software now are foundation of NOAA’s software **CarbonTracker-Lagrange** available from <https://gml.noaa.gov/ccgg/carbontracker-lagrange/>.

**Github**: <https://github.com/vineety>

**Software app;** IOS Phone Device (search on App store). **TerraOorja**

**Data Products:**

1. Hai Nguyen, J Liu, S, Kulawik, D Baker, J Hobbs, M Katzfuss, and V Yadav (2022), *OCO-2 Gridded bias-corrected XCO2 and other select fields aggregated as Level 4 daily files*, Greenbelt, MD, USA, Goddard Earth Sciences Data and Information Services Center (GES DISC), [10.5067/582L7HTJ343N](https://doi.org/10.5067/582L7HTJ343N)
2. Hai Nguyen, J Liu, S, Kulawik, D Baker, J Hobbs, M Katzfuss, and V Yadav (2022), *Multi-Instrument Fused bias-corrected XCO2 and other select fields aggregated as Level 4 daily files*,   
   Greenbelt, MD, USA, Goddard Earth Sciences Data and Information Services Center (GES DISC), [10.5067/ZS346LH1NTIS](https://doi.org/10.5067/ZS346LH1NTIS)
3. Hai Nguyen, Manju Johny, Junjie Liu, Susan Kulawik, David Baker, Jonathan Hobbs, Amy Braverman, Matthias Katzfuss, and Vineet Yadav (2024), OCO-2 Gridded bias-corrected XCO2, SIF, and other select fields aggregated as Level 3 daily files, Greenbelt, MD, USA, Goddard Earth Sciences Data and Information Services Center (GES DISC), Accessed: [Data Access Date], 10.5067/0QR48EPN1BVR

**Reviewing Activity**: (Paper) Journal of Geophysical Research: Atmospheres, Journal of Geophysical Research: Biogeosciences, Geophysical Research Letters, Water Resources Research, Atmospheric Chemistry and Physics, Geoscientific Model Development, Biogeosciences, Remote Sensing of Environment: (Proposals) NASA, DOE

**Collaborators**

**Primary Internal:** Charles E. Miller, Nicholas Parazoo, Kevin Bowman, Junjie Liu, Stanley Sanders

**Primary External:** Anna Michalak, Anna Karion, Kim Mueller, David Baker, Susan S. Kulawik, Scott Miller, Deborah Huntzinger, Ralph Keeling, John Miller, Jooil Kim,David Baker, James Whetstone and Subhomoy Ghosh.

**Mentoring**

Manju Johnny: Postdoc JPL (2021—2024)

**Classes**

Data Assimilation Summer School 2024, Colorado State University, Fort Collins, Colorado

Teaching Assistant, University of Iowa, 2004-2007

**Awards & Scholarships**:

1. 3 JPL Voyager Awards,
2. Ballard and Seashore Dissertation Fellowship, University of Iowa (2007-2008)
3. Cambridge Commonwealth Trust, the University of Cambridge, Cambridge, UK*;* Department of International Development-Cambridge Shared Scholarship (2001-2002)

