Aerosol & Atmospheirc Reserach Laboratory

Department of Physics
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Anantapur - 515003

AEROSOL & ATMOSPHERIC RESEARCH LABORATORY

PRINCIPAL INVESTIGATOR

Prof. Kotalo Rama Gopal did his B.Sc., and M.Sc., degrees in the year 1994 and 1996, respectively and obtained PhD (2001) degree, all from the Sri Krishnadevaraya University, Anantapur, India. His research interest focused on the Spectroscopic properties of glasses, Opto-electronic properties of materials, material Science, Solid State Spectroscopy, Atmospheric Aerosols and Trace gases. He also participated in various land campaign and sea campaigns conducted by ISRO for various the measurement of near surface aerosols. He has intensively collaborated with various research institutes and universities to study the impact of pollutants (aerosols and trace gases) on Earth's radiation budget. He is now acting as the principal investigator and was involved in the indigenous development of ISRO projects worth of 8 crores. He served as a Deputy Warden and Public Relation Officer in S.K. University. He leads the efforts of the atmospheric research team to integrate the boundary layer observations with the regional meteorological data for detection and characterization of atmospheric particulate matter and gas pollutants. He has published more than 170 research articles in reputed international journals. He has guided 19 research students for Ph.D., degree and 6 students for M.Phil. Degree and guiding two PhD students. He has attended 6 international seminars and 42 national seminars and organized 16 national level seminars. He has authored 11 international books and are related to Atmospheric Science published in Germany, He is a life member of the IASTA, NESA and ISCA and recipient of the Scientist and **Eminent Scientist of the year Award for the year 2007 and 2015** from NESA, New Delhi, **Outstanding Scientist Award 2016** from Venus International Foundation, Chennai and **Distinguished Scientist Award, 2020** from VD GOOD Technology Factory, Coimbatore, India. **Andhra Pradesh State Best Teacher Award 2023,** by AP state Government, India.

ISRO NODAL CENTRE AT S.K. UNIVERSITY
AEROSOL & ATMOSPHERIC RESEARCH LABORATORY

Background

The Earth's climate is modulated by Land-Air-Ocean interactions through Geosphere-Biosphere-Atmospheric processes. These interactive forces regulate equilibrium in the weather and climate. Indiscriminate land use practices, fossil fuel burning, increased vehicular traffic, loss of vegetation cover, etc. are leading to exert changes in the radiative forcing reaching the Earth's surface.

The temporal and spatial scales of changes in the Earth's climate, result in changes of natural cycles of monsoon, vagaries in the form of natural disasters, increased temperatures on surface and oceans, loss of soil moisture, decrease in the extent of snow/glaciers, changes in plant productivity etc. Cumulatively these inflict irrecoverable changes to the climate. Realizing the importance of temporal and spatial scales in Geospheric and Biospheric exchange processes, Indian Space Research Organization (ISRO) during the 11th year plan (FYP), focused its objectives mainly on addressing large-scale issues that contribute to the overall understanding of parameters responsible for our climate change.

Anantapur located in Southeast India represents a very dry semi-arid, rain shadow and continental region of Rayalaseema, Andhra Pradesh, India. This region receives very little rain fall and the average annual rain fall is above the order of 450mm. Within a 50 km radius, this region is surrounded by a number of cement plants, lime kilns, slab polishing and brick making units. No region in the country receives more varied meteorological phenomena than Anantapur (Andhra Pradesh) and its vicinity.

In view of the regional importance ISRO, Bangalore selected S.K. University, Department of Physics, Anantapur as a Nodal Centre and extended all infrastructure and research facilities worth of 8 crores with the following objectives in various ISRO-GBP activities:

1) Aerosol Radiative Forcing: On a periodic basis – is contemplated through the establishment of Multi Wave Radiometer (MWR) network and their assimilation into numerical weather forecasting efforts.

2) *Atmospheric Trace Gases Composition and transport*. This programme envisages to apportion the sources and sinks of the trace gases and their residence time of transporting to other regions and to identify ecological hotspots.

3) *Atmospheric Dust Composition and Transport.* This programme aims to establish aerosols dust composition observatory network and the transport of atmospheric dust from the continental and extra-continental regions to understand on the intra-annual variability of our atmospheric composition and the possible role of dust in regulating radiative forcing.

4) *Atmospheric Boundary Layer Characterization:* This aims to establish boundary layer Lidars surveys.

The Context

There is a growing need for scientists and engineers with advanced training in the Atmospheric sciences. In particular, there is a need for society to understand and respond to problems related to weather, climate, atmospheric hazards from natural and human sources (local and global pollution, volcanic clouds, etc.), and the hydrological cycle. Powerful new research tools for addressing these problems, such as satellite remote sensors and multi-scale atmospheric computer models, require graduate-level /research training in the atmospheric sciences for their effective use. The University collaborated with ISRO in this regard, which stands as the unique model to further knowledge and research work.

The Practice

The data generated from the Weather station has been provided to the students of the University to carry out their research work (M.Phil./ Ph.D./ Projects etc.,). Staff and students of the University are allowed to involve in the training programmes, internships and fellowships, and project works offered by Atmospheric Aerosol Research Laboratory. It also paves way to explore the possibilities of research between the ongoing ISRO Research Programmes of Atmospheric Science at the University and Indian Meteorological Department.

Evidence of Success

The evolution of projects under ISRO-GBP presents the saga of nearly two decades of collective national team work, which stood the test of time to become benchmark in climate science endeavours. About 60 publications have emerged in front line, peer reviewed, impact factor journals. The candidates who pursued research under these programmes and obtained their Ph.Ds are settled in different countries such as Japan, South Africa, China, South Korea and Twain as research scientists and faculty members. Eight candidates got Ph.D. degrees and three M.Phils in the research activities promoted under AARL, as detailed below.

