

CURRICULUM VITAE

I. Personal

Name	VIJAY NATRAJ
Date Of Birth	February 2, 1976
Nationality	US
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II. Degrees

Ph.D. in Chemical Engineering, California Institute of Technology (2008)

Thesis: Radiative Transfer Modeling for the Retrieval of CO₂ from Space

Advisors: [Yuk L. Yung](#), John H. Seinfeld, Richard C. Flagan

M.S. in Chemical Engineering, California Institute of Technology (2004)

GPA: 4.1/4

M.Eng. in Chemical Engineering, National University of Singapore (2001)

Thesis: Rheology and Sedimentation of Charged Porous Spheres

Advisor: [Shing Bor Chen](#)

B.Eng. in Chemical Engineering, National University of Singapore (1998)

III. Research and Work Experience

Scientist IV (Apr 2018 – Present), Jet Propulsion Laboratory

Scientist III (Feb 2010 – Apr 2018), Jet Propulsion Laboratory

Visiting Associate in Planetary Science (Mar 2020 – Present), California Institute of Technology

Visitor in Planetary Science (Mar 2010 – Feb 2020), California Institute of Technology

Associate Project Scientist III (Jul 2018 – Present), Joint Institute for Regional Earth System Science and Engineering, University of California, Los Angeles

Associate Project Scientist II (Jul 2016 – Jun 2018), Joint Institute for Regional Earth System Science and Engineering, University of California, Los Angeles

Associate Project Scientist I (Nov 2014 – Jun 2016), Joint Institute for Regional Earth System Science and Engineering, University of California, Los Angeles

Visiting Assistant Researcher (May 2012 – Oct 2014), Joint Institute for Regional Earth System Science and Engineering, University of California, Los Angeles

Researcher (Jul 2007 – Jan 2010), California Institute of Technology

Co-Mentor (Jun 2006 – Present), Summer Undergraduate Research Fellowship (SURF) Program

Research Assistant (Oct 2001 – Jun 2007), California Institute of Technology

Research Engineer (Aug 1998 – Jun 2001), National University of Singapore

Internship Trainee (Jan 1997 – Jun 1997), ESSO Singapore Pte. Ltd.

IV. Leadership and Responsibilities

1. Recognized as an authority on radiative transfer (RT) at JPL and lead RT modeling activities for a variety of projects (TROPESS, [OCO-2](#), [GEO-CAPE](#), [PanFITS](#), [CLARS](#), [AIRS](#), [AVIRIS-NG](#), [ESI](#)).
2. Work in close partnership with [ESD](#) using both ROSES and R&TD funding to expand the use of RT models to new areas such as imaging spectroscopy and hydrology.
3. [RT/retrieval/assimilation inter-comparison effort](#) Lead (under [CEOS AC-VC](#) aegis) for international GEO constellation, involving GEO-CAPE (USA), MAGEAQ (Europe) and GEMS (Korea).
4. GEO-CAPE [Regional/Urban OSSE](#) Working Group Co-Lead (2015–2019).
5. Member of [Aerosol Remote Sensing from Space](#) Working Group (supported by the International Space Science Institute), composed of scientists (by invitation only) from USA, Europe, Russia and Asia (2012–2014).
6. Scientific leadership on RT for [OCO-2](#) (2010–Present).
7. Retrieval algorithm Lead for [GEO-CAPE](#), [PanFITS](#) and GEO-IR Sounder (2010–Present).
8. Maintain close collaborations with [Caltech](#) and [UCLA](#) faculty, and supervise graduate students and postdocs.

V. Research Interests and Project Accomplishments

TROPESS

- Lead retrieval algorithm development team.
- Act as liaison between PI (Kevin Bowman) and algorithm team.
- Provide intellectual support for RT model development and integration into ReFRACtor and MUSES-Py software frameworks.
- Lead efforts to improve treatment of physical process (e.g., Raman scattering, treatment of clouds)

GEO-IR Sounder

- Lead retrieval algorithm development team.
- Perform RT simulations.
- Leading manuscript on the simulation results; co-author on manuscript on weather OSSE results.

OCO-2

- Developed, implemented and tested polarized 2OS and scalar 2S RT models for OCO-2.
- 2OS and 2S models were crucial to meeting OCO-2 L2 processing requirements.
- Lead efforts to improve representation of surface reflection using bidirectional reflectance distribution function (BRDF) models.
- Lead efforts to improve treatment of physical process (e.g., Raman scattering)

GEO-CAPE/PanFTS

- Led a study involving 12 scientists from six institutions (including NASA centers and universities) to assess the impact of multispectral measurements on lowermost tropospheric ozone retrievals, resulting in a peer-reviewed publication and informing GEO-CAPE/TEMPO design.
- Ozone paper cited prominently in 2015 White Paper to NASA Earth Science Division summarizing accomplishments and providing recommendations to implement GEO-CAPE.

- Co-Lead of Regional/Urban OSSE Working Group to assess benefits of GEO mission over North America to improve forecasting of O₃, NO₂, HCHO and other air quality relevant species, leading to recommendations for a White Paper.
- Lead ongoing RT/retrieval/assimilation inter-comparison effort for international GEO constellation.
- Lead retrieval team for PanFTS, one of the candidates for the GEO-CAPE instrument.
- Lead author for GEO-CAPE Final Report to NASA Earth Science Division.

Aerosol Remote Sensing

- Invited member of Working Group on aerosol remote sensing from space, composed of scientists from USA, Europe, Russia and Asia, and sponsored by the International Space Science Institute, Switzerland.
- Leading role in expanding JPL aerosol retrieval capabilities (especially estimation of vertical distribution, relevant to aerosol and cloud designated mission proposed by 2017 Earth Science Decadal Survey) through PDF and (potentially) strategic R&TD activities.

Other Earth Science Activities

- Using airborne measurements of tropical tropopause layer to improve cirrus cloud retrievals.
- Using visible and mid-infrared measurements to retrieve ice cloud properties.
- Profiling temperature and water vapor in the planetary boundary layer using near- and thermal-infrared measurements.
- Improving diagnosis of clouds in climate models using mid-infrared satellite data.
- Coupled surface-atmosphere retrievals for imaging spectroscopic measurements, leading to major advances in visible/shortwave infrared imaging spectroscopy science, and relevant to surface geology and biology designated missions proposed by 2017 Earth Science Decadal Survey.
- Analysis of trace gases and aerosols over volcanoes.
- Remote sensing of biomass burning plumes.
- Spatially correlated retrievals of imaging spectroscopic measurements.
- Improving computational efficiency of Markov Chain Monte Carlo (MCMC) algorithms.
- Develop RT models for simulating Spatial Heterodyne Spectrometric (SHS) measurements, with relevance to measurement of Solar Induced Fluorescence (SIF).

Exoplanet Research

- Lead R&TD project to study the Earth as an exoplanet.
- Leading role in interdisciplinary collaboration between scientists from Earth science, planetary science and astrophysics on exoplanetary atmospheric characterization.

