Sundarabalan. V. Balasubramanian

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RESEARCH INTERESTS

Ocean Satellite Remote Sensing | Aquatic optics | Water Quality | Data Science: ML/DL
Field Measurements | Drone Images | Underwater Images

EDUCATION AND ACADEMIC POSITIONS

May 2025 – Present	**Postdoctoral Fellow**, Department of Biology, University of Massachusetts Boston. Advisor: Prof. Jarrett Byrnes
November 2022 – November 2023	**Postdoctoral Fellow**, Goddard Earth Science Technology and Research (GESTAR-II), UMBC, USA. Advisor: Dr. Nima Pahlevan
March 2017 – November 2019	**Postdoctoral Fellow**, Goddard Space Flight Center (GSFC), NASA/ UMD Advisor: Dr. Nima Pahlevan
Jan 2016 – Jan 2017	**Postdoctoral Fellow,** Laboratory of Oceanology and Geoscience (LOG), ULCO), France. Advisor: Prof. Cedric Jamet
May 2014-Nov 2014	**Pre-doctoral Fellow,** Indian Institute of Technology Madras, India Advisor: Prof. Palanisamy Shanmugam
2010–2015	**Ph.D.** Department of Ocean Engineering, IIT Madras, India Dissertation: Radiative transfer modelling of underwater light fields in clear and turbid waters. Advisor: Prof. Palanisamy Shanmugam
2005 –2007	**M.E.** Digital Communication Engineering, Anna University, Chennai
2001 –2005	**B.E.** Electronics and Communication Engg Anna University, Chennai

PROFESSIONAL APPOINTMENTS

- Remote sensing scientist (November 2023– April 2025 & March 2020 - October 2022), GeoSensing and Imaging (GeoSI) Consultancy Pvt. Ltd., Trivandrum, India
- Project Associate (August 2009-June 2010), IIT Madras, Chennai, India
- Software Engineer (June 2007-July 2009), Sheeba computers, Bangalore, India

TEACHING EXPERIENCE

Sept- Dec 2025	**Teaching Assistant,** Handling Kelp remote sensing Lab for Undergrad students, Department of Biology, Univ. of Massachusetts Boston
Aug- Dec 2015	**Adhoc Faculty**, Handled Digital Image Processing Course for Master's students, Department of ECE, NIT Calicut, India
2015	**Visiting Faculty**, Handled Basic Electrical Engg, Course for Undergrad students, Department of CSE, IIIT Kurnool, India

MENTORSHIP AND SUPERVISION

- 2025 – Present: Mentor for Ph.D. student Nivedita Priyadarshini, Department of Geosciences, Virginia Tech, Blacksburg, VA, USA
- 2023: Mentor for Sandhani, Ph.D. student, Department of Ocean Engg, IIT Madras, India
- 2020 – 2024: Supervised undergraduate interns including Catherine (2024) and Manjunath (2020) on remote sensing and image analysis projects.
- 2020 – 2025: Project Lead, Geosensing and Imaging Consultancy (GeoSI), Trivandrum. supervised junior engineers and internship students on satellite image processing and machine learning projects.

FIELD CAMPAIGNS

- Participated in **three 15-day research cruises** in the Gulf of Mannar and the Bay of Bengal, India, conducting in-situ radiometric and photometric measurements for MODIS-Aqua validation and regional bio-optical algorithm development (MODIS, OCM-2).
- Participated in **five one-day coastal cruises** offshore of Chennai, Bay of Bengal, collecting radiometric data and water-quality samples (turbidity, chlorophyll-a) to support MERIS and MODIS satellite product validation.
- Participated in **ten one-day field campaigns** on Muttukadu Lake, Chennai, performing inland-water optical measurements using spectroradiometers for remote-sensing reflectance (Rrs) and water-quality sampling under varying environmental conditions.

COMPUTATIONAL AND ANALYTICAL SKILLS

- Satellite Data Processing: SeaDAS, ACOLITE
- Radiative Transfer Modeling: HYDROLIGHT
- Programming and Data Analysis: Python, R, MATLAB, C, C++
- Machine & Deep Learning: Image classification and regression modeling

WORKSHOPS CONDUCTED

March 2024	Organized a one-day workshop on "*Fundamentals of Machine Learning and its Applications in Ocean Color Remote Sensing*" for undergraduate students at Kalasalingam University, India.
December 2024	Conducted a one-day winter workshop on "*Integrated Remote Sensing and Radiative Transfer Modeling Framework for Coastal Water Studies*" for Ph.D. scholars at the Department of Ocean Engineering, IIT Madras, India.

