Dr. K. Rajeev
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Head, Microwave and Boundary Layer Physics (MBLP)
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Education *:* B. Sc (Physics), University of Kerala, 1985
M.Sc (Physics), University of Kerala, 1987
Ph.D (Physics), University of Kerala, 1993

Areas of Specialization: **Atmospheric Science:** Atmospheric Aerosols, Clouds, Radiation Transfer, Boundary Layer Physics, Atmospheric Dynamics, Climate Change, Satellite and Lidar Remote Sensing & Inversion Methods.

Post-Doctoral Research: Post-Doctoral Research Physicist,
Centre for Clouds, Chemistry and Climate (C^4)
Scripps Institution of Oceanography, University of California, San Diego
USA (May 1998 - Dec.1999)

Professional Training*:* Meteorologist Training at India Meteorological Department Pune during Oct.1992-Sept.1993

Research Publications: Refereed impact factor Journals: 68
Proceedings/Books: 44

Number of Invited Papers (Refereed Journals): 2

Number of Invited Lectures in National/International Conferences: 28

Citation for Publications:
Total number of citations for publications: 1519

Membership in Professional bodies
Indian Aerosol Science and Technology Association (IASTA)
Indian Meteorological Society (IMS)
Kerala Academy of Sciences (KAS)
COSPAR Associate

Programs and Projects
Principal Scientist, IGBP-NOBLE (Network of Observatories for Boundary Layer Experiments)
Principal Investigator, Indo-French Megha-Tropiques Science Project– "Aerosol and Cloud Radiative Forcing using MT/ScaRaB"

Major Additional Responsibilities handled

1. Member, Research Advisory Committee, Indian Institute of Geomagnetism (Dept. of Science and Tech., Govt. of India), Mumbai
2. Member, Critical Design Review (CDR) Committee for Chandrayaan-2 Science Payloads
3. Member, Committee for identification of microgravity experiments in Gaganyaan

4. Chair, Academic Committee, SPL, VSSC
5. Member, Academic Committee, VSSC
6. Recognized Research Guide, University of Kerala & CUSAT
7. Member, Project Implementation Committee, ST Radar (DST, Govt. of India), Calcutta University.
8. Member, Review committee for ISRO's Space Science Promotion Scheme at Universities.
9. Member, Scientific Steering Committee for Atmospheric Research Testbed at Central India, Indian Institute of Tropical Meteorology (IITM), Pune (Ministry of Earth Science - MoES)
10. Chair, Steering Committee for setting up High Altitude Cloud Physics Observatory (HACPO) at Munnar (National Centre for Earth Science Studies-NCESS, MoES).
11. Member, Space Generation Task Group (SGTG), ISRO (1999-2002)
12. Ph.D Thesis Examiner: Gujarat University, Ahmedabad; S. V. University, Tirupati; Mohanlal Sukhadia University, Udaipur, Cochin University of Science and Technology.
13. Invited Faculty, Indian Institute of Space Science and Technology, Trivandrum (2009).
14. Invited Faculty, UGC-Academic Staff College, Kerala University
15. Invited Faculty, UGC-Academic Staff College, Cochin University of Science & Technology
16. Academic Auditor, Department of Earth and Space Sciences, IIST, Trivandrum (2012)

Research Guidance (Ph.D Degree)

Ph.D. Degree Awarded: 4

i) S. Meenu, "*Studies on the Regional Distribution of Clouds over the Indian Region (30°S-30°N; 40°E-105°E) and its Association with the Atmospheric Dynamical Features using Remote Sensing Data*", Kerala University, 2011.

ii) Anish Kumar M Nair: "*Studies on the horizontal and vertical distribution of clouds and their impact on energetics of the Atmosphere over the Indian Region"*, CUSAT, 2014.

iii) Manoj Kumar Mishra, "*Studies on the Vertical Distribution of Atmospheric Aerosols and its Radiative Impact over a Tropical Coastal Station, Trivandrum",* Kerala University, 2017

iv) Ashok Kumar Gupta, *"Temporal Variations of the Horizontal and Vertical Distributions of Clouds over the Tropics and their Radiative Effects"*, CUSAT, January, 2019.