VI. Funded NASA and International Projects

ACCDAM: Co-Investigator (2021–2024); PI: Jochen Stutz (UCLA); Postdoc: TBD – UCLA; Title: Advancing UV/Vis Remote Sensing of Biomass Burning Plumes: Brown Carbon, Actinic Flux, and Trace Gas Retrievals

IDS: Institutional PI (2020–2023), PI: Stephen Broccardo (Ames); Title: Lifting the Veil of Volcanic Aerosol Impacts on Satellite Trace Gas Retrievals: Enabling Volcanic Emission Plume Composition Measurements to Track Evolving Sub-Surface Magmatic Conditions

Flight Opportunities: Co-Investigator (2020–2023), PI: Sona Hosseini (JPL); Title: Flight Demonstration and Maturation of the Next Generation of Miniature High-Resolution Spectrometers

XRP: Collaborator (2020–2022); PI: Jonathan Jiang (JPL); Title: The Imitation Game: Construction of a Habitable Exoplanet Detection Machine

ESUSPI: Principal Investigator (2017–2022); Students: Pushkar Kopparla, Tianhao Le – Caltech; Title: Retrieval of Aerosol Composition and Vertical Distribution Using Oxygen A-Band and Multi-angle Polarimetric Measurements from the EUMETSAT Polar System–Second Generation Satellite

MEaSURES: Co-Investigator (2018–2022), PI: Vineet Yadav (JPL); Title: Records of Fused and Assimilated Satellite Carbon Dioxide Observations and Fluxes from Multiple Instruments

AIST: Co-Investigator (2017–2019); PI: James Mc Duffie (JPL); Title: Multi-Instrument Radiative Transfer and Retrieval Framework

AVIRIS-NG: Co-Investigator (2017–2019); PI: David Thompson (JPL); Title: Improving Atmospheric Correction Across the Indian Subcontinent

SCS: Co-Principal Investigator (2015–2018); PI: Daniel Feldman (LBNL); Title: Using OSSEs to Compare Climate Performance of Operational Retrieval Algorithms and Spectral Fingerprints

ACCDAM: Co-Investigator (2014–2020); PI: Jochen Stutz (UCLA); Student: Ross Cheung – UCLA; Postdoc: Fedele Colosimo – UCLA; Title: Investigation of TTL Cirrus Cloud Properties Using Near-IR Absorption Spectroscopy During ATTREX

AST: Co-Investigator (2014–2017); PI: Thomas Kurosu (JPL); Title: A Height-Resolved Bromine Monoxide Tropospheric Data Product from the Ozone Monitoring Instrument on Aura

International Space Science Institute (Switzerland): Co-Investigator (2012–2014); PI: Alexander Kokhanovsky (EUMETSAT); Title: Aerosol Remote Sensing from Space

VII. Funded JPL Projects

DSWG Pilot: Co-Investigator (2021); PI: Philip Broderick; Title: Neural Network Accelerated Radiative Transfer Modeling

SURP: Co-Investigator (2020–2021); PI: Jonathan Hobbs; Title: Exploiting Spatio-Temporal Dependence in Multi-Footprint Remote Sensing Retrievals

SURP: Co-Investigator (2019–2021); PI: Amy Braverman; Title: Accelerating MCMC to Operational Speeds

R&TD: Principal Investigator (2017–2019); Title: Coupled Atmosphere-Surface Retrievals for Visible/Shortwave Infrared Imaging Spectroscopy

R&TD: Principal Investigator (2017–2018); Students: Jiazheng Li (Caltech), Siteng Fan (Caltech); Title: Radiative Transfer and Modeling Activities in Support of the Exoplanetary Science Initiative

R&TD: Co-Investigator (2017–2018); PI: Jonathan Jiang; Student: Tianhao Le (Caltech); Postdoc: Zhaocheng Zeng (Caltech); Title: iMAP (Innovative Method of Aerosol Profiling) for Air Quality Studies

ESI: Principal Investigator (2016–2017); Title: Implementation of a Generic, Fast and Optimized RT Model for (Exo)Planetary Atmospheric Characterization

PDF: Co-Investigator (2015–2016); PI: Mark Swain; Student: Pushkar Kopparla (Caltech); Title: Exoplanet Clouds and Hazes

SURP: Principal Investigator (2012–2013); Student: Ross Cheung (UCLA); Postdoc: Fedele Colosimo (UCLA); Title: Retrieval of Aerosol Profiles Using Polarimetry of O₂ and O₂-O₂

R&TD: Co-Investigator (2012–2013); PI: Pin Chen; Title: 3-D Spectral-Imager for Venus Observations

R&TD: Co-Investigator (2011–2012); PI: Pin Chen; Title: Chemistry and Transport Modeling of Exoplanetary Atmospheres

R&TD: Co-Investigator (2011–2012); PI: Edward Olsen; Title: Feasibility Study for Retrieval of Boundary Layer CO₂ by Combined Near- and Thermal-Infrared Observations

DRDF: Co-Investigator (2011–2012); PI: Dong Wu; Title: Studying Atmospheric Planetary Boundary Layer with Innovative Satellite Remote Sensing and Numerical Models

R&TD: Co-Investigator (2010–2011); PI: Pin Chen; Title: Chemistry and Transport Modeling of Exoplanetary Atmospheres

DRDF: Co-Investigator (2010–2011); PI: Stanley Sander; Title: Tropospheric Ozone Retrieval Using Polarimetric Measurements

VIII. Postdoctoral Researchers Supervised/Co-Supervised

Zhaocheng Zeng (2015–Present), California Institute of Technology

Fedele Colosimo (2012–Present), University of California, Los Angeles

IX. Graduate Students Supervised/Co-Supervised

Sihe Chen (2020–Present), California Institute of Technology

Lixiang Gu (2020–Present), California Institute of Technology

Terry Mullen (2018–2019), University of Massachusetts, Amherst

Siteng Fan (2017–Present), California Institute of Technology

Jiazheng Li (2017–Present), California Institute of Technology

Tianhao Le (2016–Present), California Institute of Technology

Peter Somkuti (2015–2018), University of Leicester

Kai-Wei Chang (2014–2017), University of Wisconsin

Pushkar Kopparla (2013–2018), California Institute of Technology

Xi Xi (2013–2015), California Institute of Technology

Ross Cheung (2012–2016), University of California, Los Angeles

Qiong Zhang (2012–2016), California Institute of Technology

Zhan Su (2010–2016), California Institute of Technology

Le Kuai (2006–2011), California Institute of Technolo

X. Undergraduate Students Mentored/Co-Mentored

Andrew Gao, California Institute of Technology (2020)

Daniel Bi, California Institute of Technology (2020)

Sihe Chen, National University of Singapore (2019)

Drew Limpasuvan, Coastal Carolina University (2016)

Victor Chu, California Institute of Technology (2008)

Norbert Binkiewicz, California Institute of Technology (2008)

XI. Publication Summary (see section XIV for complete list)

64 peer-reviewed publications to date

1911 total citations

314 max citations

47 max first author citations

h-index: 21

XII. Professional Activities

Reviewer: Astrophysical Journal, Atmospheric Environment, Atmospheric Measurement Techniques, Environmental Science and Technology, Geophysical Research Letters, Icarus, IEEE Transactions on Geoscience and Remote Sensing, Journal of Atmospheric and Oceanic Technology, Journal of the Atmospheric Sciences, Journal of Climate, Journal of Geophysical Research — Atmospheres, Journal of Quantitative Spectroscopy and Radiative Transfer, Measurement, PLOS One, Remote Sensing, Remote Sensing of Environment (2007–Present)

