Sunanda N

**Address:** *19/1928 B Sreekrishna, Bajana Koil Road, Chalapuram, Calicut-673002, Kerala, India* **Ph:** *+91 808 943 2457*

**Email: sunanda.narayanan@gmail.com**

**Research Experience**

**2025-present Postdoctoral Researcher**

*Universität Hamburg*

**2019-2025 PhD Scholar**

*Centre for Ocean, River, Atmosphere and Land Sciences, Indian Institute of Tech nology Kharagpur, West Bengal*

**2021 - 2022 Senior Project Assistant**

*Centre for Ocean, River, Atmosphere and Land Sciences, Indian Institute of Tech nology Kharagpur West Bengal-721302*

**Project:** *Implementation of NEMO model at NPOL Kochi funded by Naval Physical and Oceanopgraphic Laboratory*

**2018 - 2021 Junior Project Assistant**

*Centre for Ocean, River, Atmosphere and Land Sciences, Indian Institute of Tech nology Kharagpur West Bengal-721302*

**Project:** *The impact of atmospheric pollution on Bay of Bengal Marine Ecosystem funded by INCOIS, Ministry of Earth Sciences (MoES)*

**2016 - 2018 Project Assistant**

*Centre for Ocean, River, Atmosphere and Land Sciences, Indian Institute of Tech nology Kharagpur West Bengal-721302*

**Sep 2015 - May 2016**

**Junior Research Fellow**

*CSIR-National Aerospace Laboratories, Kodihalli, Bangalore*

**Project:** *INDO-UK INCOMPASS Project Collaboration with University of Reading* **Education**

**2019-2025 Doctor of Philosophy** in Ocean Biogeochemistry at Centre for Ocean, River, At mosphere and Land Sciences, Indian Institute of Technology Kharagpur, West Bengal

*Thesis title: The impact of changes in the atmospheric and oceanic processes on the net primary productivity of the north Indian ocean*

**2013-2015 Mater of Science** in Meteorology at Department of Atmospheric Science, CUSAT, Kerala

*Thesis title: Influence of El Nino forcing on Indian Summer Monsoon using RegCM 4.3*

**2010-2013 Bachelor of Science** in Physics at Providence Women’s College, University of Calicut, Kerala

*Thesis title: A Study of the relationship between Symmetry and various Multipole Expansions*

**Publications**

***Journal Articles***

• Peter, R., Kuttippurath, J. **Sunanda, N.** and Chakraborty, K. (2025). Effect of thermal and non thermal processes on the variability of ocean surface pCO2 and buffering capacity in the North Indian Ocean. Progress in Oceanography, (Accepted)

• Akhila, R.S., Kuttippurath, J., Chakraborty, A., **Sunanda, N.** and Peter, R. (2025) Rapid Intensi fication of the Super Cyclone Amphan: environmental drivers and its future projections. Tropical Cyclone Research and Review, (Accepted)

• **Sunanda, N.**, Kuttippurath, J., Peter, R., & Chakraborty, A. (2024). An atmosphere–ocean cou pled model for simulating physical and biogeochemical state of north Indian Ocean: Customi sation and validation. Ocean Modelling, 191, 102419. doi :[10.1016/j.ocemod.2024.102419] (https://doi.org/10.1016/j.ocemod.2024.102419)

• Krishnaja, P. B., Akhila, R. S., Kuttippurath, J., & **Sunanda, N.** (2024). Tropical Cyclone-driven rainfall in the northeast Indian Ocean and adjoining land regions during the period 2000–2020. Journal of Hydrology, 130610. doi : https://doi.org/10.1016/j.jhydrol.2024.130610

• **Sunanda, N.**, Kuttippurath, J., Chakraborty, A., & Peter, R. (2023). Stressors of primaryproduc tivity in the north Indian Ocean using satellite, reanalysis and CMIP6 data. Progress in Oceanog raphy, 103164. doi : https://doi.org/10.1016/j.pocean.2023.103164

