

Brief Professional updates of Dr. Suresh Raju C

Dr. SURESH RAJU C.

Head, Microwave Remote Sensing Section.

Principal Investigator, ChaSTE Payload, Chandrayaan2 Mission.

Scientist/Engineer-SG

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Educational Qualifications

Ph.D (Physics)**: University of Paris (VII), Paris, France

**Thesis Title: *“Influences of Soil moisture and Temperature vertical profiles on the soil microwave emission: consequence on soil Moisture estimation”*.

**Specialization: *Physical Methods in Microwave Remote Sensing*.

** Thèses préparé at: *Institute Nationale de la Recherche Agronomique (INRA), France, fellowship by INRA, & Centre National d'études Spatiales (CNES), Paris, France.*

Post MSc. Dip. (Space Sciences & Applications), Gujarat University, Ahmedabad, India

M.Sc. (Physics): Bharkathulla (Bhopal) University, Bhopal, India

Major Scientific Activities:

Dr. Suresh Raju specialised in Microwave Radiometry for Earth-Planetary observations and Microwave Propagation studies. At present leading a research team in the area of Microwave Radiometry for the studies of Earth/other planetary bodies and microwave propagation studies at SPL. His major research activities are:

1. Earth-based microwave probing (using GMRT) of Venus surface.
2. Developing the payload 'ChaSTE' for Lander-based (Chandrayaan2) in-situ measurement of thermal properties of lunar regolith.
3. Microwave radiative transfer modeling for planetary atmospheric and terrain studies
4. Tropical deep convective clouds and Upper tropospheric humidity studies using satellite microwave radiometric data.
5. Ground-based microwave radiometer measurements for atmosphere, convective clouds and boundary layer studies.
6. Ku- and Ka-band propagation studies with geostationary satellite.

7. Modeling of Tropospheric delay correction for GPS navigation water vapor & atmospheric studies.

Technical Responsibilities

- **Principal Investigator:** “ChaSTE Payload- **Chandras Surface Thermophysical Experiment**” aboard Lander of CHANDRAYAAN-II MISSION.
- **Co- Principal Investigator:** “Thermophysical Characterization of **Venus Surfaces** Using GMRT-microwave radiometric Observation”.
- **Co-Principal Investigator:** **MSSERR-Mars Shallow Sub-surface Exploration using Radar and Radiometer** (*Proposal Shortlisted for ISRO's Mars mission by ADCOS*)
- **Principal Investigator:** Megha-Tropiques (M-T) Satellite Science Project “Modeling of land surface emissivity in the microwave regime for Megha-Tropiques”.
- **Co-Investigator:** GAGAN project “Modeling of Tropospheric Delay correction for GPS based Aircraft navigation”.
- **Principal Investigator:** Megha-Tropiques Microwave Data Utilization for land surface applications
- **Member:** National Team member for Venus studies

Research Supervision & Human Resource Development:

1. Ph.D Thesis Supervision - 3;
2. Currently supervising for Ph.D thesis – 1;

Publications:

A. Publications in refereed Journals

1. Nithin Mohan, Subhashis Roy, Govind Swarup , Divya Oberoi , Niruj Mohan Ramanujam, **Suresh Raju C.**, Anil Bhardwaj, “Radio observation of Venus at meter wavelengths using the GMRT”, **ICARUS**, Vol.297 119–125 doi.org/10.1016/j.icarus.2017.06.026, (2017)
2. Tinu Antony, **Suresh Raju C.**, Nizy Mathew, Krishna Moorthy K, “Microwave Emissivity of arid regions at 10 GHz: Potential for sub-surface studies “, International, urnal of remote sensing, doi.org/10.1080/01431161.2018.1458345, 2018. 2018.
3. Nizy Mathew and **Suresh Raju C.** , “Distribution of Tropical Deep Convective Clouds from Megha-Tropiques SAPHIR Data ”, **IEEE Trans. Geosci. Remote & Sens.**, Vol. 54, Issue 11, DOI:10.1109/TGRS.2016.2584540, 2016.
4. R. Renju, **C. Suresh Raju**, Nizy Mathew, N. V. P. Kirankumar, and K. Krishna Moorthy, Tropical Convective Cloud Characterization Using Ground-Based Microwave Radiometric Observations", **IEEE Trans. Geosci. Remote & Sens.**, Vol. 54, Issue 6, DOI:10.1109/TGRS.2016.2527099, 2016.
5. Yan Feng, M. Cadeddu, V. R. Kottamarthi, R. Renju and **Suresh Raju C.**, “Humidity bias and effect on simulated aerosol optical properties during the Ganges Valley