Outcome of the project to society

The aerosol science program under ISRO GBP has completed around one and half decades and has made significant contributions on this area which is evident from the large number of scientific publications came out of these programs. This program has contributed significantly in quantification of the climate implications of the elevated atmospheric warming by absorbing aerosols, Implication of long-term trend in aerosol loading, investigations on aerosol-cloud interaction and indirect radiative forcing of aerosols at Anantapur. These results are highly essential in forecasting of weather in this region.

The data generated from the instruments may be extended to the students of the University to carry out their research work (M.Phil./Ph.D./Projects etc.,). Staff and students of the University may be allowed to involve in the training programs, internships and fellowships, project works offered by Aerosol & Atmospheric Research Laboratory. Our interests extend to air quality and the relationships between the changing climate and airborne pollutants. Ultimately, our research is aimed at reducing the scientific uncertainties related to climate change. This will help deepen our understanding and produce more applicable results on the feedback mechanisms between atmospheric processes and natural ecosystems.

Research Projects Ongoing: 9 crores 13 Lakhs 83 Thousand rupees

S. No	Title of the projects	Funding Agency	Amount (in lakhs)	Completed/ Ongoing
1	Studies of regional features of atmospheric aerosols at Anantapur using Multi wavelength Solar Radiometer.	ISRO-GBP Bangalore	20.00	Completed
2	Air Space Polluants and Environment	ISRO Bangalore	85.00	Completed
3	Studies of regional features of radiative forcing over land due to black carbon aerosols at Anantapur, Andhra Pradesh.	DST New Delhi	25.00	Completed
4	Physical and optical characterization of aerosols over Rayalaseema region.	ISRO-GBP (ARFI) Bangalore	274.40	Ongoing
5	Measurement of surface ozone and its precursor gases in Anantapur, a semi-arid region	ISRO-GBP (AT-CTM) Bangalore	325.53	Ongoing
6	Observational study on atmospheric boundary layer over a semi-arid zone at Anantapur (A.P.) using PROWNAM data	ISRO - PROWNAM Bangalore	25.00	Completed
7	Characterization of atmospheric boundary layer parameters over a semi-arid zone at Anantapur, Andhra Pradesh	ISRO-GBP (NOBLE) Bangalore	313.90	Ongoing

Research Staff:

At present One Research Scientist, Two Senior Research Fellows, Four Junior Research Fellows, Two Project Fellows and One Field Assistant are working in Aerosol & Atmospheric Research Laboratory, S.K. University, Anantapur.

Aerosol and Atmospheric Research Laboratory research programs

ISRO-GBP (ARFI) PROJECT

TITLE: Physical and optical properties of Atmospheric Aerosols in Rayalaseema region

SCIENTIFIC OBJECTIVES:

a. To study the temporal and spectral variations of Aerosol Optical Depths.
b. To estimate size distribution and total mass concentration of near surface aerosols.
c. To study the diurnal, seasonal and annual variation of black carbon aerosol concentrations at Anantapur.
d. To estimate the impact of regional black carbon on radiative forcing.
e. To study the effect of changes of wind, temperature, RH and rainfall on aerosol properties.

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ISRO-GBP (AT-CTM) PROJECT

TITLE: Measurement of surface ozone and its Precursors gases over semi-arid zone at Anantapur

SCIENTIFIC OBJECTIVES:

a. To measure regional levels of surface ozone and its precursors over a semi arid region at Anantapur in India.
b. To study temporal and spatial variations of surface ozone and its precursors.
c. To study the diurnal and seasonal variations in the concentrations of surface ozone and its precursors at Anantapur.
d. To compare and contrast the characteristics of surface ozone and its precursors with different regions.
e. To study the effects of changes in wind speed, wind direction temperature and Relative Humidity (RH) on surface ozone and its precursors at semi arid zone.
f. To study their impacts on the regional environment and climate.

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ISRO-GBP (NOBLE) PROJECT

TITLE: Characterization of atmospheric boundary layer parameters over a semi-arid zone at Anantapur, Andhra Pradesh

SCIENTIFIC OBJECTIVES:

a. To study the vertical structure and thermodynamics of the lower atmosphere using GPS sonde.
b. The variation of Atmospheric Boundary layer (ABL) and its depth in the semi arid region.
c. To understand the thermodynamics of convective boundary layer evolution especially during pre-monsoon and summer seasons.
d. Variation of Mixed Layer over the region.
e. Understanding the nature of the turbulence in ABL that transport heat and moisture near surface to the upper atmosphere.

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ISRO-PROWNAM

PROJECT TITLE: Observational study on atmospheric boundary layer over a semi-arid zone at Anantapur (A.P.) using PROWNAM data.

SCIENTIFIC OBJECTIVES:

a. To study diurnal, monthly and seasonal variations in various surface meteorological parameters obtained from MBLM station.
b. To understand the intra and inter annual variations in different meteorological parameters.
c. To observe the rainfall pattern due to southwest and northeast monsoons prevailing in this region.
d. To study the impact of local prevailing meteorology on optical properties and size distribution of ambient aerosols monitored from collocated instruments.
e. To infer soil moisture and soil temperature status at Anantapur.
f. To study the vertical structure and thermodynamics of the lower atmosphere using GPS sonde data.

