

---

# DR. PRABHA R NAIR

SCIENTIST SG & HEAD ACTG

Space Physics Laboratory, Vikram Sarabhai Space Centre, Trivandrum-695022

Phone : +91-471-2563927 (Office)

E-mail : [prabha\\_nair\[at\]vssc\[dot\]gov\[dot\]in](mailto:prabha_nair[at]vssc[dot]gov[dot]in)

---

## Research Area

Atmospheric Aerosols, Trace Gases, Radiation and Modelling

### Current Research Topics

- Physical and Chemical characterisation of atmospheric aerosols at geographically different environments over Indian landmass & surrounding Oceans to

- Evolve aerosol chemical models for Indian region
- Assess the radiative characteristics of aerosols

Studies on Atmospheric Trace Gases like O<sub>3</sub>, NO<sub>x</sub>, CO, SO<sub>2</sub>, CH<sub>4</sub>, CO<sub>2</sub> Using in-situ measurements and satellite data to

- evolve the 3D distribution over Indian region
  - Understand the spatio- temporal variations
  - Identify sources, sinks and transport pathways
  - Delineate the role of photochemistry and meteorology
- Balloon based measurement of altitude profile of Ozone
  - Modelling

## Academic Qualifications

Degree	year	University
<i>B Sc Physics</i>	<i>1979</i>	<i>University of Kerala</i>
<i>MSc Physics</i>	<i>1981</i>	<i>University of Kerala</i>
<i>Ph D Physics</i>	<i>1994</i>	<i>University of Kerala</i>

### *Title of Thesis: Studies on Atmospheric Aerosols*

*Work included the development of Multi-wavelength solar radiometer, measurement of aerosol optical depth, retrieval of aerosol size distributions using inversion techniques, studies on their temporal features, effect of water vapour on aerosols and effect of volcanic aerosols on columnar optical depths.*

<b>Post Held</b>	<b>Year</b>	<b>Major Responsibilities/activities</b>
<i>Junior lecturer in NSS Colleges &amp; Govt College</i>	<i>1982-1984</i>	<i>Teaching</i>
<i>Scientific Assistant C SPD/SPL,</i>	<i>1984-1987</i>	<i>Development of Multi-Wavelength Radiometer (MWR)</i>
<i>Scientist/Engineer SC, SPL</i>	<i>1987-1989</i>	<i>Development of MWR, development of necessary algorithms for data analysis and establishment of MWR network</i>
<i>Scientist/Engineer SD,SPL</i>	<i>1989-1995</i>	<i>Scientific Studies on atmospheric aerosols, Computation of atmospheric path radiance &amp; correction of IRS data for atmospheric effects &amp; calibration of sensors</i>
<i>Scientist/Engineer SE,SPL</i>	<i>1995-2001</i>	<i>Aerosol Sampling &amp; Aerosol Chemistry (new initiative)</i>
<i>Scientist/Engineer SF,SPL</i>	<i>2001-2008</i>	<i>Trace Gas (O<sub>3</sub>, NO<sub>x</sub>, CO and SO<sub>2</sub>) measurements &amp; studies (new initiative), planning and co-ordination of experiments on trace gases &amp; aerosol chemistry on-board ship, Participation In Ship-based campaigns (ICARB I)</i>
<i>Scientist/Engineer SG, SPL &amp; Head, ACTG Branch of SPL</i>	<i>2008-2017</i>	<i>Use of satellite based data for trace gas studies, Balloon based Ozone profiling at Thumba (new initiative) planning and co-ordination of experiments on trace gases &amp; aerosol chemistry for ship-borne measurements (ICARB II, CTCZ campaign), Antarctic Expeditions Green House Gas (CO<sub>2</sub>&amp; CH<sub>4</sub>) measurements (new initiative), Planning, coordination and management of the R&amp; D activities on trace gases and aerosols chemistry of ACTG Branch of SPL</i>
<i>Scientist/Engineer G, SPL &amp; Head, ACTG Branch of SPL</i>	<i>2017 onwards</i>	<i>Satellite-based, ship-based and ground-based studies on trace gases and aerosols  Investigations on the vertical profiles of O<sub>3</sub> and CH<sub>4</sub></i>

### **Awards**

*Best paper awards in National Space Science Symposium 1992  
Best paper awards in National Space Science Symposium 2010  
Best paper award in International Conference on Climate Change and Disaster Management, 2015*