Panel Reviewer: NASA Remote Sensing Theory, NASA FINESST, NSF Exoplanets, JPL SURP

Subject Matter Expert: JPL A-Team Studies

Editorial Board: Remote Sensing, Frontiers in Remote Sensing

Atmospheric Sciences Section Secretary: Asia-Oceania Geosciences Society (AOGS)

Primary Session Chair: Invited session on Advances in Monitoring and Assessment of Wildfires Using Remote Sensing and Modeling at IGARSS (2021)

Co-Convener: EGU session on Spectroscopy and Radiative Transfer in Planetary Atmospheres (2010), AOGS session on Polarimetry of Planetary Systems: Observations, Theory and Models (2015)

Organizing Committee/Session Chair: Electromagnetic and Light Scattering Conference (2019)

Member: Early Career PhD Core Committee at JPL (2015–Present)

Guest Lecturer: Caltech class ESE/GE139 Introduction to Radiation (2010–Present)

Co-Author: White Paper titled “Monitoring Surface PM_{2.5}: An International Constellation Approach to Enhancing the Role of Satellite Observations”

XIII. Achievements and Awards

1. **JPL Bonus Award** (2020) for valuable contributions to the 2020 Earth Science Senior Review proposals.
2. **JPL Voyager Award** (2019) for pioneering a radiative transfer technique for imaging spectroscopy.
3. **NASA Early Career Achievement Medal** (2016) for developing fast and accurate RT models needed for current and future atmospheric composition remote sensing missions.
4. **NASA Group Achievement Award** (2016) for outstanding achievement in developing a science algorithm and parameters that meet threshold requirements for the Orbiting Carbon Observatory-2 mission.
5. **JPL Team Bonus Award** (2016) for diagnosing, correcting, testing, and implementing the baseline OCO-2 data processing algorithms for a timely product delivery to the science team.
6. **JPL Voyager Award** (2015) for contributions to the field of Atmospheric Radiation and Remote Sensing, leading to the receipt of the Richard Goody Award.
7. **JPL Team Bonus Award** (2015) for validation and delivery of the first year of OCO-2 X_{CO2} and Fluorescence data.
8. **Elsevier/JQSRT Richard M. Goody Award** (2014) for Atmospheric Radiation and Remote Sensing.
9. **JPL Team Bonus Award** (2014) for outstanding contributions to the OCO-2 Project by developing a set of science algorithms.

10. **JPL Team Bonus Award** (2012) for critical scientific contributions to highly competitive proposals submitted to the NASA ROSES Earth Venture Instrument-1 call.
11. **JPL Team Bonus Award** (2012) for developing, implementing, testing and validating a launch-ready version of the OCO-2 Level 2 algorithm and processing software.
12. Selected for inclusion in **Marquis Who's Who in America** (2011).
13. **JPL Team Bonus Award** (2010) for critical contributions to the Atmospheric CO₂ Observations from Space project.
14. **Best JQSRT Reviewer of the Year** (2009).
15. **Travel Grant** for Gordon Research Conference on Radiation and Climate (2005, 2007).
16. **"Turning Coal into Diamonds" Award** (2003) for OCO retrieval algorithm development.
17. **Departmental Fellowship** (2001) for a doctoral program in Chemical Engineering at the California Institute of Technology.
18. **Citation Letter** (1994) from the Professor and Head, Department of Chemical and Environmental Engineering, National University of Singapore, for outstanding academic excellence.
19. **Singapore Airlines-Neptune Orient Lines (SIA-NOL) Scholarship** (1994–1998) for undergraduate studies at the National University of Singapore.
20. **Certificate of Participation** (1992, 1993) in the American Invitational Mathematics Examination (AIME), after qualifying through the American High School Mathematics Examination.
21. **Certificate of Merit with Honorable Mention** (1992) in the Singapore Chemistry Olympiad, indicating a ranking between six and ten.
22. **Promotional Examination Academic Award** (1992) for outstanding performance in the Raffles Junior College Promotional Examinations.
23. **Runner-Up** (1992) in the Hewlett Packard Technology Quiz.
24. **Singapore Airlines (SIA) Youth Scholarship** (1992–1993) to pursue a two-year junior college course in Raffles Junior College, Singapore. The scholarship was awarded to 20 students from India.
25. **National Finalist with Honorable Mention** (1991) in the H. Dudley Wright International Student Contest, on the theme *Together to Mars*, organized by the Planetary Society, Pasadena. This competition involved qualifying through a written test, submission of a 10,000-word report on some aspect of exploration of Mars and presentation of the report before a panel of judges.

26. **National Talent Search Examination Scholarship** (1991). This award carried a stipend and book grant for every year throughout my education up to undergraduate degree and was given to about 750 high school students after two written rounds and an interview.
27. **First Prize** (1990) in the Srinivasa Ramanujam Memorial Mathematics Olympiad for the states of Kerala and Tamil Nadu, India.

XIV. Peer-Reviewed Publications

- **Natraj, V.**, R. J. D. Spurr, R. Hu, and D. Crisp (2020), Two-Stream Radiative Transfer Model for Conservative and Near-Conservative Scattering Scenarios, manuscript in preparation.
- Le, T., C. Li, **V. Natraj**, et al. (2020), Modeling of Hyperspectral Infrared Spectra in Clear-Sky and Cloudy Atmospheres, *J. Geophys. Res.*, manuscript in preparation.
- Zilber, D., D. R. Thompson, M. Katzfuss, V. Natraj, J. Hobbs, and A. Braverman (2021), Spatial Surface Retrievals for Visible/Shortwave Infrared Remote Sensing, *Remote Sens. Environ.*, under review.
- Bartlett, S., J. Li, L. Gu, S. Fan, L. Sinapayen, **V. Natraj**, et al. (2021), Inferring Planetary Complexity Using Epsilon Machines: A Novel Approach to Agnostic Biosignatures, *Nat. Astron.*, under review.
- Zeng, Z.-C., **V. Natraj**, F. Xu, S. Chen, F.-Y. Gong, T. J. Pongetti, et al. (2021), GFIT3: A Full Physics Retrieval Algorithm for Remote Sensing of Greenhouse Gases in the Presence of Aerosols, *Atmos. Meas. Tech.*, under review.
- Gu, L., S. Fan, J.-Z. Li, S. J. Bartlett, **V. Natraj**, J. H. Jiang, et al. (2021), Earth as a Proxy Exoplanet: Deconstructing and Reconstructing Spectrophotometric Light Curves, *Astrophys. J.*, 161(3), 122, doi:10.3847/1538-3881/abd54a.
- Huang, Y., **V. Natraj**, Z.-C. Zeng, P. Kopparla, and Y. L. Yung (2020), Quantifying the Impact of Aerosol Scattering on the Retrieval of Methane from Airborne Remote Sensing Measurements, *Atmos. Meas. Tech.*, 13(12), 6755–6769, doi:10.5194/amt-13-6755-2020.
Corresponding author.
- Sasi, S., **V. Natraj**, V. M. Garcia, D. S. Efremenko, D. Loyola, and A. Doicu (2020), Model Selection in Atmospheric Remote Sensing with Application to Aerosol Retrieval from DSCOVR/ EPIC. Part 1: Theory, *Remote Sens.*, 12(22), 3724, doi:10.3390/rs12223724.
Corresponding author.