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EXISTING INSTRUMENTS & FACILITIES

Instruments	Measurements
Instruments related to optical and physical properties of aerosol	
Multi-Wavelength Radiometer (MWR)	Columnar AOD at 10 wavelengths (UV through Near IR), retrieved columnar size distributions.
Quartz Crystal Microbalance	Mass size distribution & Total mass concentration of composite aerosols (0.05 to 25 μm)
High Volume Sampler	To measure the suspended particulates, which are respirable particles (particle ≤10 microns) in ambient air with a flow rate of 1.13 m^3/min
Aethalometer	Mass concentration of BC aerosols
Nephelometer	Total & back scatter coefficients and estimates SSA.
Microtops II Sunphotometer	Measures Spectral Optical depth at different channels.
Instruments related to surface trace gases monitoring	
CO, O_3, SO_2, NOx, CH_4 and Non-Methane Hydrocarbon Analysers	To measure the concentration of atmospheric gases.
Instruments related to surface boundary layer and meteorological measurements	
Net Radiometer (Pyranometer & pyrgeo meter)	It measures Downward and Upward solar radiation fluxes
Automatic Weather Station	Consist of Wind speed, Wind direction, Relative humidity, Air temperature, Atmospheric pressure, Rainfall, Total solar radiation and Net radiation sensors
Mini Boundary Layer Mast	To measure meteorological parameter at different altitudes.
Sonic Anemometer	To measure the wind velocity, wind components, wind direction and Temperature
Doppler sodar	To measure the vertical profiles of wind speed and direction, vertical motion, turbulence and thermal structure in the lower part of the troposphere.

Collaborative Ventures:

Collaborative work is carriedf out with the following Institutions:

SPL, Trivandrum	IISc, Bangalore	Durban Univesrity, Durbanm South Africa
PRL, Ahmedabad	MoES, New Delhi	Hokkaido National University, Sapparo, Japan
NPL, New Delhi	NRSC, Hyderabad	Nanjing University, China
IIT, Kanpur	IITM, Pune	Qatar National University, Qatar

Participation in International and National Programs:

- Arabian Sea Monsoon Experiment (ARMEX)
- ISRO-GBP Land Campaign-I over South Indian Region
- ISRO-GBP Land Campaign-II over North Indian Region
- ICARB
- ICARB-W

Countries Visited

- Prof. R. Ramakrishna Reddy visited University of KwaZulu Natal, South Africa during 25th-27th September 2013.
- Prof. R. Ramakrishna Reddy visited Rutgers University, USA during May 2014 to Aug 2014.
- Prof. K. Rama Gopal participated in "International Conference of Asia Oceania Geosciences Society (AOGS-2014)" held in the cosmopolitan district of Sapporo, Japan, during July 28-Aug 01, 2014.
- Dr. B. Suresh Kumar Reddy as JSPS Post Doc Fellow, Hokkaido National University, Sapparo, Japan from 2012 till date.
- Dr. G. Balakrishnaiah visited Taiwan as a post-doctoral fellow during 2011-2012 at Institute of Environmental Engineering, National Chiao Tung University, Taiwan.
- Dr. M. Penchal Reddy visited South Korea and China as a post-doctoral scientist during 2012-14 and Centre for Advanced material, Qatar University, Doha, Qatar from 2014-till date.
- Dr. K. Raghavendra Kumar visited South Africa as a post-doctoral scientist during 2013- 14 and Assistant professor at School of Atmospheric Physics, Nanjing University, Jiangsu, China from 2015-till date.
- Dr. A.P. Linga Swamy as a Post Doctoral Fellow, Environment Research Institute, Shandong University, Jinan, China from 2016- till date.
- Dr. K. Raja Obul Reddy as a Post Doctoral Fellow, Zhejiang University, China from 2017-till date.

Participation in Expedition in international level over sea

Dr. G. Balakrishnaiah and Dr. K. Narasimhulu Dr. K. Raghavendra Kumar participated in ORV Sagar Kanya Cruise (SK 254) as a part of Integrated Campaign for Aerosol and Radiative Budget (ICARB) Programme from December 27, 2009 to January 30, 2010 over Bay of Bengal. The track of the ship cruise was designed in such a way to travel into the oncoming wind and away from it alternatively so that the issue of potential long-range transport from different source regions can be examined over these oceanic regions.

RESEARCH PUBLICATIONS (related to Atmospheric Science : 89)

1. Spatio-temporal evolution of dry and wet spells based on scPDSI index over Andhra Pradesh in Southern peninsular India. Advances in Space Research, 77, 264–280, (2026).
2. Validation of Net Radiometer Fluxes with Estimated CERES Satellite Fluxes over a Semi-Arid Region in Southern Peninsular India. International Journal of Research and Analytical Reviews, 1, 13, 6-10, (2026).
3. Long term (2000-2022) variation of aerosol direct radiative forcing retrieved from CERES satellite over a semi-arid region in southern peninsular India. International Journal of Research and Analytical Reviews 1, 13, 121-126, (2026).
4. The effect of local pollution and transport dust on near surface aerosol properties over a semi-arid station from ground and satellite observations. Air Quality, Atmosphere & Health 17:541–558, (2024).
5. Classifying aerosol type using in situ and satellite observations over a semi-arid station, Anantapur, from southern peninsular India. Advances in Space Research.72, 4, 1109-1122, (2023).