### **Membership in Professional Bodies**

*Indian Aerosol Science and Technology Association (IASTA)  
Kerala Academy of Science*

### **Research Supervision**

**No: of students received Ph D : 3**

**Dr. Susan George K**

**Dr. Liji Mary David**

**Dr. Aryasree S**

**No: of students/faculty doing Ph D : 3**

**Mr. Girach Imran Asatar**

**Ms. Kavitha M**

**Ms. Aswini AR**

### **Other Activities**

**Guide to Academic projects** for MSc, M Phil and Summer research fellowship programme of Indian Science Academy

**Reviewer for Scientific papers in international journals** JGR, AE, JOCH, JESS, JASTP, ESPR, Current Science etc

### **Other Responsibilities**

Principal Investigator/Co-ordinator of ATCTM (Atmospheric Trace gases Chemistry Transport Modelling) Project of ISRO-GBP at SPL

### **Participation in National/International Field Campaigns**

**Participated in several International and national level Field Campaigns:**

**Indian Ocean Experiment (INDOEX), Arabian Sea Monsoon Experiment (ARMEX), LAND CAMPAIGNS (I & II) and Integrated Campaign for Aerosols, gases and Radiation Budget (ICARB) under ISRO-Geosphere Biosphere Programme, CTCZ campaign etc**

### **List of Publications**

1. Krishna Moorthy, K., **Prabha B. Nair** and B.V. Krishna Murthy, A study on aerosol optical depth at a coastal station, Trivandrum, *Indian J. Radio and Space Phys.*, **17**, 16-22, 1988.
2. Krishna Moorthy, K., **Prabha R. Nair** and B.V. Krishna Murthy, Multiwavelength Solar Radiometer net-work and features of aerosol optical depth at Trivandrum, *Indian J. Radio and Space Phys.*, **18**, 194-201, 1989.
3. Krishna Moorthy, K., **Prabha R. Nair** and B.V. Krishna Murthy, Size distribution of coastal aerosols: Effects of local sources and sinks, *J. Appl. Meteorol.*, **30**, 844-852, 1991.
4. Krishna Moorthy, K., B.V. Krishna Murthy and **Prabha R. Nair**, Sea-breeze front effects on boundary layer aerosols at a tropical coastal station, *J. Appl. Meteorol.*, **32**, 1196-1205, 1993.
5. Krishna Moorthy, K., **Prabha R. Nair**, B.S.N. Prasad, N. Muralikrishnan, H.B. Gayatri, B. Narasimha Murthy, K. Niranjana, V. Ramesh Babu, G.V. Satyanarayana, V.V. Agashe, G.R. Aher, Risal Singh and B.N. Srivastava, Results from the MWR net work of IMAP, *Indian J. Radio and*