Reviewer of Journals

Geophysical Research Letters, Journal of Geophysical Research - Atmospheres, Remote Sensing of Environment, Quarterly Journal of Royal Meteorological Society. Journal of Atmospheric and Solar Terrestrial Physics, Atmospheric Research, Atmospheric Environment, Applied Optics, IEEE Tran. Geosci and Rem Sens., Atmospheric Research, Atmospheric Chemistry and Physics, Journal of Atmospheric and Oceanic Technology, Journal of Earth System Science, Advances in Space Research, Current Science, Indian Journal of Physics, Indian Journal of Radio and Space Physics.

Acclamations:

NASA Press Release

NASA Earth Observatory (NASA EOS) did a press release as "**breaking news"** (No. 01-80) on 16 August 2001, titled "NASA sensor and Field experiment show aerosols cool surface and warm atmosphere" on the paper entitled "Direct observations of clear-sky aerosol radiative forcing from space during the Indian Ocean Experiment", by K. Rajeev and V. Ramanathan, Journal of Geophysical Research, 106, 17,221-17,236, 2001.

http://earthobservatory.nasa.gov/Newsroom/NasaNews/2001/200108135050.html.

Best Paper Awards

Indian Aerosol Science and Technology Association (IASTA-2007) for the paper "A case study on the impact of atmospheric aerosols in modifying the regional meteorology"

National Space Science Symposium (NSSS-2008) for the paper "Thin semitransparent cirrus clouds observed using KALPANA-1 VHRR and its intercomparison with the Lidar-derived cirrus optical depth"

National Space Science Symposium (NSSS-2014) for the paper "Orographically modulated mesoscale circulation and atmospheric boundary layer characteristics over Shillong (25.60°N, 91.90°E)".

International Tropical Meteorology Symposium (INTROMET-2014) for the paper "Dependence of the Cloud Vertical Distribution on Sea Surface Temperature and Tropospheric Dynamics - New Insights".

Organization of Conferences/Symposia

Co-Convener, PS-1 Session, National Space Science Symposium, 2010.

Co-Chair, Science Program Committee, International Conf. on Climate Change and Disaster Management (i3DCM), Kovalam, Jan. 2015

Convener, PS-1 Session, National Space Science Symposium, Feb. 2016

Member Secretary, Local Organizing Committee, National Space Science Symposium, 2016

Member, Program Committee, SPIE Asia Pacific Conference – Lidar Remote Sensing, New Delhi, 4-7 April 2016.

Selected Scientific Contributions

Clouds and Deep Convection

1. Established the climatology of total and deep convective clouds over the Indian region (mainland and oceans) using long-term satellite radiance data. This study revealed several unique meteorological features over this region, including the persistent occurrence of double ITCZ characteristics over the Indian Ocean during November-December period [*JGR, 2007*].
2. First-time quantification of vertical distribution of deep convective clouds over the Indian mainland and surrounding oceans using multi-satellite observations. This study showed that the deep connective cloud top is higher over Northern Bay of Bengal than that over the surrounding regions during the summer monsoon period and significantly influences the tropical tropopause layer [*JGR, 2010*].
3. For the first time, quantitative estimates of the regional distribution of semi-transparent cirrus clouds and its annual variation were made over the Indian region using Kalpana-1-VHRR observations [*J. Atmos. Sol. Phys., 2010*] and delineated the seasonal evolution of their 3-dimensional distribution by combining with spaceborne LIdar (CALIPSO) and estimated its abundance above the tropical tropopause – a critical input for cloud radiative forcing and stratosphere-troposphere exchange [*J. Atmos. Sol. Terr. Phys., 2011*].
4. Discovered the 'pool of inhibited cloudiness' over the Bay of Bengal during the summer monsoon season. Mechanism for its genesis from a mini-circulation that is embedded in the large-scale monsoon circulation was hypothesized by integrating all the available observations (such as surface wind divergence from spaceborne scatterometers and 3-dimensional distribution of clouds and atmospheric heating) [*Ann. Geo., 2011; MAP, 2017*].
5. Quantification of the descending nature of tropical cirrus clouds showed that over 20% of tropical cirrus descend by >3 km, influencing their longwave radiative forcing by 5-15 Wm^{-2} [*JGR, 2011*].
6. First direct observations on the role of sea surface temperature (SST) and atmospheric thermodynamics on the vertical development of clouds have been made by combining 5-years of observations from spaceborne cloud radar (CloudSat), microwave imager and reanalysis data. This study revealed that the development of deep convective clouds will be triggered only at SST>27.5°C and that the threshold SST of 26.5°C used until then (reported in the literature as inferred using passive radiometer data) was an artifact caused by the thick cirrus outflows from deep convective clouds [*J. Climate, 2014*].
7. Identification and consolidation of the physical processes responsible for the nighttime enhancement and daytime breakup of the widespread marine stratocumulus clouds over subtropical oceans, based on observations of the vertical distribution and radiative properties of these clouds [*JASTP, 2017*].
8. First observational evidence for the radiatively driven convection in enhancing the vertical development of thick clouds in the upper troposphere (above 12 km) over tropical oceans and continents [*Atmos. Res., 2018*].