6. Measurements of aerosol optical depth and equivalent black carbon aerosols over a semi-arid station in Southern India. Environment, Development and Sustainability, 25, 7903-7925, (2023).
7. Long-term (2001–2020) trend analysis of temperature and rainfall and drought characteristics by in situ measurements at a tropical semi-arid station from southern peninsular India. International Journal of Climatology 42, 16, 8928-8949, (2022).
8. An assessment of the impact of Indian summer monsoon droughts on atmospheric aerosols and associated radiative forcing at a semi-arid station in peninsular India. Science of the Total Environment,813 (2022) 152683, (2022).
9. Diurnal, seasonal and vertical distribution of carbon monoxide levels and their potential sources over a semi-arid region, India. Atmosfera. 35(1), 165-178, (2022).
10. The impact of lockdown on black carbon mass concentrations over a semi-arid region in Southern India: Ground observation and model simulations. Aerosol and Air Quality Research, 21(11)210101, (2021).
11. Characteristics of atmospheric surface layer 1 during winter season over Anantapur (14.62° N, 77.65° E), a semi-arid location in peninsular India. Journal of Atmospheric and Solar–Terrestrial Physics. (216) 1055, (2021).
12. Impact of aerosols on surface ozone during COVID-19 pandemic in southern India: A multi-instrumental approach from ground and satellite observations, and model simulations. Journal of Atmospheric and Solar–Terrestrial Physics 212,105491, (2021).
13. Perturbations of Atmospheric Surface Layer Characteristics during the Annular Solar Eclipse on 26 December 2019 over a Semi-Arid Region Anantapur in Southern India. Journal of Atmospheric and Solar-Terrestrial Physics, 211:105467, (2020).
14. Long-term (2008-2017) analysis of atmospheric composite aerosol and black carbon radiative forcing over a semi-arid region in southern India: Model results and ground measurement. Atmospheric Environment, 240,117840, (2020).
15. Chemical characterization and source identification of particulate matter at Bellary, Karnakata over Southern India Region. Journal of Atmospheric and Solar-Terrestrial Physics, 211, 105467, (2020).
16. Decadal Climatology of the Spatial and Vertical Distributions of tropospheric Aerosol over the Arabian Sea Based on Satellite Observations. International Journal of Climatology 40 (10): 4676–89, (2020).
17. Carbonaceous aerosol emission reduction over Shandong province and the impact of aerosol pollution control as observed from synthetic satellite data. Atmospheric Environment (222) 117150, (2020).
18. Investigation of black carbon aerosols and their characteristics over tropical urban and semi-arid rural environments in peninsular India. Journal of Atmospheric and Solar-Terrestrial Physics (167) 48 – 57, (2018).
19. Seasonal analysis of near surface and vertical distribution of aerosols over a semi - arid station Anantapur, in India. Atmospheric Research (184) 77 – 87, (2017).
20. Measurements of scattering and absorption properties of surface aerosols at a semi-arid site, Anantapur. Atmospheric Research (183) 84 – 93, (2017).
21. Measurements of black carbon aerosols and their associated absorption characteristics at Anantapur, Andhra Pradesh, India. Journal of Neutral Atmosphere, 1, 03-20. ISSN 2523-1812, (2017).

15. Investigation of black carbon aerosols and their characteristics over tropical urban and semi-arid rural environments in peninsular India. J. Atmos.Solar-Terrestr. Phys. (2017)
16. Measurements of black carbon content and its absorption characteristics at Anantapur, Andhra Pradesh. Journal of Neutral Atmosphere. 1, 3-20, (2017)
17. Observations of trace gases, photolysis rate coefficients and model simulations over semi-arid region, India. Atmospheric Environment, 158, 246-258, (2017).
18. Seasonal analysis of near surface and vertical distribution of aerosols over a semi - arid station Anantapur, in India. Atmospheric Research, 184,77–87, (2017).
19. Measurements of scattering and absorption properties of surface aerosols at a semi-arid site, Anantapur. Atmospheric Research, 183, 84–93, (2017).
20. Direct radiative forcing properties of atmospheric aerosols over semi-arid region, Anantapur in India. Science of the total Environment 566-567, 1002-1013, (2016).
21. Regional trends of aerosol optical depth and their impact on cloud properties over Southern India using MODIS data. Journal of Atmospheric and solar terrestrial physics 146, 38-48, (2016).
22. Evaluation of clearness and diffuse index at a semi-arid station (Anantapur) using estimated global and diffuse solar radiation. International Journal of Advanced Earth Science and Engineering 5(1), 347-363), (2016).
23. Long term (2007 - 2013) observations of columnar aerosol optical properties and retrieved size distributions over Anantapur, India using Multi Wavelength solar Radiometer. Atmospheric Environment, 142, 238-250, (2016).
24. Estimation of surface ozone photolysis rates and UV irradiance using TUV model over a semi-arid station, Anantapur. Indian Aerosol Science and Technology Association, *ISSN 09714510 Vol.22, Issue,1&2, 328-331.(2016).*
25. Study on cloud fraction and AOD retrieved from different satellites and its impact on ozone. Indian Aerosol Science and Technology Association, *ISSN 09714510 Vol.22, Issue,1&2, 459-462. (2016).*
26. Influence of Surface Layer Fluxes and Energy on Near Surface Aerosols over a Semi-Arid Region Anantapur (14.62°N, 77.65°E), During Winter Period. Indian Aerosol Science and Technology Association, *ISSN 09714510 Vol.22, Issue,1&2, 725-728.(2016).*
27. Seasonal variations of surface sensible and latent heat fluxes tendency over semi-arid region at Anantapur, India. Indian Aerosol Science and Technology Association, *ISSN 09714510, Vol.22, Issue,1&2, 721-724.(2016).*
28. Correlation between aerosol optical depth and angstrom wavelength exponent with meteorological parameters. Indian Aerosol Science and Technology Association, *ISSN 09714510, Vol.22, Issue,1&2, 463-467.(2016).*
29. Characteristics of aerosol optical depth over a semi- arid region, Anantapur (14.62°, 77.65 °), India. Indian Aerosol Science and Technology Association, *ISSN 09714510, Vol.22, Issue,1&2, 475-479.(2016).*
30. Classification of aerosols on the basis of optical measurements at a semi-arid station, Anantapur, A.P. Indian Aerosol Science and Technology Association, *ISSN 09714510, Vol.22, Issue,1&2, 470-474. (2016).*