• Kuttippurath, J., Maishal, S., Anjaneyan, P., **Sunanda, N.**, & Chakraborty, K. (2023). Recent changes in atmospheric input and primary productivity in the north Indian Ocean. Heliyon, 9(7). • Peter, R., Kuttippurath, J., Chakraborty, K. and **Sunanda, N.** (2023). A high concentration CO2 pool over the Indo-Pacific Warm Pool. Scientific Reports, 13(1), 4314. doi: **10.1038/s41598-023-31468-0** • Kuttippurath, J., Akhila, R.S., Martin, M.V., Girishkumar, M.S., Mohapatra, M., Sarojini, B.B., Mo gensen, K., **Sunanda, N.** and Chakraborty, A. (2022). Tropical cyclone-induced cold wakes in the northeast Indian Ocean. Environmental Science: Atmospheres. doi : **10.1039/D1EA00066G** • **Sunanda, N.**, Kuttippurath, J., Peter, R., Chakraborty, K. and Chakraborty, A. (2021) Long-Term Trends and Impact of SARS-CoV-2 COVID-19 Lockdown on the Primary Productivity of the North Indian Ocean. Front. Mar. Sci. 8:669415. doi: **10.3389/fmars.2021.669415**

• Peter, R., Kuttippurath, J., Chakraborty, K. and **Sunanda, N.** (2021), Temporal evolution of mid tropospheric CO2over the Indian Ocean. Atmos. Environ. 257, 118475. doi : **10.1016/j.at mosenv.2021.118475**

• Kuttippurath, J., **Sunanda, N.**, Martin, M. V. and Chakraborty, K. (2021). Tropical storms trigger phytoplankton blooms in the deserts of north Indian Ocean. npj Climate and Atmospheric Science, 4(1), 1-12., doi : **10.1038/s41612-021-00166-x**

• Dutta, R., **Sunanda, N.**, Patra, A. and Maity, R. (2021). Long-term simulation of daily rainfall across India: Performance of cumulus convection schemes in regional climate model during southwest and northeast monsoon. Atmospheric Research, 259, 105675., doi : **10.1016/j.at mosres.2021.105675**

***Articles under Review***

• Peter, R., Kuttippurath, J., **Sunanda, N.** and Chakraborty, K. (2023). Role of rising atmospheric CO2 on ocean surface pCO2 variability and changes in buffering capacity in the north Indian Ocean, Marine Pollution Bulletin.

***Articles submitted***

• **Sunanda, N.**, Kuttippurath, J., Chakraborty, A. (2025). Estimation of Net Primary Productivity in the north Indian Ocean using different algorithms and comparison with bio-argo measurements. Remote Sensing Applications: Society and Environment.

***Conference Publications***

• **Sunanda, N.**, Kuttippurath, J., Chakraborty, A. and Peter, R. (2022, February). Impact of cli mate oscillations on the Net Primary Productivity of Indian and Pacific Oceans. *In OCEANS 2022-Chennai, India* (pp. 1-3). IEEE. doi: **https://doi.org/10.1109/OCEANSChennai45887 .2022.9775413**

• Peter, R., Kuttippurath, J., Chakraborty, K. and **Sunanda, N.** (2022, February). Modelling the oceanic partial pressure of carbon dioxide in the North Indian Ocean. *In OCEANS 2022-Chennai, India* (pp. 1-3). IEEE.\* doi: **https://doi.org/10.1109/OCEANSChennai45887.2022 .9775440**

• **Narayanan, S.**, Vishwanathan, G. and Mrudula, G. (2016, May). Possible development mech anisms of pre-monsoon thunderstorms over northeast and east India. *In Remote Sensing and Modeling of the Atmosphere, Oceans, and Interactions VI (Vol. 9882, pp. 274-298)*. SPIE. doi: **https://doi.org/10.1117/12.2223719**

***Conference Proceedings***

• **Sunanda, N.** and Kuttippurath, J.: Comparison of the physical state of the north Indian Ocean using global and regional models. National Symposium on Coastal Oceanographic Studies: Mod eling & Observations (COSMOS), 17–19 April 2024, Kochi.