- Sasi, S., **V. Natraj**, V. M. Garcia, D. S. Efremenko, D. Loyola, and A. Doicu (2020), Model Selection in Atmospheric Remote Sensing with Application to Aerosol Retrieval from DSCOVR/ EPIC. Part 2: Numerical Analysis, *Remote Sens.*, 12(21), 3656, doi:10.3390/rs12213656. **Corresponding author.**
- Kuang, S., B. Wang, M. J. Newchurch, P. Tucker, E. W. Eloranta, **V. Natraj**, et al. (2020), Evaluation of UV Aerosol Retrievals from an Ozone Lidar, *Atmos. Meas. Tech.*, 13(10), 5277–5292, doi:10.5194/amt-13-5277-2020.
- Zeng, Z.-C., Y. Wang, T. J. Pongetti, S. Newman, Y. Li, **V. Natraj**, et al. (2020), Tracking the Atmospheric Pulse of a North American Megacity from a Mountain-top Remote Sensing Observatory, *Remote Sens. Environ.*, 248, 112000, doi:10.1016/j.rse.2020.112000.
- Liu, C., B. Yao, **V. Natraj**, P. Kopparla, T. Le, R.-L. Shia, et al. (2020), A Spectral Data Compression (SDCOMP) Radiative Transfer Model for High Spectral Resolution Radiation Simulations, *J. Atmos. Sci.*, 77(6), 2055–2066, doi:10.1175/JAS-D-19-0238.1. **Corresponding author.**
- Le, T., C. Liu, B. Yao, **V. Natraj**, and Y. L. Yung (2020), Application of Machine Learning Technique to Hyperspectral Radiative Transfer Simulations, *J. Quant. Spectrosc. Radiat. Transfer*, 246, 106928, doi:10.1016/j.jqsrt.2020.106928.
- Zeng, Z.-C., F. Xu, **V. Natraj**, T. J. Pongetti, R.-L. Shia, Q. Zhang, et al. (2020), Remote Sensing of Angular Scattering Effect of Aerosols in a North American Megacity, *Remote Sens. Environ.*, 242, 111760, doi:10.1016/j.rse.2020.111760.
- Zeng, Z.-C., S. Chen, **V. Natraj**, T. Le, F. Xu, A. Merrelli, et al. (2020), Constraining Coastal Aerosol Vertical Distribution Using OCO-2 O₂ A-band Measurements, *Remote Sens. Environ.*, 236, 111494, doi:10.1016/j.rse.2019.111494.
- Fan, S., C. Li, J.-Z. Li, S. J. Bartlett, J. H. Jiang, **V. Natraj**, et al. (2019), Earth as an Exoplanet: A Two-Dimensional Alien Map, *Astrophys. J. Lett.*, 882(1), L1, doi:10.3847/2041-8213/ab3a49. **Highlighted in Science.**
<https://www.sciencemag.org/news/2019/08/here-s-what-earth-might-look-aliens>
- Thompson, D. R., **V. Natraj**, K. N. Babu, A. J. Braverman, M. L. Eastwood, R. O. Green, et al. (2019), Optimal Estimation of Spectral Surface Reflectance in Challenging Atmospheres, *Remote Sens. Environ.*, 232, 111258, doi:10.1016/j.rse.2019.111258.
- Thompson, D. R., **V. Natraj**, et al. (2019), A Unified Approach to Estimate Land and Water Reflectances with Uncertainties for Coastal Ocean Imaging Spectroscopy, *Remote Sens. Environ.*, 231, 111198, doi:10.1016/j.rse.2019.05.017.

- Bue, B. D., D. R. Thompson, **V. Natraj**, S. Deshpande, M. L. Eastwood, R. O. Green, et al. (2019), Neural Network Radiative Transfer for Imaging Spectroscopy, *Atmos. Meas. Tech.*, *12*(4), 2567–2578, doi:10.5194/amt-12-2567-2019.
- Li, J., S. Fan, P. Kopparla, C. Liu, J. H. Jiang, **V. Natraj**, et al. (2019), Study of Terrestrial Glints Based on DSCOVR Observations, *Earth Space Sci.*, *6*(1), 166–173, doi:10.1029/2018EA000509.
- O’Dell, C. W., A. Eldering, P. O. Wennberg, **V. Natraj**, et al. (2018), Improved Retrievals of Carbon Dioxide from the Orbiting Carbon Observatory-2 with the Version 8 ACOS Algorithm, *Atmos. Meas. Tech.*, *11*(12), 6539–6576, doi:10.5194/amt-11-6539-2018.
- Zeng, Z.-C., **V. Natraj**, et al. (2018), Constraining Aerosol Vertical Profile in the Boundary Layer Using Hyperspectral Measurements of Oxygen Absorption, *Geophys. Res. Lett.*, *45*, doi: 10.1029/2018GL079286. **Editor’s Highlight.**
- Thompson, D. R., **V. Natraj**, R. O. Green, M. C. Helmlinger, B.-C. Gao, and M. L. Eastwood (2018), Optimal Estimation for Imaging Spectrometer Atmospheric Correction, *Remote Sens. Environ.*, *216*, 355–373, doi:10.1016/j.rse.2018.07.003.
- Kopparla, P., **V. Natraj**, D. Crisp, K. Bott, M. R. Swain and Y. L. Yung (2018), Observing Oceans in Tightly Packed Planetary Systems: Perspectives from Polarization Modeling of the TRAPPIST-1 System, *Astron. J.*, *156*(4), 143, doi:10.3847/1538-3881/aad9a1.
- Kopparla, P., **V. Natraj**, X. Zhang, M R. Swain, S. J. Wiktorowicz, and Y. L. Yung (2018), Erratum: “A Multiple Scattering Polarized Radiative Transfer Model: Application to HD189733b” (vol 817, 32, 2016), *Astrophys. J.*, *862*(2), doi:10.3847/1538-4357/aaceb0.
- Jiang, J. H., A. J. Zhai, J. Herman, C. Zhai, R. Hu, **V. Natraj**, et al. (2018), Using Deep Space Climate Observatory Measurements to Study the Earth as An Exoplanet, *Astron. J.*, *156*(1), 26, doi:10.3847/1538-3881/aac6e2.
- Aumann, H. H., **V. Natraj**, et al. (2018), Evaluation of Radiative Transfer Models with Clouds, *J. Geophys. Res.*, *123*(11), 6142–6157, doi:10.1029/2017JD028063.
- Kim, S.-W., **V. Natraj**, et al. (2018), Impact of High-Resolution *A Priori* Profiles on Satellite-Based Formaldehyde Retrievals, *Atmos. Chem. Phys.*, *18*(10), 7639–7655, doi:10.5194/acp-18-7639-2018.
- Somkuti, P., H. Bösch, **V. Natraj**, and P. Kopparla (2017), Application of a PCA-Based Fast Radiative Transfer Model to XCO₂ Retrievals in the Shortwave Infrared, *J. Geophys. Res.*, *122*(19), 10268–10287, doi:10.1002/2017JD027013.