31. Multiyear fluctuations of aerosol optical properties over a semi-arid Region in southern India since 2004 as seen in the MODIS data. Indian Aerosol Science and Technology Association, *ISSN 09714510, Vol.22, Issue,1&2, 500-503. (2016).*
32. Columnar-integrated aerosol optical properties and classification of different aerosol types over the semi-arid region, Anantapur. Science of the Total Environment, 527-528, 507 (2015).
33. Long-term (2003–2013) climatological trends and variations in aerosol optical parameters retrieved from MODIS over three stations in South Africa, Atmospheric Environment, 95,400-408,(2014).
34. In-situ measurements of atmospheric aerosols by using Integrating Nephelometer over a semi-arid station, southern India, Atmospheric Environment, 86, 228-240, (2014).
35. Seasonal heterogeneity in ozone and its precursors (NOx) by in-situ and model observations on semi-arid station in Anantapur (AP), South India, Atmospheric Environment, 84, 294-306, (2014).
36. Identification and classification of different aerosol types over a subtropical rural site in Mpumalanga, South Africa: seasonal variations as retrieved from the AERONET Sun photometer, Aerosol Air Quality Research 14, 108-123, (2014).
37. An estimation of aerosol size over semi-arid region, Anantapur, India, Indian Aerosol Science and Technology Association ISSN 0971-4570 (2014).
38. Variability of aerosol intensive properties near the surface during winter and summer, Indian Aerosol Science and Technology Association ISSN 0971-4570 (2014).
39. The observation of black carbon concentration over semi-arid region Anantapur in India. Indian Aerosol Science and Technology Association, ISSN 0971-4570 (2014).
40. Inter-comparison of satellite retrieved aerosol optical depth with ground based measurement over semi-arid region, southern India. Indian Aerosol Science and Technology Association ISSN 0971-4570 (2014).
41. Inferring wavelength dependence of AOD and Angstrom exponent over a sub-tropical station in South Africa using AERONET data: Influence of meteorology, long-range transport and curvature effect, Science of the Total Environment, 461-462, 397-408, (2013).
42. Remote sensing of atmospheric aerosols in South Africa, SPIE, 10.117/2.1201306.004893, (2013).
43. Ship-Borne measurements of columnar and surface aerosol loading over the Bay of Bengal during W-ICARB campaign: Role of Air mass transport, latitudinal and longitudinal gradients, Aerosol and Air Quality Research, 13, 818-837, (2013).
44. Ground-Based in-situ measurements of near surface aerosol mass concentration over Anantapur: Heterogeneity in source impacts, Advances in Atmospheric Sciences 30, 235-246, (2013).
45. Latitudinal variations of aerosols in the MABL over Bay of Bengal, IEEE 978-1-4673-2272-0/12 (2013).
46. Spatio-temporal variations in aerosol optical and could parameters over Southern India retried from MODIS satellite data Atmospheric Environment 47, 435-445 (2012).

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48. Analysis of diurnal and seasonal behavior of surface ozone and its precursors (NOx) at a semi-arid rural site in Southern India Aerosol and Air Quality Research 12, 1081-1094 (2012).
49. Estimation of clear sky shortwave direct aerosol radiative forcing from radiative transfer models over South India Indian Aerosol Science and Technology Association ISSN 0971-4570 (2012).
50. Diurnal and seasonal variation of Black carbon, size parameter as mass concentration of surface aerosols over Anantapur, at a semi-arid region Indian Aerosol Science and Technology Association ISSN 0971-4570 (2012).
51. Scattering properties of surface aerosols over semi arid region in the Southern India, Indian Aerosol Science and Technology Association ISSN 0971-4570 (2012).
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53. Spatial heterogeneities in aerosol properties over Bay of Bengal inferred from ship-borne and MODIS observations during ICARB-W cruise campaign: Implications to radiative forcing Atmospheric Environment 45, 404-412 (2011).
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56. Characterization of PM, PM10 and PM2.5 mass concentrations at a tropical semi-arid station in Anantapur, India Ind. J. Radio & Space Physics 40, 95-104 (2011).
57. Aerosol climatology over an urban site, Tirupati (India)derived from columnar and surface measurements: First time results obtained from a 30-day campaign J. Atmospheric & Solar Terrestrial Physics Doi:10.1016/j.jastp.2011.03.015 (2011).
58. Anthropogenic impact on the temporal variations of aerosol mass and black carbon concentrations at a tropical semi-arid station in southeastern region of India J. Asian Earth Sciences 42, 1297-1308 (2011).
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60. A study on the variations of optical and physical properties of aerosols over a tropical semi-arid station during grassland fire Atmospheric Research 95, 77-87 (2010).
61. Black carbon aerosol mass concentrations observed over Anantapur, a tropical semi-arid station in southern India Ind. Aerosol Sci. & Tech. Association 19, 65-69 (2010).
62. A study on optical and physical properties of aerosols at a semi-arid urban site, Tirupati during summer season Ind. Aerosol Sci. & Tech. Association 19, 447-453 (2010).
63. Observational studies on the variations in surface ozone concentrations at Anantapur, Southern India. Atmospheric Research 98, 125-139 (2010).