- Experiment”, *Current Science*, Vol. 111, No.1, 93-100,DOI:10.18520/cs/v111/i1/93-100(2016).
6. Renju R., **Suresh Raju C.**, Nizy Mathew, Tinu Antony and K. Krishna Moorthy, Microwave Radiometer observation of Inter-annual variability of water vapor and its vertical structure over an equatorial station, **J. Geophys. Res. Atmosphere**, 22 May 2015, Vol. 120, 45854599, DOI:10.1002/2014JD022838, 2015.
 7. Tinu Antony, **Suresh Raju C.**, Nizy Mathew and K. Krishna Moorthy, 'Flood Extent Analysis Over the Major River Basins in the Indian Subcontinent Using Satellite Microwave Radiometric Data' **IEEE JSTAR**, VOL. 8, NO. 9, SEPT. 2015
 8. Nizy Mathew, Viju Oommen John, **Suresh Raju C.** and K. Krishna Moorthy, “Upper Tropospheric Humidity from SAPHIR on board Megha-Tropiques”, **Current Science**,108 (10), 1915-1922, 25 May 2015.
 9. Tinu Antony, **Suresh Raju C.**, Nizy Mathew, Korak Saha and K. Krishna Moorthy, “Detailed Analyses on Microwave Land Surface Emissivity of Indian Subcontinent”, **IEEE Trans. Geosci. & Remote Sens.** VOL. 52, NO. 6, JUNE 2014.
 10. **Suresh Raju C.**, Renju. R, Tinu Antony, Nizy Mathew, K. Krishna Moorthy, “Microwave radiometric observation of an intense convective system that formed waterspout over the coastal Arabian Sea”, **IEEE Geosci. & Rem. Sens. Letter**, 10, 1075-1079, doi: 10.1109/LGRS.2012.2229960, 2013.
 11. **Suresh Raju, C.**, T. Antony, N. Mathew, K. N. Uma, and K. K. Moorthy .,“MT MADRAS brightness temperature analysis for terrain characterization and land surface microwave estimation”, **Current Science**, “SPECIAL ISSUE ON MT”, 104 (12), 1643–1649, 2013.
 12. Andre Chanzy, **C. Suresh Raju**, Jean-Pierre Wigneron, “Estimation of Soil microwave Effective Temperature at L and C bands”, **IEEE Trans. Geosciences & Remote Sensing** . Vol.35(3), pp.570-580, May.1997.
 13. Calvet J. C., J. P. Wigneron, A. Chanzy, **C. Suresh Raju**, and L. Laguerre, “Microwave dielectric properties of a silt-loam at high frequencies”, **IEEE Trans. Geosciences & Remote Sensing**, Vol.33(3), pp.634-642, May.1995.
 14. **Suresh Raju C**, Andre Chanzy, Jean-Pierre Wigneron, Jean-Christophe Calvet, Yann Kerr, and Laurent Laguerre, “Soil moisture and temperature profile effects on microwave emission at low frequencies, **Remote Sensing of Environment**, 54, 85-97, 1995.
 15. Rao, K. S, **C. Suresh Raju**, Wang, J. R., “Estimation of soil moisture and surface roughness parameters from backscattering coefficient”, **IEEE Trans. Geosciences and Remote Sensing**, Vol.31(5), pp.1094-1099, Sept..1993.
 16. Korak Saha, **Suresh Raju C.**, and K. Parameswaran, ”A New Hydrostatic Mapping Function for Tropospheric Delay Estimation”, **J. Atmosphere and Solar Terrestrial Physics**, Vol.72, 125-134, 2010.
 17. **Suresh Raju C.**, KorakSaha and K. Parameswaran, “Signature of atmospheric oscillations in GPS-measured tropospheric delay”, **J. Atmosphere and Solar Terrestrial Physics**, doi:10.1016/j.jastp.2009.06.011, 2009.