• **Sunanda, N.**, Kuttippurath, J. and Chakraborty, A.: Assessment of Nitrogen dynamics and pro duction regimes in the north Indian Ocean: A coupled modeling perspective. International Con ference on Frontiers in Marine Sciences (MARICON), Kochi, India, 8-10, April 2024.

• **Sunanda, N.**, Kuttippurath, J., Chakraborty, A., & Peter, R. (2023). Stressors affecting net primary productivity in the North Indian Ocean in past, present and future periods. *In Fall Meeting 2022, AGU* (Virtual).

• **Sunanda, N.**, Kuttippurath, J. and Chakraborty, A: A coupled ocean biophysical-atmosphere model for simulation of the biogeochemistry of the North Indian Ocean. In Proceedings of the 8th National Conference of the Ocean Society of India (OSICON-23), August 23-25, 2023

• **Sunanda, N.**, Kuttippurath, J., Chakraborty, A. and Peter, R. Impact of Atmospheric Input on the Biogeochemistry of North Indian Ocean using Ocean–Atmosphere Coupled Model. *In Fall Meeting 2022, AGU*. December 12-16, Chicago, Illinois, USA. AGU. December 12-16, Chicago, Illinois, USA

• Peter, R., Kuttippurath, J., **Sunanda, N.** and Chakraborty, K. Assessment of the Impact of Increas ing Atmospheric CO2 on the North Indian Ocean Carbon Chemistry. *In Fall Meeting 2022, AGU*. December 12-16, Chicago, Illinois, USA.

• **Sunanda, N.**, Kuttippurath, J., Anjaneyan, P. and Chakraborty, A.: Eddy mediated chlorophyll blooms in North Indian Ocean. *In International Indian Ocean Science Conference (IIOSC)*, 14-18 March 2022, Virtual.

• **Sunanda, N.** and Kuttippurath, J.: Role of eddies on tropical cyclone induced phytoplankton blooms in North Indian Ocean. *In International Symposium on Tropical Meteorology, “Changing Climate: Consequences and Challenges (INTROMET-C4)”*, November 23–26, 2021.

• **Sunanda, N.**, Kuttippurath. J., Chakraborty, A. and Peter, R.: Did COVID-19 lockdown impact the Net Primary Productivity in the Arabian Sea? *In Ocean for sustainable development, OSICON - 21*, August 12- 14, 2021.

• **Sunanda, N.** and Kuttippurath, J.: The Relationship between Aerosols and Chlorophyll -a in the North Indian Ocean, *In International Conference on Frontiers in Marine Science Challenges and Prospects (MARICON)*, December 16-20, 2019

• Akhila, R.S, **Sunanda, N.**, Chakraborty, A. and Kuttippurath, J.: Cooling of Bay of Bengal surface temperature during the passage of the cyclones Aila, Bijli and Ward, *In International conference on SONAR Systems and Sensors, ICONS 2018*, 22–24 February 2018.

• **Sunanda, N.**, Akhila, R.S, Chakraborty, A. and Kuttippurath, J.: The Chl-a bloom in Bay of Bengal during the cyclones Fanoos, Nisha and Nilam, *In International conference on SONAR Systems and Sensors, ICONS 2018*, 22–24 February 2018

**Skills**

***Languages*** Strong reading, writing and speaking competencies for English, Malayalam, Hindi, Tamil, Basic Knowledge in French

***Coding*** Python, MATLAB, Fortran

***Datasets*** NetCDF, ASCII, Argo

***Models*** Regional Climate Model (RegCM), Regional Ocean Modelling System (ROMS), Weather Research Forecast Model with Chemistry (WRF & WRF-CHEM), Cou pled Ocean Atmosphere Wave Sediment Transport Model (COAWST), Nucleus for European Modelling of Ocean (NEMO)