64. Temporal and spectral characteristics of aerosol optical depths in a semi-arid region of southern India Science of the Total Environment 407, 2673-2688 (2009a).
65. Black carbon aerosol mass concentration variation in urban and rural environments of India – a case study. Atmospheric Science Letters Doi:10.1002/asl.206 (2009).
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71. Measurement of CO and SO_2 trace gases in the Southern India during ISRO-GBP Land Campaign –I J. Radio & Space Phys 37, 216-220 (2008).
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77. Wintertime aerosol characteristics over the Indo-Gangetic Plain (IGP): Impacts of local boundary layer processes and long-range transport J. Geophysical Research112, D13205, doi:10.1029/ 2006JD008099(2007).
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80. Aerosol radiative properties in the semi-arid region Ind. Aerosol Sci. & Tech. Associa. 18, 335-338 (2007).
81. Seasonal variation of the surface ozone and its precursor gases during 2001-2003,measured at Anantapur (14.62^{O}N), a semi-arid site in India Atmospheric Research 80, 151 (2006).
82. Measurement of atmospheric parameters during Indian space Research Organization Geosphere Biosphere Programme Land Campaign II at a typical location in the Ganga Basin: Physical and optical properties J. Geophysical Research,111, D23209, doi:10.1029/2006JD007278 (2006).

83. Effects of pollution on plants. Bull. Env. Sci. IV 53 (2006).
84. Winter time Spatial characteristics of Boundary layer aerosols over Peninsular India J. Geophysical Research, 110(2005)
85. Studies on aerosol optical properties over urban and semi-urban environments of Hyderabad and Anantapur J. Quan. Spec. Radia. Trans., 78, 257 (2003).
86. Seasonal and diurnal variations in the levels of NO_x and CO trace gases at Anantapur in Andhra Pradesh Ind. Geophysics Union 6, 163 (2002)
87. Air space pollutants CO and NOx levels Anantapur (semi-arid zone), Andhra Pradesh Ind. Geophysics Union 6, 151 (2002)
88. Spatial variation of Aerosol optical depth over and regions of Anantapur, India. Ind. Aerosol Sci. & Tech. Associa. X, 97 (2002).
89. Studies on the variabilities of NO_x and CO trace gases at university site (A.P.) in India Second Inter. seminar on Analy. Tech. In monitoring the Environment Dec, 18, 250P (2001).

Ph.d Degree awarded : 23

S. No.	Name of the candidate	Topic	Degree	Year
1	K. Narasimhulu	Atmospheric Aerosol Characterization of different Environments in Indian region	Ph.D.	2008
2	L. Siva Sankara Reddy	Variabilities of surface Ozone and its precursor gases in different environments of Indian region	Ph.D.	2008
3	K. Raghavendra Kumar	Experimental studies on characterization of atmospheric aerosols using in-situ and remote sensing techniques	Ph.D.	2010
4	G. Balakrishnaiah	Studies on aerosol climatology over a semi-arid environment and aerosol-cloud interactions using MODIS	Ph.D.	2011
5	B. Suresh Kumar Reddy	Investigations on atmospheric aerosols and trace gases over tropical regions of southern peninsular India	Ph.D.	2011
6	Mahammad Arafath Shaik	Studies on aerosol properties using ground based measurements at semi-arid region: Anantapur	Ph.D.	2014
7	A. Pedda Lingaswamy	Investigations on Trace Gases and Its Inter-Comparison with Near Surface Aerosols along with satellite and Model observations over Semi-Arid Region, India	Ph.D.	2014

8	K. Uma Devi	Studies on regional features of atmospheric aerosols over a tropical semi-arid station in southeastern region of India.	Ph.D.	2015
9	S. Pavan Kumari	Characteristics of spectral aerosol optical depths over semi arid region Anantapur	Ph.D.	2015
10	K. Raja Obul Reddy	Studies on optical properties of atmospheric aerosols and estimation of aerosol direct radiative forcing over a semi arid region.	Ph.D.	2016
11	N. Siva Kumar Reddy	Characterization of atmospheric boundary layer parameters over a semi-arid zone at Anantapur 14.62°N, 77.65°E, Andhra Pradesh.	Ph.D.	2017
12	S. Nazeer Hussain	In-situ and remote sensing measurements of atmospheric aerosols over peninsular India	Ph.D.	2017
13	M. Vasudeva Reddy	Monitoring of atmospheric aerosols at Anantapur (14.62°N, 77.65°E) A.P., India.	Ph.D.	2018
14	V. Koteswara Rao	Association of Solar Energetic Particle (SEP) Events with Sunspot Numbers	Ph.D.	2018
15	P. Ramanjaneya Reddy	Aerosol characteristic over a semi arid environment southern Indian region.	Ph.D.	2018
16	T. Subramanyam	Spectroscopic Studies on Rare Earth Ions (Sm^{3+}, Eu^{3+}, Tb^{3+}) doped Oxy Fluoro Tellurite Glasses for Solid State Lasers	Ph.D.	2019
17	C. Manjunatha	Observational Studies on Atmospheric Aerosol properties and analysis of global solar radiation over semi-arid Region	Ph.D.	2020
18	V. Shalini	Physical, Chemical characterization and source identification of aerosols over a Tropical Indian region	Ph.D.	2020
19	B. Elizabethamma	Study of Ozone and other Trace Gases Distribution over Southern Indian Region	Ph.D.	2020
20	P. Surya Nagi Reddy	Studies on Black carbon mass concentration and its source apportionment over a semi –arid region, AP.	Ph.D.	2022