GUEST LECTURES DELIVERED

2024	Ocean Color Remote Sensing, Saveetha University, India.
2023	Mixture Density Networks (MDN) for Water Quality Parameter Retrieval over Inland and Coastal Waters, Vellore Institute of Technology (VIT), Chennai, India.
2019	Satellite Image Processing for Ocean Applications, Chennai Institute of Tech, India.
2018	Aquatic Remote Sensing, Adhiyamaan Engineering College, India
2017	Satellite Image Processing for Ocean Applications, Rohini Engineering College, Chennai, India.

ONGOING WORK

1. Ashapure, A., O'Shea, R., **Balasubramanian, S. V.** "Aquaverse: A Machine Learning-Based Atmospheric Correction Framework for Inland and Coastal Waters",
2. **Balasubramanian, S. V.,** Byrnes, J., et al. "Hyperspectral Modeling of Kelp Forests from PRISMA Satellite Data Validated with UAV Imager"
3. Nivedita, P. K., **Balasubramanian, S. V.,** Manoochehr, S., Susanna, W., and Ashutosh. T. "Mixture Density Network-Based retrieval of Chlorophyll-a from multispectral imagery in the optically complex Chesapeake Bay"
4. **Balasubramanian, S. V.,** Byrnes, J., et al. "Deep Learning Framework for the Classification and Segmentation of Underwater Kelp Images"

PUBLISHED REPORTS

IOCCG (2025). Intercomparison of Atmospheric Correction Algorithms Over Optically Complex Waters. Jamet. C., and **Balasubramanian, S.V** (ed.), Reports of the International Ocean-Colour Coordinating Group, No. 21, IOCCG, Dartmouth, Canada.

PUBLISHED DATASET

1. Werther, M., Gurlin, D., Burggraaff, O., & **Balasubramanian, S. V.** (**2025**). Datasets and models used in the manuscript "On the generalization ability of probabilistic neural networks for hyperspectral remote sensing of absorption properties across optically complex waters" [Data set]. In Remote Sensing of Environment (v1.0, Vol. 328, Number 114820). Zenodo. https://doi.org/10.5281/zenodo.14893798
2. Lehmann, M K; Gurlin, D; Pahlevan, N; Alikas, K; Anstee, J M; **Balasubramanian, S V**; et al., (**2022**): GLORIA - A global dataset of remote sensing reflectance and water quality from inland and coastal waters [dataset]. *PANGAEA*, https://doi.org/10.1594/PANGAEA.948492

REFEREED PUBLICATIONS

1. Werther, M., Burggraaff, O., Gurlin, D., Saranathan, A. M., **Balasubramanian, S.V.**, et al., (**2025**). On the generalization ability of neural networks for hyperspectral remote sensing of absorption properties across optically complex waters. *Remote Sensing of Environment*, 328.
2. **Balasubramanian, S.V.**, et. al., (**2025**), "Mixture density networks for re-constructing historical ocean-color products over inland and coastal waters: Demonstration and validation", *Frontiers in Remote Sensing, 6.*
3. Saranathan, A. M., Pahlevan, N., Werther, M., Odermatt, D., **Balasubramanian, S.V.** (**2024**). Assessment of probabilistic neural networks for the dual estimation of water quality indicators and uncertainties from multi- and hyperspectral observations. *Frontiers in Remote Sensing, 5.*
4. Sandhani, C. G., Shanmugam, P., **Balasubramanian, S.V.,** and Sannasiraj, S.A., (**2024**). "Influence of the Bubbles on the Hyperspectral Reflectance and Watercolour Products," in *IEEE Access*, 12.
5. Pahlevan, N., **Balasubramanian, S.V**., et. al., (**2024**), "Going Beyond Chlorophyll-a: A re-assessment of remote sensing reflectance products from heritage ocean color satellites over inland and coastal waters", *IEEE transactions on Geoscience and remote sensing,* 21.
6. Maciel, D. A., Pahlevan, N., Barbosa, C. C. F., Martins, V. S., Smith, B., O'Shea, R. E., **Balasubramanian, S. V.,** Saranathan, A. M., Novo, E. M. L. M., (**2023**), Towards global long-term water transparency products from the Landsat archive. *Remote Sensing of Environment 299, 113889.*