**Publications**

1. Yadav, V., Hobbs, J., Nguyen, H. M., Kulawik, S. S., Liu, J., Baker, D. F., Morino, I., Ohyama, H., Velazco, V. A., Vrekoussis, M., & Dubey, M. K. (2025). An error model for evaluating the accuracy of satellite-based XCO₂ products. arXiv preprint arXiv:2509.16419. https://arxiv.org/abs/2509.16419
2. Mueller, Kimberly L., Anna Karion, Israel Lopez-Coto, Julia Marrs, Vineet Yadav, Genevieve Plant, Joseph Pitt, Zachary R. Barkley, and James Whetstone. "Scaling Urban Methane Emissions: Utility of Single-Site Measurements in Five Urban Domains." *Environmental Science & Technology* 59, no. 28 (2025): 14399-14409.
3. Liu, H., Vogel, F. R., Ishizawa, M., Zhang, Z., Poulter, B., Worthy, D. E. J., Feng, L., Gagné-Landmann, A. L., Chen, A., Huang, Z., Gaeta, D. C., Melton, J. R., Chan, D., Yadav, V., Huntzinger, D., and Miller, S. M.: Methane fluxes from arctic & boreal North America: Comparisons between process-based estimates and atmospheric observations, EGUsphere [preprint], https://doi.org/10.5194/egusphere-2025-2150, 2025.
4. Johny, M., Hobbs, J., Yadav, V., Johnson, M., Parazoo, N., Nguyen, H., & Braverman, A. (2025). A Bayesian hierarchical framework for fusion of remote sensing data: An example with solar-induced fluorescence. arXiv preprint arXiv:2503.03901. https://arxiv.org/abs/2503.03901
5. Mueller et al., IG3IS Urban Greenhouse Gas Emission Observation and Monitoring Good Research Practice Guidelines, Report, Under Revision. Accessible from https://wmoomm.sharepoint.com  
   /:w:/s/wmocpdb/EfTH9KfixddBk29epuSQ088Bj\_f5bTol80YG1C8QQN3bdA?e=323sHJ
6. Yadav, V., Verhulst, K., Duren, R., et al. (2023). "A declining trend of methane emissions in the Los Angeles basin from 2015 to 2020." *Environmental Research Letters*, 18(3), 034004.
7. Thorpe, A. K., Kort, E. A., Cusworth, D. H., et al. (2023). "Methane emissions decline from reduced oil, natural gas, and refinery production during COVID-19." *Environmental Research Communications*, 5(2), 021006.
8. Kim, J., Miller, J. B., Miller, C. E., et al. (2023). "Quantification of fossil fuel CO2 from combined CO, δ13CO2 and Δ14CO2 observations." *Atmospheric Chemistry and Physics*, 23(22), 14425-14436.
9. Yadav, V., Ghosh, S., & Miller, C. E. (2023). "Metrics for evaluating the quality in linear atmospheric inverse problems: a case study of a trace gas inversion." *Geoscientific Model Development*, 16(17), 5219-5236.
10. Cusworth, D. H., Thorpe, A. K., Ayasse, A. K., et al. (2022). "Strong methane point sources contribute a disproportionate fraction of total emissions across multiple basins in the United States." *Proceedings of the National Academy of Sciences*, 119(38), e2202338119.
11. Parazoo, N. C., Coleman, R. W., Yadav, V., et al. (2022). "Diverse biosphere influence on carbon and heat in mixed urban Mediterranean landscape revealed by high resolution thermal and optical remote sensing." *Science of The Total Environment*, 806, 151335.
12. Hobbs, J., Katzfuss, M., Nguyen, H., & Yadav, V. (2022). "Functional ANOVA for Carbon Flux Estimates from Remote Sensing Data." *Geoscientific Model Development Discussions*, 2022, 1-24.
13. Yadav, V., Ghosh, S., Mueller, K., et al. (2021). "The impact of COVID-19 on CO2 emissions in the Los Angeles and Washington DC/Baltimore metropolitan areas." *Geophysical Research Letters*, 48(11), e2021GL092744.
14. Tadić, J. M., Miller, S., Yadav, V., & Biraud, S. C. (2021). "Greenhouse gas fluxes from Alaska's North Slope inferred from the Airborne Carbon Measurements campaign (ACME-V)." Atmospheric Environment, 248, 118239.
15. Thorpe, A. K., O'Handley, C., Emmitt, G. D., et al. (2021). "Improved methane emission estimates using AVIRIS-NG and an Airborne Doppler Wind Lidar." *Remote Sensing of Environment*, 266, 112681.
16. Thorpe, A. K., Duren, R. M., Conley, S., et al. (2020). "Methane emissions from underground gas storage in California." *Environmental Research Letters*, 15(4), 045005.
17. Cusworth, D. H., Duren, R. M., Yadav, V., et al. (2020). "Synthesis of methane observations across scales: Strategies for deploying a multitiered observing network." *Geophysical Research Letters*, 47(7), e2020GL087869.