21	T. Chakradhar Rao	Investigation of tropospheric aerosols over the Arabian Sea: Biogeochemical effects	Ph.D.	2023
22	T. Lokeswara Reddy	Climatological studies on droughts and meteorological parameters over a Semi-arid station in Southern Peninsular India	Ph.D.	2024
23	A. Bhavya Sree	Direct Radiative Forcing and Characteristics of Near-Surface Atmospheric Aerosols over a Semi-Arid Region, Anantapur, A.P.	Ph.D.	2024

Conference / Workshops conducted: 16

1. **National Seminar on Remote Sensing and its applications in natural resources management with special reference to Rayalaseema region in A.P.** State (Sponsored by I.S.R.O., Bangalore) at S.K. University, Anantapur on 11-3-1998.
2. **National Workshop on Interstellar Molecules** (Sponsored by Inter University Centre for Astronomy and Astrophysics and I.S.R.O., Bangalore) at S.K. University, Anantapur during 29th – 31st Oct, 1999.
3. **National Seminar on Atmospheric Science and Spectroscopic Techniques** (Sponsored by I.S.R.O., Bangalore) at S.K. University, Anantapur during 29th & 30th July 2003.
4. **National Seminar on Atmospheric Science** (Sponsored by I.S.R.O. Bangalore) Sri Krishnadevaraya University, Anantapur, during 24-25 February, 2006.
5. **Innovation In Science Pursuit For Inspired Research (INSPIRE) – 2012 (**Sponsored by DST, New Delhi), S.K. University, Anantapur during 9-13 January, 2012.
6. **Two Day National Workshop on Environmental Pollution and Impacts on Public Health and Agriculture** (Sponsored by AP Pollution control board, Andhra Pradesh), S.K. University, Anantapur during 21-22 February, 2012.
7. **Facing Challenges On Climate Change (FCCC)-2012** (Sponsored by ISRO, CSIR, DRDO) S.K. University, Anantapur during 30-31 October, 2012.
8. **National Workshop on Transit of Venus and Related Phenomena (NWTV)-2013** (Sponsored by APCOST, UGC) S.K. University, Anantapur during 2-3March, 2013.
9. **Environmental Pollution and its impact on Regional Climate Change (EPRCC-2016)** (Sponsored by ISRO, MoES, SERB) S.K. University, Anantapur during 11-12 March, 2016
10. **Innovation In Science Pursuit For Inspired Research (INSPIRE) – 2016 (**Sponsored by DST, New Delhi), S.K. University, Anantapur during 24-28 August, 2016.
11. **Innovation In Science Pursuit For Inspired Research (INSPIRE) – 2017 (**Sponsored by DST, New Delhi), S.K. University, Anantapur during 08-12 February, 2017.
12. **Environment and climate change: Issues and challenges (ECCIC-2017)** (Sponsored by ISRO, MoES, SERB, UGC and INSA) S.K. University, Anantapur during 10-11 March, 2017.
13. **Facing Challenges on Environment, Climate change, Agriculture and Human health: National and Regional Scenario (ECAH-2018)** (Sponsored by ISRO, MoES, SERB, UGC and INSA) S.K. University, Anantapur during 27th - 28th January, 2018.
14. **Innovation In Science Pursuit For Inspired Research (INSPIRE) – 2018 (**Sponsored by DST, New Delhi), S.K. University, Anantapur during 09-13 November, 2018.
15. **Innovation In Science Pursuit For Inspired Research (INSPIRE) – 2019 (**Sponsored by DST, New Delhi), S.K. University, Anantapur during 08-12 November, 2019.

16. One day national workshop on **National Information system for Climate and Environment studies (NISCE),** Jointly Organized by National Remote Sensing Centre (NRSC), ISRO, Hyderabad and S.K. University, Anantapur on 28th January 2020.

Books Published: International - 7

1. **Identification of different aerosol types over a semi-arid location in southern peninsular India retrieved from the CALIPSO.** Raja Obul Reddy Kalluri, Rama Gopal Kotalo. Book chapter in Atmospheric Remote Sensing, Elsevier, 139-156. 2023.
2. **Atmospheric aerosols characterization in different regions of India.** K. Narashimalu, R. Ramakrishna Reddy and K. Rama Gopal, Scholars Press, ISBN NO: 978-613-8-83552-3, 2022.
3. **Characteristics of Black Corbon aerosols and it Radiative effects**. K Raja Obul Reddy, G. Balakrishnaiah, K. Rama Gopal. Scholars Press. ISBN: 978-613-8-95072-1, 2021.
4. **Atmospheric Aerosols: Optical Characteristics and Radiative Effects**. K Raja Obul Reddy, G. Balakrishnaiah, K. Rama Gopal. Scholars Press. ISBN: 978 – 620-2-3-31124-3, 2018.
5. **Environmental Pollution and its Effects** Chapter in "Pollution Plant Health and Biotechnology" G. Balakrishnaiah and K. Rama Gopal, Discovery Publishing House Pvt. Ltd., New Delhi, ISBN: 978-93-86841-63-6, 2018.
6. **Studies on the surface ozone at Anantapur (Andhra Pradesh).** Dr. L. Siva Sankara Reddy and Dr. K. Rama Gopal, Roshan Publicaitons, Vishakapatnam, ISBN: 978-93-92257-53-7, 2016.
7. **Characterization of near surface aerosols at a semi-arid station.** K. Narashimalu, R. Ramakrishna Reddy and K. Rama Gopal, Lambert Academic publications, ISBN NO: 978-3-659-80910-1, 2015.
8. **Characterization of near surface aerosols at a semi-arid station**. G. Balakrishnaiah, R. Ramakrishna Reddy and K. Rama Gopal Lambert Academic publications, ISBN NO: 978-3-659-80910-1, 2015.
9. **Aerosol climatology and aerosol cloud interaction using MODIS,** Characterization and Measurement Techniques, Gugamsetty Balakrishnaiah, Rajuru Ramakrishna Reddy, Kotalo Rama Gopal, *Scholars' press*, ISBN No.13:978-363970600, 2014.
10. **Atmospheric Aerosol: Measurement and Characterization Techniques,** Remote Sensing and In-situ Principles and Methodologies, Raghavendra Kumar Kanike, Rajuru Ramakrishna Reddy, Kotalo Rama Gopal, *Lambert Academic Publishing, ISBN-978-3-659-35659-9*, 2013.
11. **Tropospheric Ozone: Measurement and Characterization Techniques**, In-situ Principles and Methodologies, Boreddy Suresh Kumar Reddy, Rajuru Ramakrishna Reddy, Kotalo Rama Gopal, *Scholars' press*, ISBN No.13:978-3639517187, 2013.