Atmospheric Aerosols, Radiative Forcing & Meteorological Impact

1. Multi-year monthly mean regional aerosol distributions over the oceanic regions around the Indian subcontinent using satellite data were made using indigenously developed and validated retrieval

algorithm. Extensive studies were made on the pathways of continental aerosol transport into the Arabian Sea, the Bay of Bengal and the Indian Ocean. Possible vertical extent of significant aerosol concentration during the contrasting periods of summer and winter were inferred. The conclusions drawn from this study were confirmed later by satellite-borne Lidar observations. [*JGR, 2000; ASR, 2002; JASTP: 2003; IJMS, 2004; Ann. Geophys., 2005; JMAR,2007; JESS, 2008*].

2. For the first time**,** direct observations of the top-of-atmosphere clear-sky aerosol radiative forcing over the Arabian Sea, the Bay of Bengal, and the Indian Ocean were carried out using TRMM-CERES data and satellite-derived aerosol optical depth (AOD). A new method for the determination of the diurnal mean aerosol forcing from satellite data was developed. This was published as 'breaking news' by NASA-EOS [*JGR, 2001*].
3. Direct observational evidence for the radiative impact of aerosols in decreasing sea surface temperature and, for the first time, the impact of aerosol radiative cooling of the surface in delaying the reversal of Indian Ocean Dipole was proposed and proved. This study is the rarest of such quantitative estimates ever made, fully accounting for all the other atmospheric and ocean surface variations. [*JGR, 2008*].
4. Spreading of the smoke generated by Indonesian forest fires to the equatorial Indian Ocean during El Nino years has been quantified by deriving aerosol optical depth from satellite data, which revealed the occurrence of a strong westward spreading smoke plume with AOD exceeding 1.2 that extend up to ~85°E over the east equatorial Indian Ocean [*ASR, 2004*].
5. By ingeniously combining multi-satellite observations, evolved the 3-dimensional distribution of smoke aerosols from Southeast Asian forest fires and estimated the resulting atmospheric heating, which provided first experimental evidence of the formation of a stable atmospheric layer between 0.6-1.5km due to atmospheric heating of aerosols [*GRL, 2009*].
6. Synthesizing the data from dual polarization Lidar and satellite, delineated the genesis of elevated aerosol layers and their impact on atmospheric radiative heating [*Atmos. Environ.,2010; J. Atmos. Sol. Terr. Phys., 2010, Atmos. Env., 2013*].
7. Integrated picture of the impact of noon-time annular Solar Eclipse on the spectral irradiance, surface temperature, vertical distribution of aerosols in the atmospheric boundary layer and mixing layer height has been brought out [*J. Atmos. Sol. Terr. Phys., 2011*].
8. Observations and modeling of the three-dimensional distribution of mineral dust over the Arabian Sea and Indian subcontinent during summer monsoon season and its anomalous nature during some years revealed the importance of shamal winds over West Asian deserts in producing dust plumes and their transport into the north Arabian Sea and Indian subcontinent [*J. Atmos. Sol. Terr. Phys., 2013; MAP, 2015*].
9. Direct observations of aerosol radiative forcing on the surface radiation budget at southwest Peninsular India during winter and pre-monsoon seasons show that the aerosol radiative forcing peaks at ~3 hours before and after the local noon (due to a combination of aerosol upscatter fraction and incoming solar irradiance) and has a diurnal mean forcing efficiency of 75±15 Wm^{-2}. [*J. Atmos. Sol. Terr. Phys., 2015*].
10. Diurnal variation of aerosol radiative impact at TOA over the mineral dust dominated Arabian Sea and the equatorial Atlantic during northern summer derived from Megha-Tropiques-ScaRaB shows larger magnitude of the aerosol forcing efficiency over the Arabian Sea (affected by West Asian desert) compared to the Atlantic (Saharan dust), presumably associated with the differences in shortwave absorption by aerosols [*IEEE Trans. GeoSci. & Rem. Sens., 2017*].