- Kopparla, P., **V. Natraj**, et al. (2017), PCA-Based Radiative Transfer: Improvements to Aerosol Scheme, Vertical Layering and Spectral Binning, *J. Quant. Spectrosc. Radiat. Transfer*, 198, 104–111, doi:10.1016/j.jqsrt.2017.05.005.
- Chang, K.-W., T. S. L'Ecuyer, B. H. Kahn, and **V. Natraj** (2017), Information Content from the Visible to the Mid-Infrared for Retrieving Tropical Ice Cloud Properties, *J. Geophys. Res.*, 122(9), 4944–4966, doi:10.1002/2016JD026357.
- Zeng, Z.-C., Q. Zhang, **V. Natraj**, et al. (2017), Aerosol Scattering Effects on Water Vapor Retrievals over the Los Angeles Basin, *Atmos. Chem. Phys.*, 17(4), 2495–2508, doi:10.5194/acp-17-2495-2017.
- Eldering, A., **V. Natraj**, et al. (2017), The Orbiting Carbon Observatory-2: First 18 Months of Science Data Products, *Atmos. Meas. Tech.*, 10(2), 549–563, doi:10.5194/amt-10-549-2017.
- Zoogman, P., **V. Natraj**, et al. (2017), Tropospheric Emissions: Monitoring of Pollution (TEMPO), *J. Quant. Spectrosc. Radiat. Transfer*, 186, 17–39, doi:10.1016/j.jqsrt.2016.05.008.
- Kopparla, P., **V. Natraj**, R. J. D. Spurr, R.-L. Shia, Y. L. Yung, and D. Crisp (2016), A Fast and Accurate PCA Based Radiative Transfer Model: Extension to the Broadband Shortwave Region, *J. Quant. Spectrosc. Radiat. Transfer*, 173, 65–71, doi:10.1016/j.jqsrt.2016.01.014.
- Kopparla, P., **V. Natraj**, X. Zhang, M R. Swain, S. J. Wiktorowicz, and Y. L. Yung (2016), A Multiple Scattering Polarized Radiative Transfer Model: Application to HD189733b, *Astrophys. J.*, 817(1), doi:10.3847/0004-637X/817/1/32.
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XV. Invited Book Chapters

1. Spurr, R. J. D., **V. Natraj**, P. Kopparla, and M. Christi (2017), *Application of Principal Component Analysis to Performance Enhancement of Hyperspectral Radiative Transfer Computations*, in: *Principal Component Analysis: Methods, Applications and Technology* (ed. V. Gray), Nova Science Publishers: New York, ISBN:978-1-53610-911-5.
2. **Natraj, V.** (2013), *A Review of Fast Radiative Transfer Techniques*, in: *Light Scattering Reviews Vol. 8* (ed. A. A. Kokhanovsky), 475–504, Springer: Berlin, doi:10.1007/978-3-642-32106-1_10.

XVI. Invited Oral Presentations

1. Constraining Aerosol Vertical Profile Using Hyperspectral Measurements of Oxygen Absorption, *GEMS Science Team Meeting*, Seoul, South Korea, 2019.
2. Spectral Compression for Remote Sensing Using Principal Component Analysis, *Yuk Lunch Seminar*, Caltech, Pasadena, USA, 2019.
3. Improved Atmospheric Correction Over the Indian Subcontinent Using Fast Radiative Transfer Models and Neural Networks, *AVIRIS-NG Science Team Meeting*, Ahmedabad, India, 2018.
4. Multispectral Ozone Retrievals for the GEO-CAPE Mission, *GEO-CAPE Air Quality Science Working Group Workshop*, College Park, USA, 2018.
5. Towards Improved Radiative Transfer Simulations of Hyperspectral Measurements for Cloudy Atmospheres, *AGU Fall Meeting*, San Francisco, USA, 2016.
6. Fast Forward Modeling for the GEO-CAPE Regional/Urban OSSE, *2nd Workshop on Atmospheric Composition OSSEs*, Reading, United Kingdom, 2016.
7. O₃ and NO₂ OSSEs for the GEO-CAPE Mission, *7th GEMS Science Team Meeting*, Seoul, South Korea, 2016.
8. A New RT Model for the Investigation of TTL Cirrus Cloud Properties, *Yuk Lunch Seminar*, Caltech, Pasadena, USA, 2016.

9. Ozone and NO₂ OSSEs on a Regional/Urban Scale for GEO-CAPE, *GEO-CAPE Open Community Workshop*, Durham, USA, 2015.
10. Use of the Oxygen A-band to Retrieve Aerosol Vertical Profiles, *3rd ISSI Workshop on Aerosol Remote Sensing from Space*, Bern, Switzerland, 2014.
11. The Potential of Passive VNIR Observations in Gaseous Absorption Regions to Retrieve Aerosol Vertical Profiles, *2nd ISSI Workshop on Aerosol Remote Sensing from Space*, Bern, Switzerland, 2013.
12. Simulated Atmospheric Composition Retrievals for the Panchromatic Fourier Transform Spectrometer (PanFTS), *GEO-CAPE Team Meeting*, Moffett Field, USA, 2013.
13. Using Principal Component Analysis to Speed Up Radiative Transfer Calculations, *1st ISSI Workshop on Aerosol Remote Sensing from Space*, Bern, Switzerland, 2012.
14. Utility of Multispectral Measurements to Improve Atmospheric Composition Retrievals, *Atmospheric Chemistry and Radiation Seminar*, UCLA, USA, 2012.
15. Tropospheric Ozone Profiling Using Simulated GEO-CAPE Measurements, *2nd GEO-CAPE Community Workshop*, Boulder, USA, 2011.
16. Polarimetry as a Tool for Remote Sensing of Planetary Atmospheres, *University College*, London, UK, 2010.
17. Polarization as a Tool for Remote Sensing of Planetary Atmospheres, *EGU Annual General Meeting*, Vienna, Austria, 2009.
18. The Orbiting Carbon Observatory Mission, *International Symposium on Aerosol-Chemistry-Climate Interactions*, Ahmedabad, India, 2007.
19. Radiative Transfer Modeling for the Retrieval of CO₂ from Space, *Thesis Defense Seminar*, Pasadena, USA, 2007.
20. The OCO Mission: Accounting for Polarization in Retrievals, *Planetary Sciences Seminar*, Pasadena, USA, 2006.
21. The Orbiting Carbon Observatory (OCO) Mission: Effects of Polarization on Retrievals, *Planetary Sciences Seminar*, Pasadena, USA, 2005.

XVII. Contributed Oral Presentations

1. Spectral Compression for Remote Sensing Using Principal Component Analysis, *AGU Fall Meeting*, San Francisco, USA, 2019.