- Space Phys.*, **22**, 243-258, 1993.
6. **Prabha R. Nair** and K. Krishna Moorthy, On the association between aerosol optical depths and surface meteorological condition in a tropical coastal environment, *Mausam*, **46(4)**, 427-434, 1995.
  7. Krishna Moorthy, K., **Prabha R. Nair**, B.V. Krishna Murthy and S.K. Satheesh, Time evolution of the optical effects and aerosol characteristics of Mt. Pinatubo origin from ground-based observations, *J. Atmos. Terr. Phys.*, **58(10)**, 1101-1116, 1996.
  8. **Prabha R. Nair** and K. Krishna Moorthy, Effect of physical properties of atmospheric aerosols on path radiance, *Atmos. Res.*, **43**, 139-155, 1997.
  9. **Prabha R. Nair**, Krishna Moorthy, K., and SK Satheesh, On the climatology of aerosol columnar size distribution, changes in *Global Climate due to natural and human activities*, ISBN 81-7023-632-0, Allied Publishers Limited, 1997.
  10. Parameswaran K., Rekha Rajan, G. Vijayakumar, K. Rajeev, K. Krishna Moorthy, **Prabha R. Nair** and S.K. Satheesh, Seasonal and long term variations of aerosol content in the atmospheric mixing region at a tropical station on the Arabian sea-coast, *J. Atmos. Sol. Terr. Phys.*, **60**, 17-25, 1998
  11. **Prabha R. Nair** and K. Krishna Moorthy, Effects of changes in atmospheric water vapor content on physical properties of atmospheric aerosols at a coastal station, *J. Atmos. Solar Terr. Phys.*, **60**, 563-572, 1998.
  12. **Prabha R. Nair** and K. Krishna Moorthy, An analysis of the effects of Mt. Pinatubo aerosols on atmospheric radiances, *Int. J. Remote Sensing*, **19**, 697-705, 1998.
  13. Parameswaran K., **Prabha R. Nair**, Rekha Rajan and M. Venkata Ramana, Aerosol loading in the coastal and marine environments in the Indian Ocean region during the winter season, *Current Science*, **76**, 347-355, 1999.
  14. Parameswaran, K., M.N. Sasi, Geetha Ramkumar, **Prabha R. Nair** and V. Deepa, B.V. Krishna Murthy, S.R. Prabhakaran Nayar, K. Revathy, G. Mrudula and K. Satheesan, Y. Bhavanikumar, V. Sivakumar, K. Raghunath and T. Rajendraprasad and M. Krishnaiah, Altitude Profiles of Temperature from 4 to 80 km over the tropics from MST Radar and Lidar, *J. Atmos. Solar Terr. Phys.*, **62**, 1327-1337, 2000.
  15. Krishna Murthy, B.V., S.R. Prabhakaran Nayar, K. Revathy, G. Mrudula, K. Satheesan, K. Parameswaran, M.N. Sasi, **Prabha R. Nair**, Geetha Ramkumar, V. Deepa, Y. Bhavanikumar, V. Siva Kumar, K. Raghunath, T. Rajendraprasad and M. Krishnaiah, Preliminary results of equatorial wave experiment conducted from January 18, 1999 to March 5, 1999 with lidar at Gadanki, *Indian J. Radio & Space Physics*, **29**, 231-234, 2000.
  16. Krishna Murthy, B.V., S.R. Prabhakaran Nayar, K. Revathy, K. Satheesan, K. Parameswaran, **Prabha R. Nair**, K. Krishna Moorthy, P.B. Rao, Y. Bhavanikumar, K. Raghunath and M. Krishnaiah, Thin aerosol clouds at tropopause level, *Indian J. Radio & Space Physics*, **29**, 245-249, 2000.
  17. Parameswaran K., **Prabha R. Nair** and Rekha Rajan, Aerosol loading in the atmospheric boundary layer at Trivandrum coast and in the adjoining oceanic environments during the FFP and IFP of the Indian Ocean Experiment, *Current Science*, **80**, 151-160, 2001.
  18. Parameswaran K., **Prabha R. Nair**, K. Krishna Moorthy, B.V. Krishna Murthy, S.R. Prabhakaran Nayar, K. Revathy, K. Satheesan, P.B. Rao, Y. Bhavanikumar, K. Raghunath and M. Krishnaiah, Lidar observations of aerosol layers just below the tropopause level during IFP-INDOEX, *Current Science*, **80**, 166-170, 2001.
  19. Parameswaran K., **Prabha R. Nair**, Rekha Rajan and D. Balasubrahmanyam, Spatial distribution of aerosol concentrations over the Arabian sea and the Indian Ocean during Intense Field Phase of INDOEX, *Current Science*, **80**, 161-165, 2001.
  20. **Prabha R. Nair**, Rekha Rajan and K. Parameswaran, Chemical composition of aerosol particles over the Arabian sea and Indian Ocean regions during the INDOEX (FFP-98) cruise- preliminary results, *Current science*, **80**, 171-175, 2001.