18. K. Parameswaran, Korak Saha, and **Suresh Raju C.** “Development of Regional Tropospheric Delay Model for Tropospheric Correction in GAGAN”, **RADIO SCIENCES**, 43, RS4007, doi:10.1029/2007RS003782, 2008.
19. Rajeev, K., K. Parameswaran, S. Meenu, S. V. Sunilkumar, Bijoy V. Thampi, C. **Suresh Raju**, B. V. Krishna Murthy, K. S. Jagannath, Sanjay K. Mehta, D. Narayana Rao, and Kusuma G. Rao, ‘Observational assessment of the potential of satellite-based water vapor and thermal IR brightness temperatures in detecting semitransparent cirrus’, **Geophys. Res. Lett.**, 35, (2008) L08808, doi:10.1029/2008GL033393, 2008.
20. Mehta, S.K., Krishna Murthy, B.V., Narayana Rao, D., Venkat Ratnam, M., Parameswaran, K., Rajeev, K., **Suresh Raju, C.**, Rao, K.G. “Identification of tropical convective tropopause and its association with cold point tropopause”, **J. Geophysical Research A: Space Physics**, V.113, issue 14, 2008.
21. **Suresh Raju C.**, K. Saha, B. V. Thampi and K. Parameswaran, Empirical Model for Mean Temperature for Indian Zone and Estimation of Precipitable Water Vapor from Ground Based GPS Measurements”, **Annales Geophysicae**, Vol.25, pp. 1935-1948, 2007, (SRef-ID: 1432-0576/angeo/2007-25-1935), 2007.
22. Korak Saha, K. Parameswaran, and C. **Suresh Raju**, “Tropospheric delay in Microwave propagation in tropical atmosphere based on data from Indian Subcontinent”, **J. Atmospheric and Solar Terrestrial Physics.**, 69, 875–905, 2007.
23. Meenu, S., K. Rajeev, K. Parameswaran, and C. **Suresh Raju**, “Characteristics of Double ITCZ over the Tropical Indian Ocean”, **J. Geophys. Res.**,112, D11106, doi:10.1029/2006JD007950,2007.
24. K. Rajeev, Sandhya K Nair, K. Parameswaran, and C. **Suresh Raju**, “Satellite observations of the regional aerosol distribution and transport over the Arabian Sea, Bay of Bengal, and Indian Ocean”, **Indian J. Marine Sciences**, 33, 11-29, 2004 (Invited paper).
25. **Suresh Raju. C.**, V. K. Yadhav, V. K. Malhotra, and Rao K. S., “Simulating the radar back scattering coefficients of grasslands”, **Asian-Pacific Remote & Sensing**, 3(2), pp.49-58, May 1991.
26. Narasimha Rao, P.V., C. **Suresh Raju**, and Rao K. S., “Microwave remote sensing of soil moisture: elimination texture effect”, **IEEE Trans. Geosciences & Remote Sensing**, 38(1), pp.148-151, Jan.1990.
27. Rao K. S, Narasimha Rao, P.V., Y.S. Rao, G. Chandra, C. **Suresh Raju**, and M.V. Bapat “A study on the effect of the soil texture on passive microwave remote sensing”, **J. Indian Soci. of Remote Sensing**. 16(3), pp 55-63, 1989.

B. Publications in the Proceedings/Books

1. Korak saha, C. **Suresh Raju**, and K. Parameswaran, “Neutral atmospheric refraction on microwave propagation and its implications on GPS based ranging systems”, Proc. *Commission F: XXVIII International Union of Radio Science (URSI) General Assembly (GA), New Delhi, India*, 24 - 29, Oct. 2005.
2. **Suresh Raju. C.**, Korak saha, Bijoy V. Thampi and K. Parameswaran, “Measurement of

Integrated water vapor over Bangalore using ground based GPS data”, Proc. *Commission F: XXVIII International Union of Radio Science (URSI) General Assembly (GA)*, New Delhi, India, 24 - 29, Oct. 2005.