2. Aerosol Vertical Distribution Retrievals Using Hyperspectral Measurements of Oxygen Absorption, *Joint Satellite Conference*, Boston, USA, 2019.
3. Constraining Aerosol Vertical Profile Using Hyperspectral Measurements of Oxygen Absorption, *AOGS 16th Annual Meeting*, Singapore, 2019.
4. Constraining Aerosol Vertical Profile in the Boundary Layer Using Hyperspectral Measurements of Oxygen Absorption, *18th Electromagnetic and Light Scattering Conference*, Hangzhou, China, 2019.c
5. Remote Sensing of Planetary Boundary Layer Temperature and Water Vapor Using Near- and Thermal-Infrared Measurements, *AMS Annual Meeting*, Phoenix, USA, 2019.
6. Simultaneous Retrievals of Aerosol Composition and Vertical Distribution Using Simulated Multi-Angle and Hyper-Spectral Measurements, *AGU Fall Meeting*, Washington, DC, USA, 2018.
7. Aerosol Composition and Vertical Distribution Retrievals from Simulated Multi-Angle, Hyper-Spectral Measurements of Oxygen Absorption, *EUMETSAT Meteorological Satellite Conference*, Tallinn, Estonia, 2018.
8. Aerosol Retrievals Using Hyperspectral Oxygen A-Band Measurements, *International Geoscience and Remote Sensing Symposium*, Valencia, Spain, 2018.
9. Aerosol Retrievals Using Multi-Angle, Hyperspectral Measurements of the Oxygen A-Band, *AOGS 15th Annual Meeting*, Honolulu, USA, 2018.
10. Improved Atmospheric Correction for Imaging Spectroscopy Using Optimal Estimation, *AGU Fall Meeting*, New Orleans, USA, 2017.
11. O₃ and NO₂ OSSEs on a Regional/Urban Scale for the GEO-CAPE Mission, *EUMETSAT Meteorological Satellite Conference*, Rome, Italy, 2017.
12. O₃ OSSEs on a Regional Scale for the GEO-CAPE Mission, *AGU Fall Meeting*, San Francisco, USA, 2016.
13. Retrieval of Aerosol Vertical Profiles Using the Oxygen A-Band, *Remote Sensing in the O₂ A-Band*, De Bilt, Netherlands, 2016.
14. A New BRDF Model to Reduce Biases in Orbiting Carbon Observatory-2 (OCO-2) Retrievals, *12th International Workshop on Greenhouse Gas Measurements from Space*, Pasadena, USA, 2016.
15. Application of Principal Component Analysis for Narrow and Broadband Radiance and Flux Calculations, *International Radiation Symposium*, Auckland, New Zealand, 2016.

16. Assessing Surface BRDF-Related Biases Using Target Mode Observations from the Orbiting Carbon Observatory-2, *International Radiation Symposium*, Auckland, New Zealand, 2016.
17. An Overview of CO₂ Retrievals from the Recently Launched Orbiting Carbon Observatory-2 (OCO-2), *AOGS 12th Annual Meeting*, Singapore, 2015.
18. Application of Principal Component Analysis for Narrow and Broadband Radiance and Flux Calculations, *15th Electromagnetic and Light Scattering Conference*, Leipzig, Germany, 2015.
19. Assessing Aerosol and Surface BRDF-Related Biases Using Target Mode Retrievals from the Orbiting Carbon Observatory-2 (OCO-2), *11th International Workshop on Greenhouse Gas Measurements from Space*, Pasadena, USA, 2015.
20. Influence of Aerosol Scattering on the Retrieval of CO₂ Mixing Ratios: A Case Study Using Measurements from the California Laboratory for Remote Sensing (CLARS), *10th International Workshop on Greenhouse Gas Measurements from Space*, Noordwijk, Netherlands, 2014.
21. Linearized Principal Component Analysis as a Tool to Speed up Remote Sensing Retrievals, *14th Electromagnetic and Light Scattering Conference*, Lille, France, 2013.
22. Simulated Atmospheric Composition Retrievals for the Panchromatic Fourier Transform Spectrometer (PanFTS), *AGU Fall Meeting*, San Francisco, USA, 2012.
23. The Orbiting Carbon Observatory (OCO-2) L2 Retrieval Algorithm: First Tests with Greenhouse Gases Observing SATellite (GOSAT) Data, *International Radiation Symposium*, Berlin, Germany, 2012.
24. On the Intensity and Polarization of Radiation Emerging from a Thick Rayleigh Scattering Atmosphere, *13th Electromagnetic and Light Scattering Conference*, Taormina, Italy, 2011.
25. A Two Orders of Scattering Approach to Account for Polarization in CO₂ Retrievals from Space, *NATO Advanced Study Institute on Polarimetry and Remote Sensing*, Kyiv, Ukraine, 2010.
26. Simulations of Space-Based Near IR CO₂ Observations over Ground Target, *EGU Annual General Meeting*, Vienna, Austria, 2009.
27. Glint and Target Mode Simulations for the Orbiting Carbon Observatory, *AGU Fall Meeting*, San Francisco, USA, 2008.
28. Sensitivity Studies for the OCO Glint Mode of Operation, *5th International Workshop on Greenhouse Gas Measurements from Space*, Pasadena, USA, 2008.

29. Atmospheric Effects on Surface Polarimetric Signatures, *30th Review of Atmospheric Transmission Models Meeting*, Lexington, USA, 2008.
30. The Fast Two Orders of Scattering Linearized Vector Radiative Transfer Model: A Case Study of CO₂ Retrieval from Simulated Orbiting Carbon Observatory Measurements, *29th Review of Atmospheric Transmission Models Meeting*, Lexington, USA, 2007.
31. A Two Orders of Scattering Approach to Account for Polarization in NIR Retrievals, *28th Review of Atmospheric Transmission Models Meeting*, Lexington, USA, 2006.
32. A Two Orders of Scattering Approach to Account for Polarization in the OCO RT Model, *4th OCO Science Team Meeting*, Pasadena, USA, 2006.
33. Quantifying Aerosol Types and Their Impact on Trace Gas Retrievals from Satellite Measurements, *AGU Fall Meeting*, San Francisco, USA, 2005.
34. Extracting Atmospheric and Surface Information from Near Infrared (NIR) AVIRIS Spectra, *AVIRIS Science Workshop*, Pasadena, USA, 2005.
35. Polarization in the OCO Retrieval Algorithm, *3rd OCO Science Team Meeting*, Pasadena, USA, 2005.
36. Empirical Orthogonal Function Analysis of the O₂ A Band, *2nd OCO Science Team Meeting*, Pasadena, USA, 2004.
37. Retrieval of Oxygen A band Spectra Using Airborne Measurements, *AGU Fall Meeting*, San Francisco, USA, 2003.

XVIII. Poster Presentations

1. **Natraj, V.**, J. L. McDuffie, M. Thill, K. W. Bowman, J. R. Worden and T. P. Kurosu (2020), Towards Multi-Spectral, Multi-Sensor Satellite Retrievals of Air Quality Relevant Gases Using the Reusable Framework for Atmospheric Composition, *AGU Fall Meeting*, San Francisco, USA.
2. McDuffie, J. L., M. Smyth, S. Val, **V. Natraj**, and K. W. Bowman (2020), Why Robust Software Engineering Matters For the Development of a Reusable Framework for Atmospheric Composition, *AGU Fall Meeting*, San Francisco, USA.
3. Chen, S., Z.-C. Zeng, **V. Natraj**, T. J. Pongetti, S. P. Sander, and Y. L. Yung (2020), Observing Greenhouse Gases and Aerosols in Los Angeles Using CLARS-FTS and OCO-3, *AGU Fall Meeting*, San Francisco, USA.