<u>Dynamics of the Tropical Atmosphere, including Boundary Layer</u>

1. First observations of cloud radiative forcing impact on the evolution of daytime convective atmospheric boundary layer during onshore and offshore flows [*BLM, 2020]*.
2. Effect of background circulation on the sea breeze circulation and its onset over the east coast of India (J. Atmos. Sol. Terr. Phys., 2019)
3. Retrieval of diurnal variation of boundary layer height and its seasonal variation over coastal station using Microwave Radiometer Profiler (MRP) – first of its kind using MRP [*IEEE Trans. Geosci. & Rem. Sens, 2017*].
4. Observational evidence for the applicability of Monin-Obukhov Similarity Theory in the surface layer over mountain terrains in the Central Himalaya was obtained using scaled-variable analysis of the tower-based fast-response micrometeorological observations [*BLM, 2015*].
5. First observational evidence for the modulation of gravity wave activity by equatorial waves in the middle atmosphere was obtained using Rayleigh Lidar observations of temperature and rocket observations of wind [*GRL, 2002*].
6. Detailed observations of the characteristics of quasi-monochromatic waves (among the rarest of its kind) in the tropical middle atmosphere were made using Rayleigh Lidar observations [*JGR, 2008*].

7. Gravity wave characteristics such as the vertical wave number spectra, gravity wave activity and their vertical propagation in the tropical middle atmosphere were studied using Rayleigh Lidar observations of temperature over Gadanki [*ASR, 2003*].
8. For the first time, the annual and semiannual oscillations in the mesopause temperatures over the tropical atmosphere were derived from decay rate of radio meteor trails [*JGR, 1993*].

Inversion Methods: Satellite, Lidar and Radar Remote Sensing

1. Developed a state-of-the-art satellite data inversion method using radiation transfer computations incorporating multiple scattering and absorption and wind-dependent surface reflectance for deriving aerosol optical depth (AOD) over oceans. This has been validated using *in-situ* observations and is demonstrated to be in par with the best-known algorithms developed elsewhere [*JGR, 2000*].
2. Developed an innovative method based on spatial coherence (applied to visible channel) for the cloud screening of data from satellite sensors that do not have thermal IR channel (e.g. OCM, SeaWiFS). This method is proved to be far superior to the conventional methods, particularly in removing artifacts in the aerosol retrieval using satellite data [*Rem. Sens. Environ., 2004*].
3. Developed a method for detection of semitransparent cirrus clouds and made the first quantitative assessment of the semitransparent cirrus detection capability using water vapour band and thermal IR band data (e.g., Kalpana-1-VHRR, METEOSAT) [*GRL, 2008*].
4. Developed a new shape-constraint-free inversion technique for the retrieval of aerosol extinction and backscatter profiles from multiwavelength Lidar signals, which relaxes the assumption on the apriori knowledge of aerosol extinction-to-backscatter ratio [*Appl. Opt., 1998*].
5. Developed a method to derive the temperature variations at mesopause level from the decay rate of the radio meteor echo amplitudes observed using Meteor Trail Radars *[JGR, 1993]*.

A. Publications in Peer Reviewed International Journals

1) C.R.Reddi, **K.Rajeev**, and G. Ramkumar : Winds in the meteor zone over Trivandrum, Indian Journal of Radio & Space Physics, 20, 82-91, 1991

2) C.R.Reddi, **K.Rajeev**, G.Ramkumar, K.P.Kamath, and K.S.V.Shenoy : Meteor Wind Radar system at Trivandrum (8.5N,77E), Indian Journal of Radio & Space Physics, 21, 195-211,1992

3) C.R.Reddi, **K.Rajeev**, and R.Geetha : Tidal winds in the radio meteor region over Trivandrum (8.5N,77E), Journal of Atmospheric and Solar Terrestrial Physics, 55, 1219-1231, 1993

4) V.V.Somayajulu, L.Cherian, **K.Rajeev**, G.Ramkumar, and C.R.Reddi: Mean winds and tidal components during counter electrojet events, Geophysical Research Letters, 20, 1443-1446, 1993

5) C.R.Reddi, **K.Rajeev**, and G.Ramkumar: Annual and semiannual temperature oscillations at the mesopause levels over Trivandrum (8.5N, 77E), Journal of Geophysical Research, 98, 8925-8931, 1993

6) C.R. Reddi, **K. Rajeev**, S.M.Nair, B.H.Subbaraya, G.V.Rama, K.S.Appu, V.Narayanan, B.V.Apparao, S.C.Chakravarthy, O.P.Nagpal, S.P.Perov, and G.A.Kokin,: DYANA campaign results in long period atmospheric waves over Thumba and Balasore: Journal of Atmospheric and Solar Terrestrial Physics, 56, 1753-1763, 1994.