21. **Prabha R Nair**, D. Chand, S. Lal, K.S., Modh, M. Naja, K. Parameswaran. S. Ravindran, and Venkataramani, S. Temporal variations in surface ozone at Thumba (8.6°N, 77°E)- a tropical coastal site in India, *Atmos. Environ*, *36*, 603-610, 2002
22. Parameswaran, K., S. V. Sunilkumar, B. V. Krishna Murthy, K. Satheesan, and **Prabha R Nair**, Lidar Observations of cirrus cloud near the tropical tropopause: Temporal variations and association with tropospheric turbulence, *Atmos. Res.*, *69*, 29-49, 2003.
23. Sasi, M. N, B.V. Krishna Murthy, Geetha Ramkumar, K. Satheesan, K. Parameswaran, K. Rajeev, S. V. Sunilkumar, **Prabha R. Nair**, K. Krishna Moorthy, Y. Bhavanikumar, K. Raghunath, A. R. Jain, P. B. Rao, M. Krishnaiah, S.R. Prabhakaran Nayar, K. Revathy, and S. Devanarayanan, A study of Equatorial wave characteristics using Rockets, Balloons, Lidar and Radar: *Adv. Space Res.*, *32(5)*, DOI.10.1016/3023-1177(03) 00412-5,2003.
24. **Prabha R Nair**, K. Parameswaran, S.V. Sunil Kumar and Rekha Rajan, Continental influence on the spatial distribution of particulate loading over the Indian Ocean during winter season. *J. Atmos. Solar Terr. Phys.*, *66*, 27-38, 2004.
25. **Prabha R Nair**, K. Parameswaran, S V Sunil Kumar, A. Abraham and S. Jacob, Chemical composition of Atmospheric aerosols over the Indian Ocean: Impact of continental advection, *Adv. Space Res.*, *34*, 828-832, 2004
26. Parameswaran, K., S.V. Sunil Kumar, K. Rajeev, **Prabha R Nair**, K. Krishna Moorthy, Boundary layer aerosols at Trivandrum , *Adv. Space Res.*, *34*, 838-844, 2004.
27. Sunilkumar, S.V., **Prabha R. Nair** and K. Parameswaran, Aerosol size distribution over the Arabian Sea during ARMEX-II, *Mausam*, *56*, 321-326, 2004
28. Krishnaiah M., U. Jayaprakash Raju, Y. Bhavani Kumar, K. Reghunath, V. Sivakumar, P. B. Rao, B. V. Krishna Murthy, M. N. Sasi, K. Parameswaran, K. KrishnaMoorthy and **Prabha R Nair**, Lidar observations of middle atmosphere temperature variability over low latitude, *Ind. J. Rad. & Space Phys.**33*, 50-57, 2004
29. Krishna Moorthy. K., S V Sunilkumar, Preetha Pillai, K Parameswaran, **Prabha R Nair**, Y Nazeer Ahmed, K Ramgopal, K. Narasimhulu, Rajuru Reddy, V Vinoj, S.K. Satheesh, Kandula Niranjana, B Rao, BS Brahmanandam, Auromeet Saha, dr Badarinath, TR Kiranchand, K Lata, Wintertime spatial characteristics of boundary layer aerosols over peninsular India, *J. Geophysical Research*, *110*, D08207,doi:10.1029/200JD005520, 2005
30. **Prabha R Nair**, K. Parameswaran, A. Abraham and S. Jacob, Wind-dependence of sea salt and non-sea salt aerosols over the oceanic environment, *J. Atmos. Solar Terr. Phys.*, *67*, 884-898, 2005.
31. **Prabha R Nair**, Susan K George, SV Sunil Kumar, K Parameswaran, Salu Jacob, and Annamma Abraham, Chemical composition of aerosols over peninsular India during winter, *Atmospheric Environment* *40*, 6477-6493, 2006
32. Vijayakumar S. Nair, K. Krishna Moorthy, Denny P. Alappattu, P. K. Kunhikrishnan, Susan George, **Prabha R. Nair**, S. Suresh Babu, B. Abish, S. K. Satheesh, Sachchida Nand Tripathi K. Niranjana, B. L. Madhavan, V. Srikant, C. B. S. Dutt, K. V. S. Badarinath, and R. Ramakrishna Reddy, Wintertime aerosol characteristics over the Indo-Gangetic Plain (IGP): Impacts of local boundary layer processes and long-rangetransport, *J. Geophysical Research*, *112*, D13205, doi:10.1029/2006JD008099, 2007
33. Susan K. George and **Prabha R. Nair**, Aerosol Mass Loading over the Marine Environment of Arabian Sea during ICARB: Sea-salt and Non-sea-salt Components, *J. Earth Syst. Sci.*, *117*, 333-344, 2008.
34. Marina Aloysius, M. Mohan, K. Parameswaran, Susan George K. and **Prabha R. Nair**, Aerosol transport over the Gangetic Basin during ISRO-GBP Land Campaign-II, *Ann. Geophys.*, *26*, 431-440, 2008.
35. Susan K. George, **Prabha R. Nair**, K. Parameswaran, Salu Jacob, and Annamma Abraham, Seasonal trends in chemical composition of aerosols at a tropical coastal site of India, *J. Geophys. Res.*, *113*, D16209, doi:10.1029/2007JD009507, 2008.