4. Gu, L., S. Fan, J.-Z. Li, S. J. Bartlett, **V. Natraj**, J. H. Jiang, et al. (2020), Earth as a Proxy Exoplanet: Decomposing and Recomposing Spectral Images, *AGU Fall Meeting*, San Francisco, USA.
5. Zeng, Z.-C., **V. Natraj**, S. Chen, F. Xu, T. J. Pongetti, Y. L. Yung, et al. (2020), Joint Retrieval of Greenhouse Gases and Aerosols in a Polluted Urban Atmosphere: Development of a Full Physics Algorithm for CLARS-FTS in the Los Angeles Megacity, *AGU Fall Meeting*, San Francisco, USA.
6. Colosimo, S. F., J. Stutz, N. Brockway, **V. Natraj**, R. J. D. Spurr, et al. (2020), Investigation of Cirrus Cloud Properties in the Tropical Tropopause Layer Using High-Altitude Limb Scanning Near-IR Spectroscopy During the NASA-ATTREX Experiment, *AGU Fall Meeting*, San Francisco, USA.
7. Leung, K., J. Jagalur-Mohan, D. R. Thompson, A. J. Braverman, **V. Natraj**, and Y. Marzouk (2020), Accelerated Bayesian Computation for Global Imaging Spectroscopy, *AGU Fall Meeting*, San Francisco, USA.
8. **Natraj, V.**, Z.-C. Zeng, S. P. Sander, R.-L. Shia and Y. L. Yung (2018), Reducing Biases in Greenhouse Gas Retrievals by Quantifying Aerosol Scattering Effects: A Case Study Using Measurements from the California Laboratory for Atmospheric Remote Sensing, *14th International Workshop on Greenhouse Gas Measurements from Space*, Toronto, Canada.
9. Kurosu, T. P., V. Natraj, and J. L. Neu (2016), An Improved Ozone Profile Algorithm for the Airborne GeoTASO Sensor, *AGU Fall Meeting*, San Francisco, USA.
10. Zeng, Z.-C., Q. Zhang, **V. Natraj**, et al. (2016), Investigating Wavelength-Dependent Aerosol Optical Properties Using Water Vapor Slant Column Retrievals from CLARS over the Los Angeles Basin, *AGU Fall Meeting*, San Francisco, USA.
11. Colosimo, S. F., M. Spolaor, J. Festa, **V. Natraj**, et al. (2016), Retrieval of Cirrus Clouds Properties Using Limb-Scanning Near-IR Spectroscopy in the Tropical Tropopause Layer During the NASA Attrex Mission, *AGU Fall Meeting*, San Francisco, USA.
12. Zhang, Q., Z.-C. Zeng, **V. Natraj**, et al. (2015), Constraining Aerosol Properties Using H₂O Retrievals from the California Laboratory for Atmospheric Remote Sensing (CLARS), *AGU Fall Meeting*, San Francisco, USA.
13. **Natraj, V.**, J. L. McDuffie, et al. (2015), Assessing Surface BRDF-Related Biases Using Target Mode Retrievals from the Orbiting Carbon Observatory-2 (OCO-2), *AGU Fall Meeting*, San Francisco, USA.

14. Kopparla, P. **V. Natraj**, R.-L. Shia, R. J. D. Spurr, D. Crisp, and Y. L. Yung (2015), Fast and Accurate Radiative Transfer Calculations Using Principal Component Analysis for (Exo-)Planetary Retrieval Models, *AGU Fall Meeting*, San Francisco, USA.
15. Kopparla, P. **V. Natraj**, M. R. Swain, S. Wiktorowicz, and Y. L. Yung (2015), A Theoretical Study of Polarization in Scattered Light from Exoplanetary Atmospheres, *AOGS 12th Annual Meeting*, Singapore.
16. **Natraj, V.**, T. E. Taylor, et al. (2014), A First Look at Target Mode Retrievals of CO₂ from the Orbiting Carbon Observatory-2 (OCO-2), *AGU Fall Meeting*, San Francisco, USA.
17. **Natraj, V.**, S. S. Kulawik, M. Luo, and S. P. Sander (2013), CO₂, CH₄ and CO Retrievals for the Geostationary Carbon Process investigation, *Gordon Research Conference on Atmospheric Chemistry*, West Dover, USA.
18. **Natraj, V.**, and R. J. D. Spurr (2013), Linearization of the Principal Component Analysis Method for Radiative Transfer Acceleration: Application to Retrieval Algorithms and Sensitivity Studies in the Ultraviolet, Visible and Infrared, *Gordon Research Conference on Radiation and Climate*, New London, USA.
19. **Natraj, V.**, K. E. Pickering, et al. (2012), Trace Gas Retrievals for GEO-CAPE Using DISCOVER-AQ Measurements, *12th IGAC Open Science Conference*, Beijing, China.
20. **Natraj, V.**, J. L. Neu, et al. (2012), Simulated Atmospheric Composition Retrievals for the Panchromatic Fourier Transform Spectrometer (PanFTS), *12th IGAC Open Science Conference*, Beijing, China.
21. **Natraj, V.**, S. Kulawik, et al. (2012), Capability of the Panchromatic Fourier Transform Spectrometer (PanFTS) to Perform Atmospheric Composition Retrievals, *International Radiation Symposium*, Berlin, Germany.
22. **Natraj, V.**, S. S. Kulawik, et al. (2011), Atmospheric Composition Retrievals Using Simulated Panchromatic Fourier Transform Spectrometer (PanFTS) Measurements, *AGU Fall Meeting*, San Francisco, USA.
23. Eldering, A., **V. Natraj**, et al. (2011), Profiling of Lowermost Tropospheric Ozone from Simulated Geostationary Coastal and Air Pollution Events (GEO-CAPE) Measurements, *AGU Fall Meeting*, San Francisco, USA.
24. Su, Z., K.-F. Li, **V. Natraj**, R.-L. Shia, C. E. Miller, and Y. L. Yung (2011), Space-borne Measurements of Atmospheric CH₄ by High-resolution Near Infrared Spectrometry of Reflected Sunlight, *AGU Fall Meeting*, San Francisco, USA.
25. Irion, F. W., C. Frankenberg, **V. Natraj**, J. McDuffie, and C. W. O'Dell (2011), CO₂ Retrievals from GOSAT Glint Spectra, *AGU Fall Meeting*, San Francisco, USA.