7) C.R.Reddi, **K.Rajeev**, and Geetha Ramkumar,: Diurnal variations in diffusion coefficient and occurrence rate of radio meteor trails Indian Journal of Radio & Space Physics, 24, 55-63, 1995.

8) K. Parameswaran, **K. Rajeev**, and K. Sengupta : An observational study of night-time aerosol concentrations in the lower atmosphere at a tropical coastal station, Journal of Atmospheric and Solar Terrestrial Physics, 59, 1727-1737, 1997.

9) K.Parameswaran, R.Rajan, G.Vijayakumar, **K.Rajeev**, K.K.Moorthy, P.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, Journal of Atmospheric and Solar Terrestrial Physics, 60, 17-25,1998

10) **K.Rajeev**, and K.Parameswaran: An iterative method for the inversion of multiwavelength lidar signals to determine aerosol size distribution, Applied Optics, 37, 4690-4700, 1998

11) **K. Rajeev**, V. Ramanathan, and J. Meywerk, Regional aerosol distribution and its long-range transport over the Indian Ocean, Journal of Geophysical Research, 105, 2029-2043, 2000.

12) **K. Rajeev**, and V. Ramanathan, Direct observations of clear-sky aerosol radiative forcing from space during the Indian Ocean Experiment. Journal of Geophysical Research, 106, 17,221-17,236, 2001.

13) Ramanathan, V., Crutzen, P. J., Lelieveld, J., Mitra, A. P., Althausen, D., Anderson, J., Andreae, M. O., Cantrell, W., Cass, G. R., Chung, C. E., Clarke, A. D., Coakley, J. A., Collins, W. D., Conant, W. C., Dulac, F., Heintzenberg, J., Heymsfield, A. J., Holben, B., Howell, S., Hudson, J., Jayaraman, A., Kiehl, J. T., Krishnamurti, T. N., Lubin, D., McFarquhar, G., Novakov, T., Ogren, J. A., Podgorny, I. A., Prather, K., Priestley, K., Prospero, J. M., Quinn, P. K., **Rajeev, K.,** Rasch, P., Rupert, S., Sadourny, R., Satheesh, S. K., Shaw, G. E., Sheridan, P., Valero, F. P. J., Indian Ocean Experiment: An integrated analysis of the climate forcing and effects of the great Indo-Asian haze Journal of Geophysical Research, 106 , 28,371-28,398, 2001

14) **K. Rajeev**, V. Ramanathan, The Indian Ocean experiment: Aerosol forcing obtained from satellite data, Advances in Space Research, 29(11) 1731-1740, 2002. **(INVITED)**

15) **K. Rajeev**, S. K. Nair, and K. Parameswaran, Seasonal and inter-annual variability of regional aerosol distribution over the Indian Ocean observed using NOAA-14 AVHRR, Ocean Optics: Remote Sensing and Underwater Imaging, Eds. R. J. Frouin, G. D. Gilbert, Proceedings of SPIE(USA) Vol. 4488, 238-247, 2002.

16) K. Parameswaran, **K. Rajeev**, M.N. Sasi, Geetha Ramkumar, B.V.Krishna Murthy, K. Satheesan, A R Jain, Y Bhavanikumar, K. Raghunath, M. Krishnaiah, Rayleigh lidar observations of gravity wave characteristics in the middle atmosphere at Gadanki (13.5°N, 79.2°E), Lidar Remote Sensing for Industry and Environment Monitoring II, Ed. U.N. Singh, Proceedings of SPIE (USA), Vol. 4484, 286-294, 2002.