36. **Prabha R Nair**, Susan George, K., Parameswaran, K., Marina Aloysius, Denny P. Alappattu, Mannil Mohan, Kunhikrishnan, P. K., Short-term changes in the aerosol characteristics at Kharagpur (22° 19'N, 87° 19'E) during winter, *J. Atmos. Sol. Terr. Phys.*, 71, 1771-1781, 2009
37. Girach Imran Asatar and **Prabha R Nair**, Spatial distribution of near-surface CO over bay of Bengal during winter: role of transport, *J. Atmos. Sol. Terr. Phys.*, 72 (2010) 1241–1250, doi:10.1016/j.jastp.2010.07.025, 2010
38. Vijayakumar S. Nair, S. K. Satheesh, K. Krishna Moorthy, S. Suresh Babu, **Prabha R. Nair**, and Susan K. George, Surprising observation of large anthropogenic aerosol fraction over the “near-pristine” southern Bay of Bengal: Climate implications, *J. Geophys. Res.*, doi:10.1029/2010JD013954, 2010
39. Liji Mary David and **Prabha R. Nair**, Diurnal and seasonal variability of surface ozone and NO<sub>x</sub> at a tropical coastal site: Association with mesoscale and synoptic meteorological conditions, *J. Geophys. Res.*, doi:10.1029/2010JD015076, 2011
40. Susan K George, **Prabha R Nair**, K. Parameswaran and Salu Jacob, Wintertime chemical composition of aerosols at a rural location in the Indo-Gangetic Plains, *Journal of Atmospheric and Solar-Terrestrial Physics*, doi:10.1016/j.jastp.2011.04.005, 2011
41. **Prabha R Nair**, Liji Mary David, Girach Imran Asatar and Susan George K, Ozone In The Marine Boundary Layer Of Bay Of Bengal During Post-Winter Period: Spatial Pattern And Role Of Meteorology, *Atmos. Environment*, doi:10.1016/j.atmosenv.2011.05.040, 2011
42. Liji Mary David, I. A. Girach and **Prabha R Nair**, Distribution of ozone and its precursors over Bay of Bengal during winter 2009: Role of meteorology, *Annales Geophysicae*, 29, doi:10.5194/angeo-29-1-2011.
43. I. A. Girach, **Prabha R. Nair**, Liji Mary David, Prashant Hegde, Manoj Kumar Mishra, G. Mohan Kumar, Murali Das S., N. Ojha, and M. Naja, The changes in near-surface ozone and precursors at two near-by tropical sites during annular solar eclipse of 15 January 2010, *J. Geophys. Res.*, doi:10.1029/2011JD016521, 2012
44. Liji Mary David, and **Prabha R Nair**, Tropospheric column O<sub>3</sub> and NO<sub>2</sub> over the Indian region observed by Ozone Monitoring Instrument (OMI): Seasonal changes and long-term trends, 2013, *Atmos. Environment* 65, 25-39
45. **Prabha R Nair**, Liji Mary David, Aryasree S and Susan George K., Distribution of ozone in the marine boundary layer of Arabian Sea prior to monsoon: prevailing airmass and effect of aerosols, *Atmos. Environment*, 74, 18-28.
46. **Prabha R Nair**, Susan George K, Aryasree S and Salu Jacob, Chemical composition of aerosols over Bay of Bengal during pre-monsoon: Dominance of anthropogenic sources, *Journal of Atmos. and solar Terr. Phy.*, 109, 54–65, 2014
47. Girach, I. A. and **P. R. Nair**, On the vertical distribution of Carbon monoxide over Bay of Bengal during winter: Role of water vapour and vertical updrafts, *Journal of Atmospheric and Solar-Terrestrial Physics*, 117, 31–47, 2014. (<http://dx.doi.org/10.1016/j.jastp.2014.05.003>)
48. Girach, I. A., V. S. Nair, S. S. Babu and **P. R. Nair**, Black Carbon and Carbon Monoxide over Bay of Bengal during W\_ICARB: Source characteristics, *Atmospheric Environment*, 94, 508-517, 2014. (<http://dx.doi.org/10.1016/j.atmosenv.2014.05.054>)
49. Girach, I. A., V. S. Nair, S. S. Babu and **P. R. Nair**, "Black Carbon and Carbon Monoxide over Bay of Bengal during W\_ICARB: Source characteristics", *Atmospheric Environment*, 94, 508-517, 2014. (<http://dx.doi.org/10.1016/j.atmosenv.2014.05.054>).
50. Aryasree S., **P. R. Nair**, I. A. Girach and S. Jacob, "Winter time chemical characteristics of aerosols over the Bay of Bengal: continental influence", *Environmental Science and Pollution Research*, 19, 14901-14918, 2015. (<http://dx.doi.org/10.1007/s11356-015-4700-7>)