***Softwares*** GrADS, Ferret

**Awards and Achievements**

• Winner of **Student Hackathon** (Group) at *OCEANS 2022*, Chennai, India. • **Best Paper Award** for the paper titled *“Did COVID-19 lockdown impact the Net Primary Produc tivity in the Arabian Sea?”* under the session *Marine Ecosystems and Biogeochemistry (MEBO)*

in the *7th Biennial Conference of Ocean Society of India (OSICON-21)* organised by the *National Centre for Polar and Ocean Research (NCPOR)*, Ministry of Earth Sciences (MoES) and *Ocean Society of India (OSI)* held from *12th August to 14th August 2021* through the online platform.

• **Best Oral Presentation Award** for her paper on “Assessment of Nitrogen dynamics and pro duction regimes in the north Indian Ocean: A coupled modelling perspective” in the International Conference MARICON - 2024 organised by School Marine Sciences, CUSAT, Kochi during 8-10 April 2024

• **Best Student Presentation Award** for her paper on “Comparison of the physical state of the north Indian Ocean using global and regional models” in the National Symposium on Coastal Oceanographic Studies: Modeling & Observations (COSMOS), 17–19 April 2024, Kochi

• Received **Full Travel Grant** from *Indian Institute of Technology Kharagpur* to attend and present at *AGU Fall Meeting 2022* held at Chicago during 12-16, December 2022.

**Media Coverage**

***Times of In dia***

Low pollution during lockdown linked to warmer seas, say studies

**https://timesofindia.indiatimes.com/city/pune/low-pollution-during-lockdown -linked-to-warmer-seas-studies/articleshow/86182276.cms**

***Nature In dia***

Cyclones cause phytoplankton blooms over north Indian Ocean

**https://www.nature.com/articles/nindia.2021.42**

***Youth for Ocean Decade***

Youth for the Ocean Decade: Hopes and Contributions

**https://www.youtube.com/watch?v=PYG-7yTWA6w**

***Introducing ECOPs in***

ECOPs in India

**https://www.youtube.com/watch?v=c0VJ67mbUjA**

***India***

**Memberships, Talks and other Activities**

• Life Member of Ocean Society of India

• Student Member of American Geophysical Union

• Early Career Ocean Professionals (ECOP) India Coordinator

• Member ECOP Asia

• Coordinator of Early Career Ocean Researchers India

• Technical Committee member in OSICON 2023

• Conceptualization of Climate Comics in LUCA Online Science Malayalam Magazine • Science writer at LUCA Online Science Malayalam Magazine

• Conducted ECOP session as a part of WOSC 2024 held on February 27 2024 in IITM Research Park, Chennai

• Participitated in IOC-UNESCO Ocean Prediction DCC Launch Event

• Partcipitated in Women Leadership in Marine Technology Engineering and Science as a prelude to IEEE/MTS OCEANS 2022 Conference February 21-24,2022, as a part of UN decade of ocean science for sustainable development,(2021-30)

• Partcipitated in Women in Engineering Event at IEEE/MTS OCEANS 2022 Conference February 21-24,2022, as a part of UN decade of ocean science for sustainable development,(2021-30) • Presented a short Talk on “Sci-comm initiatives in India” in the incubator session ECOP network

Early Career Ocean Professionals (Asia): a perspective on science communication, WESTPAC on 26th November 2021

**References**

1. **Prof. Jayanarayanan Kuttippurath**,

*Associate Professor*,

Centre for Ocean, River, Atmosphere and Land Sciences (CORAL),

Indian Institute of Technology Kharagpur. Email: jayan@coral.iitkgp.ac.in

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*Professor*,

Indian Institute of Technology Madras. Email: atma@iitm.ac.in,atmanandma@gmail.com **sunanda.narayanan@gmail.com** • +91 808 9432 457 •