18. Miller, J. B., Lehman, S. J., Verhulst, K. R., et al. (2020). "Large and seasonally varying biospheric CO2 fluxes in the Los Angeles megacity revealed by atmospheric radiocarbon." *Proceedings of the National Academy of Sciences*, 117(43), 26681-26687.
19. Coleman, R. W., Stavros, N., & Yadav, V. (2020). "A simplified framework for high-resolution urban vegetation classification with optical imagery in the Los Angeles Megacity." *Remote Sensing*, 12(15), 2399.
20. Yadav, V., Duren, R., Mueller, K., et al. (2019). "Spatio-temporally resolved methane fluxes from the Los Angeles Megacity." *Journal of Geophysical Research: Atmospheres*, 124(9), 5131-5148.
21. Bogue, R. R., Schwandner, F. M., Fisher, J. B., et al. (2019). "Plant responses to volcanically elevated CO2 in two Costa Rican forests." *Biogeosciences*, 16(6), 1343-1360.
22. Ware, J., Kort, E. A., Duren, R., et al. (2019). "Detecting urban emissions changes and events with a near-real-time-capable inversion system." *Journal of Geophysical Research: Atmospheres*, 124(9), 5117-5130.
23. Hu, L., Andrews, A. E., Thoning, K. W., et al. (2019). "Enhanced North American carbon uptake associated with El Niño." *Science Advances*, 5(6), eaaw0076.
24. He, L., Zeng, Z., Pongetti, T. J., et al. (2019). "Atmospheric methane emissions correlate with natural gas consumption from residential and commercial sectors in Los Angeles." *Geophysical Research Letters*, 46(14), 8563-8571.
25. Parazoo, N. C., Frankenberg, C., Köhler, P., et al. (2019). "Towards a harmonized long-term spaceborne record of far-red solar-induced fluorescence." *Journal of Geophysical Research: Biogeosciences*, 124(8), 2518-2539.
26. Cui, Y. Y., Vijayan, A., Falk, M., et al. (2019). "A multiplatform inversion estimation of statewide and regional methane emissions in California during 2014-2016." *Environmental Science & Technology*, 53(16), 9636-9645.
27. Duren, R. M., Thorpe, A. K., Foster, K. T., et al. (2019). "California’s methane super-emitters." *Nature*, 575(7781), 180-184.
28. Shiga, Y. P., Tadić, J. M., Qiu, X., et al. (2018). "Atmospheric CO2 observations reveal strong correlation between regional net biospheric carbon uptake and solar-induced chlorophyll fluorescence." *Geophysical Research Letters*, 45(2), 1122-1132.
29. Gourdji, S. M., Yadav, V., Karion, A., et al. (2018). "Reducing errors in aircraft atmospheric inversion estimates of point-source emissions: the Aliso Canyon natural gas leak as a natural tracer experiment." *Environmental Research Letters*, 13(4), 045003.
30. Mueller, K., Yadav, V., Lopez-Coto, I., et al. (2018). "Siting background towers to characterize incoming air for urban greenhouse gas estimation: a case study in the Washington, DC/Baltimore area." *Journal of Geophysical Research: Atmospheres*, 123(5), 2910-2926.
31. Verhulst, K. R., Karion, A., Kim, J., et al. (2017). "Carbon dioxide and methane measurements from the Los Angeles Megacity Carbon Project--Part 1: calibration, urban enhancements, and uncertainty estimates." *Atmospheric Chemistry and Physics*, 17(13), 8313-8341.
32. Yadav, V., Michalak, A. M., Ray, J., & Shiga, Y. P. (2016). "A statistical approach for isolating fossil fuel emissions in atmospheric inverse problems." *Journal of Geophysical Research: Atmospheres*, 121(20), 12-490.
33. Alden, C. B., Miller, J. B., Gatti, L. V., et al. (2016). "Regional atmospheric CO2 inversion reveals seasonal and geographic differences in Amazon net biome exchange." *Global Change Biology*, 22(10), 3427-3443.
34. Bloom, A. A., Lauvaux, T., Worden, J., et al. (2016). "What are the greenhouse gas observing system requirements for reducing fundamental biogeochemical process uncertainty? Amazon wetland CH4 emissions as a case study." *Atmospheric Chemistry and Physics*, 16(23), 15199-15218.
35. Yadav, V., & Michalak, A. M. (2016). "Improving the computational efficiency of sparse matrix multiplication in linear atmospheric inverse problems." *Geosci. Model Dev. Discuss*, 204.