51. Aryasree S., **P. R. Nair**, I. A. Girach and S. Jacob, "In situ measured seasonal characteristics of near-surface aerosols over Bay of Bengal and MODIS-retrieved columnar properties: A multicampaign analysis", *Journal Geophysical Research*, 120, 2015. (<http://dx.doi.org/10.1002/2015JD023418>)
52. Prashant Hegde, Kimitaka Kawamura, I. A. Girach and **Prabha R. Nair**, 2015, Characterisation of water-soluble organic aerosols at a site on the southwest coast of India. *Journal of atmospheric chemistry*. doi:10.1007/s10874-015-9322-4.
53. Bindu G, **Prabha R Nair**, Aryasree S and Salu Jacob, 2015, Pattern of aerosol mass loading and chemical composition over the atmospheric environment of an urban coastal station, *Journal of Atmospheric and Solar-Terrestrial Physics*, 138-139(2016) 121–135, doi.org/10.1016/j.jastp.2016.01.004
54. Kavitha M and **Prabha R Nair**, Region-dependent seasonal pattern of methane over Indian region as observed by SCIAMACHY, *Atmospheric Environment*, <http://dx.doi.org/10.1016/j.atmosenv.2016.02.008>, 1352-2310.
55. Kavitha M and **Prabha R. Nair**, Non-homogeneous vertical distribution of methane over Indian region using surface, aircraft and satellite based data, *Atmospheric Environment*, 141, 174-185, 2016, <http://dx.doi.org/10.1016/j.atmosenv.2016.06.068>.
56. Girach I. A., N. Ojha, **Prabha R. Nair**, A. Pozzer, Y. K. Tiwari, K. Ravi Kumar and J. Lelieveld, Variations in O<sub>3</sub>, CO, and CH<sub>4</sub> over the Bay of Bengal during the summer monsoon season: shipborne measurements and model simulations, *Atmos. Chem. Phys.*, 17, 257-275. (<http://dx.doi.org/10.5194/acp-17-257-2017>).
57. Kavitha M and **Prabha R Nair**, SCIAMACHY observed changes in the column mixing ratio of methane over the Indian region and a comparison with global scenario, *Atmospheric Environment*, 10.1016/j.atmosenv.2017.07.044, 2017.
58. Phanikumar, D. V., K. Niranjana Kumar, S. Bhattacharjee, M. Naja, Girach I. A., **Prabha R. Nair**, and Shweta Kumari, Unusual enhancement in tropospheric and surface ozone due to orography induced gravity waves, *Remote Sensing of Environment*, <http://dx.doi.org/10.1016/j.rse.2017.07.011>, 2017.
59. Girach I. A., N. Ojha, **Prabha R. Nair**, Y. K. Tiwari, and K. Ravi Kumar, Variations of trace gases over the Bay of Bengal during the summer monsoon”, *Journal of Earth System Science*,.
60. Aswini, A.R., Hegde, P., and **Prabha R. Nair**, Carbonaceous and inorganic aerosols over a sub-urban site in peninsular India: Temporal variability and source characteristics. *Atmospheric Research*, 199, 40-53. Doi:10.1016/j.atmosres.2017.09.005 (2017).
61. Aryasree S and **Prabha R Nair**, 2018 Season-dependent size distribution of aerosols over the tropical coastal environment of south-west India, *Journal of Atmospheric and Solar-Terrestrial Physics* 10.1016/j.jastp.2017.12.012
62. **Prabha R. Nair**, Revathy S. A., David L. M., Girach, I. A. and Kavitha M., "Decadal changes in surface ozone at the tropical station Thiruvananthapuram (8.542 N, 76.858 E), India: effects of anthropogenic activities and meteorological variability", *Environmental Science and Pollution Research*, 2018, <http://dx.doi.org/10.1007/s11356-018-1695-x>.
63. Kavitha M., **Prabha R. Nair**, I.A. Girach, S. Aneesh, S. Sijikumar, R. Renju, Diurnal and seasonal variations in surface methane at a tropical coastal station: Role of boundary layer meteorology, *Science of the Total Environment*, 631–632 (2018) 1472–1485, doi.org/10.1016/j.scitotenv.2018.03.123.

## International/national Symposium/Seminar/ conference Presentations