17) K. Parameswaran, **K. Rajeev**, M. N. Sasi, Geetha Ramkumar, and B. V. Krishna Murthy, First observational evidence of the modulation of gravity wave activity in the low latitude middle atmosphere by equatorial waves, Geophysical Research Letters, 29(6), 10.1029/2001GL013625, 2002

18) Nair, S. K.*, **K. Rajeev**, and K. Parameswaran, Wintertime regional aerosol distribution and the influence of continental transport over the Indian Ocean, Journal of Atmospheric and Solar Terrestrial Physics, 65(2), 149-165, 2003.

19) **K.Rajeev**, K.Parameswaran, M.N.Sasi, G. Ramkumar, and B.V.Krishna Murthy, Gravity waves in the tropical middle atmosphere: characteristics and wave-mean flow interaction, Advances in Space Research, 32(5), 807-812, DOI 10.1016/S0273-1177(03)00403-4, 2003.

20) 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, S.Devanarayanan, A study of Equatorial wave characteristics using rockets, balloons, lidar and radar, Advances in Space Research, 32(5), 813-818, DOI 10.1016/S0273-1177(03)00412-5, 2003.

21) **K. Rajeev**, K. Parameswaran, M. N. Sasi, G. Ramkumar, and B. V. Krishna Murthy, Rayleigh lidar observations of quasi-monochromatic waves in the tropical middle atmosphere, Journal of Geophysical Research, 108, NO. D24, 4749, ACL2.1–2.12, doi:10.1029/2003JD003682, 2003.

22) K.Parameswaran, S. K Nair, and **K. Rajeev,** Impact of Indonesian forest fires during the 1997 El Nino on the aerosol distribution over the Indian ocean, Advances in Space Research, 33, 1098–1103, doi:10.1016/S0273-1177(03)00736-1, 2004.

23) **K. Rajeev**, S. K Nair, K. Parameswaran, and C. S. Raju, Satellite observations of the regional aerosol distribution and transport over the Arabian Sea, Bay of Bengal, and Indian Ocean, Indian Journal of Marine Sciences, 33, 11-29, 2004 (**INVITED**).

24) Nair, S. K.*, **K. Rajeev**, and K. Parameswaran, Cloud screening in IRS-P4 OCM satellite data: Potential of spatial coherence method in the absence of thermal channel information, Remote Sensing of the Environment, 90, 259-267, 2004.

25) K. Parameswaran, S.V. Sunil Kumar, **K. Rajeev**, Prabha R Nair, K. KrishnaMoorthy, Boundary layer aerosols at Trivandrum tropical coast, Advances in Space Research, 34, 838-844, doi:10.1016/j.asr.2003.08.059, 2004.

26) Nair, S. K.*, K. Parameswaran, and **K. Rajeev**, Seven-years satellite observations of the mean structure and variabilities in the regional aerosol distribution over the oceanic areas around the Indian subcontinent, Annales Geophysicae, 23, 2011-2030, 2005.

27) Meenu, S.*, **K. Rajeev**, K. Parameswaran and C. Suresh Raju, “Regional distribution of the high altitude clouds over the Indian Subcontinent and surrounding oceanic regions based on 7-years of satellite observations”, Proceedings of SPIE, Vol. 6408, DOI: 10.1117/12.694036, 2006.

28) Meenu, S.*, **K. Rajeev**, C. Suresh Raju, and K. Parameswaran, “Double ITCZ observed over the Tropical Indian Ocean: Characteristics derived from cloud properties and OLR”, Proceedings of SPIE, Vol. 6408, DOI: 10.1117/12.694055, 2006.

29) Nair, S. K*, **K. Rajeev**, and K. Parameswaran, “Interannual variability in the shortwave aerosol direct radiative forcing over the oceanic areas around the Indian subcontinent during Dry Season”, Proceedings of SPIE, Vol.6408, DOI: 10.1117/12.694027, 2006.

30) Meenu, S.*, **K. Rajeev**, K. Parameswaran, and C. Suresh Raju, “Characteristics of Double ITCZ over the Tropical Indian Ocean”, Journal of Geophysical Research, Vol. 112, D11106, doi:10.1029/2006JD007950, 2007

31) K. Parameswaran, S. K Nair, **K. Rajeev**, Spatial distribution of sea-salt and non-sea-salt aerosol optical depths over the oceanic regions around the Indian subcontinent from space borne measurements, Journal of Marine and Atmospheric Research, 3, 64-82, 2007.

32) K. Parameswaran, S. K Nair, **K. Rajeev**, Impact of Aerosols from the Asian Continent on the Adjoining Oceanic Environments, Journal of Earth System Science, 117, 83-102, 2008.