26. Chatfield, R. B., R. F. Esswein, A. Fried, A. J. Weinheimer, **V. Natraj**, et al. (2011), Quantifying Smog Ozone Pollution and its Formation from Space: DISCOVER-AQ Measurements Connect the Retrievable to the Relevant, *AGU Fall Meeting*, San Francisco, USA.
27. **Natraj, V.**, D. Lafont, J. Worden, A. Eldering (2011), CO₂ Diurnal Profiling Using Simulated Multispectral Geostationary Measurements, *7th International Workshop on Greenhouse Gas Measurements from Space*, Edinburgh, UK.
28. O'Brien, D. M., I. Polonsky, **V. Natraj**, and the ACOS team (2011), In-orbit Test of the ACOS Implementation of the Polarization Model for TANSO-FTS on GOSAT, *7th International Workshop on Greenhouse Gas Measurements from Space*, Edinburgh, UK.
29. Irion, F. W., **V. Natraj**, J. McDuffie, and C. O'Dell (2010), ACOS Glint-Mode Total Column CO₂ Retrievals from GOSAT, *AGU Fall Meeting*, San Francisco, USA.
30. **Natraj, V.**, H. Bösch, R. J. D. Spurr, and Y. L. Yung (2010), Polarization Effects on Column CO₂ Retrievals from GOSAT Measurements, *EGU Annual General Meeting*, Vienna, Austria.
31. Kuai, L., **V. Natraj**, R.-L. Shia, C. E. Miller, and Y. L. Yung (2010), Channel Selection for CO₂ Retrieval from GOSAT Measurements Using Information Content Analysis, *6th International Workshop on Greenhouse Gas Measurements from Space*, Kyoto, Japan.
32. O'Brien, D. M., A. Kuze, C. W. O'Dell, **V. Natraj**, and the ACOS team (2010), Polarization Model for GOSAT and its Impact upon Retrievals, *6th International Workshop on Greenhouse Gas Measurements from Space*, Kyoto, Japan.
33. **Natraj, V.**, H. Bösch, R. J. D. Spurr, and Y. L. Yung (2009), Polarization Effects on Column CO₂ Retrievals from Non-Nadir Satellite Measurements in the Short-Wave Infrared, *AGU Fall Meeting*, San Francisco, USA.
34. Kuai, L., **V. Natraj**, R.-L. Shia, C. E. Miller, and Y. L. Yung (2009), Channel Selection for CO₂ Retrieval Using Near Infrared Measurements, *AGU Fall Meeting*, San Francisco, USA.
35. Fu, D., S. P. Sander, **V. Natraj**, et al. (2009), Spectropolarimetric Measurements of Scattered Sunlight in the Huggins Bands: Retrieval of Tropospheric Ozone Profiles, *AGU Fall Meeting*, San Francisco, USA.
36. Kuai, L., **V. Natraj**, et al. (2009), Channel Selection for CO₂ Retrieval Using Near Infrared Measurements, *EGU Annual General Meeting*, Vienna, Austria.
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39. Kuai, L., **V. Natraj**, et al. (2008), CO₂ Vertical Profile Constraints from OCO and Thermal IR Measurements, *5th International Workshop on Greenhouse Gas Measurements from Space*, Pasadena, USA.
40. **Natraj, V.**, H. Bösch, R. J. D. Spurr, and Y. L. Yung (2008), Fast Polarized Radiative Transfer Calculations for the Orbiting Carbon Observatory Mission, *EGU Annual General Meeting*, Vienna, Austria.
41. **Natraj, V.**, H. Bösch, R. J. D. Spurr, and Y. L. Yung (2007), The Orbiting Carbon Observatory Mission: Fast Polarization Calculations Using the R-2OS Radiative Transfer Model, *AGU Fall Meeting*, San Francisco, USA.
42. **Natraj, V.**, R. J. D. Spurr, H. Bösch, and Y. L. Yung (2007), The Fast Linearized R-2OS Model to Account for Polarization in Trace Gas Retrievals from Satellite Measurements, *Gordon Research Conference on Radiation and Climate*, New London, USA.
43. **Natraj, V.**, R. J. D. Spurr, H. Bösch, and Y. L. Yung (2006), A Fast and Accurate Two Orders of Scattering Model to Account for Polarization in Trace Gas Retrievals From Satellite Measurements, *AGU Fall Meeting*, San Francisco, USA.
44. Feldman, D. R., **V. Natraj**, L. Kuai, and Y. L. Yung (2006), Introductory Tools for Radiative Transfer Models, *AGU Fall Meeting*, San Francisco, USA.
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46. **Natraj, V.**, H. Bösch, and Y. L. Yung (2006), Identifying Aerosol Parameters for Trace Gas Retrievals from NIR Satellite Measurements, *EGU Annual General Meeting*, Vienna, Austria.
47. Guo, X., **V. Natraj**, D. R. Feldman, R.-L. Shia, S. P. Sander, and Y. L. Yung (2005), Retrieval of Ozone Profile from Ground-based Measurements with Polarization, *AGU Fall Meeting*, San Francisco, USA.
48. **Natraj, V.**, R. J. D. Spurr, Y. Jiang, and Y. L. Yung (2005), Analysis of Errors from Neglecting Polarization in the O₂ A Band, *Gordon Research Conference on Radiation and Climate*, Waterville, USA.
49. **Natraj, V.**, X. Jiang, R.-L. Shia, X. Huang, J. S. Margolis, and Y. L. Yung (2004), Application of Principal Component Analysis to High Spectral Resolution Radiative Transfer: A Case Study of the O₂ A Band, *AGU Fall Meeting*, San Francisco, USA.

50. Bösch, H., V. Natraj, et al. (2004), The Orbiting Carbon Observatory (OCO) Mission: Validation Strategy and First Retrieval Results, *AGU Fall Meeting*, San Francisco, USA.

XIX. Other Publications

1. “*Sustainable Industrial Development vis-à-vis Pollution in the Indian Subcontinent*”, (being published).
2. “*Global Funding Options for Ganga-Cauvery Link*”, Saket Industrial Digest, Vol. 9, No. 10, 34–36, Oct 2003.
3. “*Air Pollution Due to Automobile Emissions*”, Motor India, Jul 2003.
4. “*Government Assistance for Pollution Control of Industrial Units*”, Indian Chemical Manufacturers Association, Mar 2003.
5. “*South Asian Environmental Evaluation in the Context of the World Bank Assistance*”, The Hindu, Jan 2003.
6. “*World Bank’s Role in Tackling Environmental Problems of Developing Countries*”, Industrial Herald, Vol. 38, No. 1, 42–44, Jan 2003.
7. “*Impact of Power Law Constants on the Viscosity of PVC Solutions in Cyclohexanone and its Blends with Xylene*”, Industrial Herald, Vol. 36, No. 1, 69–72, Jan 2001.
8. “*Design Considerations for the Penicillin-V Production Plant*”, Chemical Weekly, Mumbai, Vol. XLVI, No. 11, 163–164, Nov 2000.
9. “*Computer Aided Design of Solvent Recovery Unit*”, Industrial Herald, Chennai, Vol. 35, No. 9, 9–12, 2000.
10. “*Preliminary Design of a Penicillin-V Production Plant*”, Thesis submitted in partial fulfillment of the degree of B.Eng. (Chemical), National University of Singapore, Singapore, 1998.
11. “*Thermo-Welded Plastics Products Have Good Growth Potential*”, Kerala Industry, Vol. XXXIX, No. 1, 17–18, Jun 1991.
12. “*Surface Exploration of Mars*”, Report Submitted to: H. Dudley Wright International Student Contest: Together to Mars, Planetary Society, Pasadena, USA, 1991.
13. “*The Mysterious Loyola Numbers*”, The Loyolite, Loyola School Magazine, Trivandrum, India, 15–16, 1990.

XX. Patents

1. *Corrosion Inhibitor Compound for Boilers VN-CIC-101*, published 2007-07-27, filed 2003-02-10.

XXI. Languages

(fluent) English, Tamil, Malayalam; (moderate) Hindi; (basic) French, Spanish

XXII. Computer Literacy

Software Proficiency: Mathematica, MATLAB, Fortran, Origin, IDL

Platforms: UNIX, Linux, Windows