7. Moritz K, L, Pahlevan, N., **Balasubramanian, S.V**., et. al., (**2023**), "GLORIA - A globally representative hyperspectral in situ dataset for optical sensing of water quality", *Scientific Data* 10 (1).
8. Pahlevan, N., Mangin A, **Balasubramanian, S.V.**, et. al., (**2021**), "ACIX-Aqua: A global assessment of atmospheric correction methods for Landsat-8 and Sentinel-2 over lakes, rivers, and coastal waters", *Remote Sensing of Environment* 258, 112366.
9. **Balasubramanian, S.V.**, Pahlevan, N., et. al., (**2020**), "A robust remote sensing technique for the estimation of suspended sediment concentration over inland and coastal waters", *Remote Sensing of Environment* 246, 111768.
10. Pahlevan, N., Chittimalli, S, K., **Balasubramanian, S.V.**, and Vellucci, V (**2019**), "Sentinel-2/Landsat-8 product consistency and implications for monitoring aquatic systems", *Remote Sensing of Environment* 201, 47-56.
11. Pahlevan, N., **Balasubramanian, S.V.**, Sarkar, S., and Franz, B. (**2018**), "Towards long-term aquatic science products from heritage Landsat missions", *Remote Sensing* 10, 1337 .
12. Sayoob, V., Shanmugam, P., and **Balasubramanian, S.V.** (**2018**), "Monte Carlo simulations of the backscattering measurements for associated uncertainty", *Optics Express* 26, 21258-21270.
13. Pahlevan, N., Sarkar, S., Franz, B., **Balasubramanian, S.V.**, and He, J., (**2017**), "Sentinel-2 MultiSpectral Instrument (MSI) data processing for aquatic science applications: Demonstrations and validations", *Remote Sensing of Environment* 201, 47-56.
14. **Balasubramanian, S.V.**, and Shanmugam, P. (**2016**), "Modeling of underwater light field fluctuations in coastal oceanic waters: Validation with experimental data", *Ocean Science Journal 51, 67-86*.
15. **Balasubramanian, S.V.**, and Shanmugam, P. (**2015**), "Modelling of underwater light fields in turbid and eutrophic waters: application and validation with experimental data", *Ocean Science* 11, 33-52.
16. Gokul, E., Shanmugam, P., **Balasubramanian, S.V.**, Arvind, S., and Chauhan, P. (**2014**). Modelling the inherent optical properties and estimating the constituents' concentrations in turbid and eutrophic waters, *Continental Shelf Research* 84: 120–138.
17. **Balasubramanian, S.V.**, Shanmugam, P., Manjusha, S.S. (**2013**). Radiative transfer modeling of upwelling light field in coastal waters, *Journal of Quantitative Spectroscopy and Radiative Transfer*; 121:30-44.
18. Shanmugam, P., Suresh, M., **Balasubramanian, S.V.**, (**2013**). OSABT: An Innovative Algorithm to Detect and Characterize Ocean Surface Algal Blooms, *IEEE Journal of selected topics in applied Earth observations and Remote Sensing*; 6:1879–1892.
19. Shanmugam, P., **Balasubramanian, S.V.**, Ahn, Y.H., Ryu, J.H. (**2011**). A New Inversion Model to Retrieve the Particulate Backscattering in Coastal/Ocean Waters. *IEEE transactions on Geoscience and remote sensing*; 49:2463-2474.
20. Shanmugam, P., Ahn, Y.H., Ryu, J.H., **Balasubramanian, S.V.**, (**2010**). An Evaluation of Inversion Models for Retrieval of Inherent Optical Properties from Ocean Color in Coastal and Open Sea Waters around Korea. *Journal of Oceanography*; 66:815-830.

ORAL/POSTERS PRESENTATIONS AT CONFERENCES

2023 – USA – IOCS, Florida
2023 – USA – NASA (CCE) Joint Science Workshop, Maryland
2018 – USA - AGU Fall meeting, Washington DC
2018 – Croatia - Ocean Optics conference, Dubrovnik
2018 – USA - Ocean Science Meeting, Portland
2016 – Canada - Ocean Optics conference
2012 – Netherland - NIOZ Royal Netherlands Institute for Sea Research