Honours/Awards Received

Prof. R. Ramakrishna Reddy

- UGC Research award (UGC, New Delhi), 1999-2002
- Andhra Pradesh State Govt., Best Teacher Award, 2005
- Bharat Jyothi Award, International Friendship society (New Delhi), 2005
- Best Scientist award, National Environmental Science Academy (New Delhi), 2005
- MARQUIS WHO'S WHO in Science and Engineering (New Jersey, USA), 2006-07.

- Fellowship of the Year award, National Environmental Science Academy (NESA) (New Delhi), 2007
- UGC-BSR Faculty Fellow 2012, UGC, New Delhi

Dr. K. Rama Gopal

- Scientist of the year Award 2009, NESA, New Delhi
- Dist Janmabhumi Gold Medal Award by Andhra Pradesh Government, Hyderabad
- Eminent Scientist of the Year Award-2015, by National Environmental Science Academy (NESA), New Delhi.
- Outstanding Scientist Award-2016, by Venus International Foundation, Chennai
- Outstanding scientist award-2016, by Venus International Foundation, Chennai.
- Distinguished Scientist Award, 2020 from VD GOOD Technology Factory, Coimbatore, India.
- Andhra Pradesh State Best Teacher Award 2023, by AP state Government, India.

Dr. K. Narasimhulu

- Jr. Scientist of the year award from National Environmental Science Academy, New Delhi for the year 2007.

Dr. L. Siva Sanakara Reddy

- Fellow of Chinese Academy of Sciences.

Dr. K. Raghavendra Kumar

- Jr. Scientist of the year award from National Environmental Science Academy, New Delhi for the year 2011.
- Young Scientist Award from Dr. K. V. Rao Scientific Society, Hyderabad for the year 2009.

Dr. G. Balakrishnaiah

- Jr. Scientist of the year award from National Environmental Science Academy, New Delhi for the year 2015.

Dr. B. Suresh Kumar Reddy

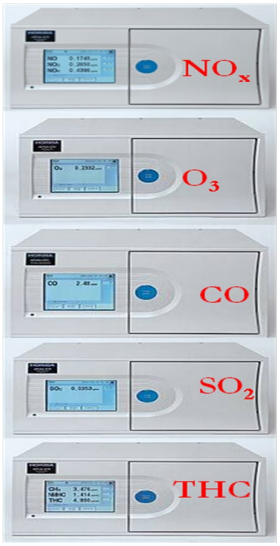
- JSPS Post Doctoral Fellow from Japan for the year 2013-2017

Dr. M. Penchal Reddy

- Fellow of Chinese Academy of Sciences.

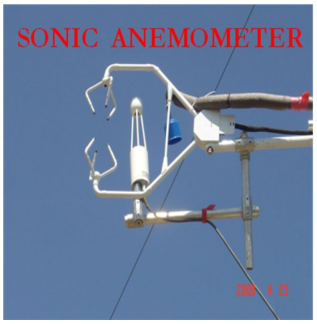
Instruments available in Aerosol & Atmospheric Research Laboratory, Department of Physics, S.K. University

GAS ANALYZERS



Nephelometer

Automatic weather Station



Participation in International and National multi-Institutional research and observational Programs:

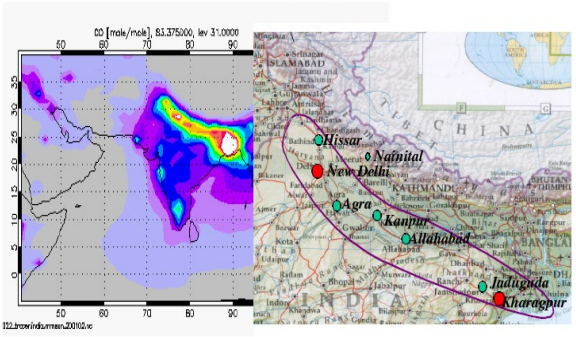
ISRO GBP Land Campaign I - Feb. 2004

Routes
For Feb. 2004

- NPL & CRRI
- PRL
- IITM
- NRSA
- AU
- IISc & AntpU
- SPL

Distance Travelled ~ 15000 km
Number of Stations ~ 150
Number of Participants ~ 50

ISRO GBP Land Campaign II – Dec. 2004



17 Indian Institutes and Universities participated