3. K. Rajeev, **C. Suresh Raju**, K. Parameswaran, Characteristics of the fractional cloud cover and its altitude distribution over the Indian ocean region derived from NOAA_AVHRR, **IASTA Bulletin 16 (No. 1 &2), 140-144**, 2004.
4. **Suresh Raju. C.**, K. Rajeev, K. Parameswaran, and K. S. Jagannath, and C. G. Patil, Cloud studies using KALPANA-1 data: Potential and Possibilities, **IASTA Bulletin, 16 (No. 1&2), 145-149**, 2004.
5. Chanzy A., J.-P. Wigneron, J.-C. Calvet, L. Laguerre and **C. Suresh Raju**, "Surface emissivity data from PORTOS-Avignon experiment", Radiative Transfer Models For Microwave Radiometry” COST 712: Final Report of Project 1, p. 171. 2000.
6. Laguerre, L., Calvet, J. C., Kerr, Y. H., Chanzy, A., Wigneron, J. P., and **Suresh Raju, S.**, "Influence of Surface Roughness on the Microwave Emission from Bare Soils for Surface Soil Moisture Retrieval Algorithms." **PIERS'94**, Noordwijk, Netherlands, 1994.
7. Laguerre, L., **Suresh Raju C.**, Chanzy, A., Kerr, Y. H., Calvet, J. C., and Wigneron, J. P., "Physical modeling of microwave emission from bare soils. Intercomparison of models and ground data." Proc. 6th International Symposium "Physical Measurements and Signatures in Remote Sensing", Val d'Isère, France, PP. **527-534. 1994.**
8. Laurent Laguerre, **C. Suresh Raju**, Andre Chanzy, Yann Kerr, Jean-Christophe Calvet, Jean-Pierre Wigneron, "Physical modeling of microwave emission from bare soils. Inter comparison of models and ground data”, 6th *Internat. Symp. On Physical measurements Signatures and Remote Sensing*, **CNES, Paris, pp 527-534, 1994.**
9. Costes, F., **C. Suresh Raju**, A. Chanzy, Chenerie, I., and Lemorton. J., "Microwave radiometry on bare soils: Comparison of various emission models of layered media with measurements”, *Proc. IEEE Geoscience and Remote sensing Symp. (IGARSS 94)*; **Vol. III IEEE, Seabrooke, TX**, pp. 15979-1581, 1994. (Surface and atmospheric remote sensing: Technologies Data Analysis and Interpretation, Pasadena 1994/08/8-12, Volume III., pp. 1579-1581 (1994).
10. Rao K.S., **C. Suresh Raju** and Y.S. Rao, Model for the retrieval of soil moisture and surface roughness parameters from multifrequency backscattering coefficients, **Proc. of IGARSS '91, IEEE symposium**, Espoo, Finland, 397-400, 1991.
11. Supriya M Mathew, Kusuma G Rao, Manjusha Chourasia, K. Parameswaran, D Narayana Rao, K. S. Jagannath, B. V. Krishna Murthy, K. Rajeev, **C. Suresh Raju**, S.C. Chakravarthy, "Links Between tropopause variations and the Boundary layer processes during the transition to southwest monsoon onset”, CAWSES-India- Scientific Results (Phase-1), ISRO publications, Eds. Kusuma G Rao and R. Sridharan, 169-186, 2009
12. S. Meenu, K. Rajeev, K. Parameswaran, and **C. Suresh Raju**, "Regional distribution of the high-altitude cloud over the Indian subcontinent and surrounding oceanic regions based on seven years of satellite observations”, *Proce. of SPIE*, 6408, doi:10.1117/12.694036., 2006.
13. Meenu, 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, 6408, 10.1117/12.694055, 2006.

C. Scientific/Technical Reports

1. **Suresh Raju C.**, et al., Chandras Surface Thermophysical Experiment (ChaSTE) PDR report, Doc.No.SPL-VSSC-PRL-ChaSTE-PDR-V3, July 2014.
2. **Suresh Raju C.**, K. Parameswaran and K. Rajeev, “A Simple Model for Tropospheric Correction in Microwave Ranging for Trivandrum and Bangalore”. *Scientific Report, SPL: SR: 001:02, September 2002.*
3. **Suresh Raju C.** and K. Parameswaran, “Tropospheric Range error estimation for Trivandrum and Bangalore Based on Hopfield model”. *Scientific report, SPL: SR: 001:03, September 2003.*
4. **Suresh Raju C.**, K. Rajeev, K. Parameswaran (SPL) and K. S. Jagannath, C.G.Patil, (MCF, Hassan, 573 201), “Cloud Studies Using Kalpana-1 VHRR: Scientific Potential and Possibilities”. *Scientific report, SPL: SR: 001:04, June 2004.*
5. **Suresh Raju C.**, Parameswaran K., and Korak Saha. “Tropospheric Models Over Indian Subcontinent for GPS Aided Geo-Augmented Navigation (GAGAN)”, *Scientific Report; SPL:SR:001:05; December 2005.*
6. **Suresh Raju C.**, Parameswaran K., and Korak Saha “A Summary Report On Tropospheric Correction Model for GAGAN”, *Scientific Report:SPL:SR:001; Jan. 2007*
7. **Suresh Raju C.**, Tinu Antony, Nizy Mathew, Uma K.N, Krishna Moorthy, K., Kishore Kumar K, Venkata subrahmanyam, K. Rajeev and Anish Kumar M Nair, “ First Results of Megha-tropiques data and its intercomparison with other radiometers and sounders”, Scientific Report: No.1; January 2012.
8. Chanzy, A., Wigneron, J. P., Calvet, J. C., Laguerre, L., **Suresh Raju C.**, Kerr, Y. H., and Grosjean, O. "Téledétection micro-ondes passives : utilisation combinée de plusieurs configurations de mesure pour l'estimation des paramètres de surface des sols nus et de la végétation." INRA HQ., Paris, 1995.