33) **K. Rajeev**, K.Parameswaran, S. Meenu, S.V. Sunilkumar, Bijoy V. Thampi, C. Suresh Raju, B. V. Krishna Murthy, K. S. Jagannath, S. K. Mehta, D. N. Rao, and K. G. Rao, “Observational assessment of the potential of satellite-based water vapour and thermal IR brightness temperatures in detecting semitransparent cirrus”, Geophysical Research Letters, 35, L08808, doi:10.1029/2008GL033393, 2008

34) **K. Rajeev,** K. Parameswaran, Sandhya K Nair, S. Meenu, “Observational evidence for the radiative impact of Indonesian smoke in modulating the sea surface temperature of the equatorial Indian Ocean”, Journal of Geophysical Research, 113, D17201, doi:1029/2007JD009611, 2008.

35) S. K. Mehta, B.V.Krishna Murthy, D. N. Rao, M.V. Ratnam, K. Parameswaran, **K.Rajeev**, C. Suresh Raju, and Kusuma G Rao, Identification of tropical convective tropopause and its association with cold point tropopause, Journal Geophysical Research, 113, D00B04, doi:1029/2007JD009625, 2008.

36) Thampi, B. V.*, **K. Rajeev**, K. Parameswaran, and M. K. Mishra, Spatial distribution of the Southeast Asian smoke plume over the Indian Ocean and its radiative heating in the atmosphere during the major fire event of 2006, Geophysical Research Letters, 36, L16808, doi:10.1029/2009GL039316, 2009.

37) Meenu, S.*, **K. Rajeev**, K. Parameswaran, and A. K. M. Nair (2010), Regional distribution of deep clouds and cloud top altitudes over the Indian subcontinent and the surrounding oceans, Journal of Geophysical Research, 115, D05205, doi:10.1029/2009JD011802.

38) **Rajeev, K.,** K. Parameswaran, B.V. Thampi, M.K. Mishra, A. K. M. Nair, and S. Meenu, Altitude distribution of aerosols over Southeast Arabian Sea coast during pre-monsoon season: Elevated layers, long-range transport and atmospheric radiative heating, Atmospheric Environment, 44, 2597 - 2604, doi:10.1016/j.atmosenv. 2010.04.014, 2010.

39) Sunilkumar, S.V., K. Parameswaran, **K. Rajeev**, B. V. Krishna Murthy, S. Meenu, S.K. Mehta, and Asha Babu, Semitransparent cirrus clouds in the Tropical Tropopause Layer during two contrasting seasons, Journal of Atmospheric and Solar Terrestrial Physics, 72, 745–762, doi:10.1016/j.jastp.2010.03.020, 2010

40) Mishra, M. K*., **K. Rajeev**, B.V. Thampi, K. Parameswaran, A.K.M. Nair, Micro pulse lidar observations of mineral dust layer in the lower troposphere over the southwest coast of Peninsular India during the Asian summer monsoon season, Journal of Atmospheric and Solar Terrestrial Physics, 72, 1251–1259, 2010.

41) Meenu, S.*, **K. Rajeev**, K. Parameswaran, Regional and vertical distribution of semitransparent cirrus clouds over the tropical Indian region derived from CALIPSO

data, Journal of Atmospheric and Solar Terrestrial Physics, 73, 1967-1979, doi:10.1016/j.jastp.2011.06.007, 2011

42) Nair, A. K. M.*, **K. Rajeev**, S. Sijikumar, S. Meenu, Characteristics of a persistent “pool of inhibited cloudiness” and its genesis over the Bay of Bengal associated with the Asian summer monsoon, Annales Geophysicae, 29, 1247–1252, doi:10.5194/angeo-29-1247-2011, 2011

43) Sijikumar. S. and **K. Rajeev**, Role of the Arabian Sea Warm Pool on the Precipitation Characteristics during Monsoon Onset Period, Journal of Climate, doi:10.1175/JCLI-D-11-00286.1, 2011

44) Mishra, M. K.*, **K. Rajeev**, A. K. M Nair, K. Krishnamoorthy and K. Parameswaran, Impact of a noon-time annular solar eclipse on the mixing layer height and vertical distribution of aerosols in the atmospheric boundary layer, Journal of Atmospheric and Solar Terrestrial Physics, 74, 232–237, doi:10.1016/j.jastp.2011.10.012, 2012.

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