36. Ray, J., Lee, J., Yadav, V., et al. (2015). "A sparse reconstruction method for the estimation of multi-resolution emission fields via atmospheric inversion." *Geoscientific Model Development*, 8(4), 1259-1273.
37. Tadić, J. M., Qiu, X., & Yadav, V. (2015). "Mapping of satellite Earth observations using moving window block kriging." *Geoscientific Model Development*, 8(10), 3311-3319.
38. Ray, J., Yadav, V., Michalak, A. M., et al. (2014). "A multiresolution spatial parameterization for the estimation of fossil-fuel carbon dioxide emissions via atmospheric inversions." *Geoscientific Model Development*, 7(5), 1901-1918.
39. Fang, Y., Michalak, A. M., Shiga, Y. P., & Yadav, V. (2014). "Using atmospheric observations to evaluate the spatiotemporal variability of CO2 fluxes simulated by terrestrial biospheric models." *Biogeosciences*, 11(23), 6985-6997.
40. Shiga, Y. P., Michalak, A. M., Gourdji, S. M., Mueller, K. L., & Yadav, V. (2014). "Detecting fossil fuel emissions patterns from sub-continental regions using North American in-situ CO2 measurements." *Geophysical Research Letters*, 41(12), 4381-4388.
41. Ray, J., Lee, J., Lefantzi, S., Yadav, V., Michalak, A. M., van Bloemen Waanders, B. G., & McKenna, S. A. (2013). "Kalman-filtered compressive sensing for high resolution estimation of anthropogenic greenhouse gas emissions from sparse measurements." Sandia National Lab. (SNL-CA), Livermore, CA (United States).
42. Yadav, V., Malanson, G. P. (2013). "A spatially explicit scheme for tracking and validating annual landscape scale changes in soil carbon." *Applied Geography*, 37, 101-113.
43. Yadav, V., Mueller, K. L., & Michalak, A. M. (2013). "A backward elimination discrete optimization algorithm for model selection in spatio-temporal regression models." *Environmental Modelling & Software*, 42, 88-98.
44. Yadav, V., & Michalak, A. M. (2013). "Improving computational efficiency in large linear inverse problems: an example from carbon dioxide flux estimation." *Geoscientific Model Development*, 6(3), 583-590.
45. Chatterjee, A., Michalak, A. M., Anderson, J. L., Mueller, K. L., & Yadav, V. (2012). "Toward reliable ensemble Kalman filter estimates of CO2 fluxes." *Journal of Geophysical Research*, 117(D22), D22306.
46. Gourdji, S. M. (2012). "North American CO2 exchange: Inter comparison of modeled estimates with results from a fine scale atmospheric inversion." *Biogeosciences*, 9, 457-475.
47. Yadav, V., Mueller, K. L., Dragoni, D., & Michalak, A. M. (2010). "A geostatistical synthesis study of factors affecting gross primary productivity in various ecosystems of North America." *Biogeosciences*, 7(9), 2655-2671.
48. Gourdji, S. M., Hirsch, A. I., Mueller, K. L., Yadav, V., Andrews, A. E., & Michalak, A. M. (2010). "Regional-scale geostatistical inverse modeling of North American CO2 fluxes: a synthetic data study." *Atmos. Chem. Phys*, 10, 6151-6167.
49. Mueller, K. L., Yadav, V., Curtis, P. S., Vogel, C., & Michalak, A. M. (2010). "Attributing the variability of eddy-covariance CO2 flux measurements across temporal scales using geostatistical regression for a mixed northern hardwood forest." Global Biogeochemical Cycles, 24(3), GB3023.
50. Yadav, V., Malanson, G. P., Bekele, E., & Lant, C. (2009). "Modeling watershed-scale sequestration of soil organic carbon for carbon credit programs." *Applied Geography*, 29(4), 488-500.
51. Yadav, V., & Malanson, G. P. (2009). "Modeling impacts of erosion and deposition on soil organic carbon in the Big Creek Basin of southern Illinois." *Geomorphology*, 106(3-4), 304-314.
52. Yadav, V., & Malanson, G. (2008). "Spatially explicit historical land use land cover and soil organic carbon transformations in Southern Illinois." *Agriculture, Ecosystems & Environment*, 123(4), 280-292.
53. Yadav, V., Del Grosso, S. J., Parton, W. J., & Malanson, G. P. (2008). "Adding ecosystem function to agent-based land use models." *Journal of Land Use Science*, 3(1), 27-40.
54. Yadav, V., & Malanson, G. (2007). "Progress in soil organic matter research." *Progress in Physical Geography*, 31(2), 131.