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Research Area:

- Ionospheric plasma Layering processes.
- Upper atmospheric/ionospheric response to diverse solar and magnetospheric and geophysical conditions in general and the effects of geomagnetic storms prompt penetration electric fields and solar flare, over the equatorial upper atmosphere, in particular.

Qualifications:

- ✓ Doctor of Philosophy (Ph.D.), University of Kerala, October 2017.
- ✓ Master of Science-Physics, University of Calicut, 2006.
- ✓ CSIR-JRF –NET, 2006 June, Included in the top 20% of passed candidates
- ✓ Bachelor of Science-Physics, University of Calicut, 2004.

Professional Background:

Scientist/Engineer SE (2018-Present)	Space Physics Laboratory
Scientist/Engineer SD (2013-2018)	Space Physics Laboratory
Scientist/Engineer SC (2008-2013)	Space Physics Laboratory
CSIR research Fellow (2007-2008)	CUSAT (Cochin University of Science and Technology), Cochin,Kerala.

Awards & Honors

- **BUTI Young Scientist Award 2018**, by BUTI Foundation for the study - A Quantitative analysis on the roles of F3 layers as well as solar flux in modulating the topside ionization over the Indian region, which was adjudged the best presentation in the BUTI young Scientist session

of PLASMA 2018, during the 33rd National Symposium on Plasma Science and Technology, Delhi University, 4-7 December 2018.

➤ **PSSI Award (Plasma Science Society of India award) for the best poster in 29th National symposium on plasma science and technology, Plasma 2014 held at Kottayam during Dec 8-11, 2014.**

➤ Best Library user of the year 2015 Award from Vikram Sarabhai Space Centre library.

➤ Included in the top 20% of passed candidates for CSIR JRF-NET (Council for Scientific and Industrial Research - Junior Research Fellowship- National Eligibility Test) 2006.

➤ First rank for Master of Science- Physics, Calicut University 2006. (90.4%)

➤ First rank for Bachelor of Science- Physics, Calicut university-2004. (99.5%)

Nature of Duties:

I am working in the Ionosphere Thermosphere Magnetosphere Physics branch (ITMP) of SPL as Scientist/Engineer SE. My duties include

- ✓ Investigation of the neutral and plasma processes in the near Earth space using ground and space based experiments and thereby contribute to ISRO's programs.
- ✓ Investigations on Additional plasma stratifications in ionosphere and their day to day variability.
- ✓ Investigations on upper atmospheric response to diverse solar conditions using tomograms obtained from the radio beacon RaBIT (Radio Beacon for Ionospheric Tomography) and airglow observations from *Limb Viewing Hyper Spectral Imager (LiVHySI)* onboard India's first small satellite, YOUTHSAT
- ✓ Being instrumental in generating tomograms using the RaBIT data, my analysis has brought out the role of F3 layers in modulating the topside ionospheric density.
- ✓ Also participated in the development of a rocket borne payload from ionospheric studies as a part of the annular solar Eclipse Campaign.
- ✓ As Project Manager InSWIM (Indian Network for Space Weather and Ionospheric monitoring), I am involved in the data analysis, generation of tomograms using TEC data obtained from Low Earth Orbiting Satellites and scientific studies thereof.
- ✓ As an active member of SOUREX (SOunding Rocket Experiment), I am is involved in the in-house development of experiments/payloads for upper atmospheric studies

✓ Having experience in working with the data obtained from ground based Ionosonde, magnetometers as well as space based satellite platforms like YOUTHSAT, CHAMP, COSMIC etc, I have used empirical models like IRI and MSIS as well as tomography technique for my research.

Research contribution:

The prime objective of my doctoral thesis work was to investigate terrestrial Atmosphere (neutral) - Ionosphere (plasma) regions with special emphasis on the plasma layering processes prevailing therein using radio remote sensing techniques.

Ionospheric plasma being a dispersive medium affects the propagation of electromagnetic waves used for communication and navigation purposes using satellites. To have error free satellite applications, a very clear understanding of ionospheric processes and their day to day variability is called for. . In fact my work encompasses the themes of the international programs like the *Climate and Weather of the Sun-Earth System (CAWSES)* and *Coupling Processes in the Equatorial Atmosphere (CPEA)* very well, with focus on the atmosphere-ionosphere system over the low and equatorial latitudes

One of the most important processes which can affect the ionospheric plasma density is the plasma layering/stratifications. Layers in ionosphere signify a region where the overall behavior of the constituent species is defined by a given set of physical laws, while outside the layer the properties are different. Normally ionospheric plasma forms D, E and F layers. However on some days, in addition to these, some additional layers appear in the ionosphere, the most important ones being the F3 layer which appears above the F layer (above 300 km) and F0.5 layers which appear below F layer (150 km).

My study has helped significantly in understanding some key aspects regarding the formation as well as evolution of these layers. *A self consistent mechanism for F3 layer generation and evolution based on ion neutral coupling over dip equatorial region has been devised.* Based on observations from the dip equatorial region, the lowered ionospheric height / inhibited vertical plasma drift and enhanced electron density is established as a necessary condition for the occurrence of F3 layer.

Further a major finding that neutral dynamical process of gravity waves provides the horizontal wind shears required for the generation of F0.5 layers over the dip equator was also made. Hence the role of neutral dynamics in the plasma layering process over equatorial region has been brought out by my studies, which indeed is a novel addition to the current understanding. This understanding is very important as this aspect is not included in many of the present day ionospheric models as well as ionospheric delay calculations and hence this aspect has huge implications in the current scenario

The major accomplishments are

- ✓ a) *The development of a Self consistent mechanism for F3 layer generation and evolution based on ion neutral coupling over dip equatorial region*
- ✓ b) *First Observation of the QBO modulation in the frequency of occurrence of pre noon F3 layers over the dip equator*
- ✓ c) *Evidence for the role of horizontal wind shears caused by gravity waves in the generation of F0.5 layers over the dip equator.*

These results are novel and have led to new understanding on the generation of ionospheric layers over the dip equatorial region.

• Refereed peer reviewed Journal Publications	:	11
• Conference /Seminar/workshop presentation	:	21
• Conference /Training /workshop participation	:	15
• Scientific reports	:	1
• Research Supervision (M.Sc Physics Projects)	:	5
• Expertise in Programming Matlab, Fortran, Origin.		
• Memberships in professional bodies : Life member of Plasma Science Society of India (PSSI).		

Refereed peer reviewed Journal Publications:

1. **Mridula N.** and Tarun Kumar Pant, The generation of post noon F3 layers over the dip equatorial location of Thiruvananthapuram- A new perspective, *J. Atmos. Terr.Phys*, 170, 55-63, <https://doi.org/10.1016/j.jastp.2018.02.008>, 2018.
2. **Mridula N.**, Tarun Kumar Pant and Ajesh A, On the QBO modulation in the frequency of occurrence of pre noon F3 layers over the dip equatorial location of Thiruvananthapuram, *J. Atmos. Terr.Phys*, 179, 114-119, <https://doi.org/10.1016/j.jastp.2018.07.004>, 2018.
3. Ajesh A, T K Pant, C Vineeth, **N Mridula**, K Kishore Kumar, Vertical Coupling between mesopause region and sporadic E layer during Equatorial and Counter Electrojet events- a case study, *Advances in space research*, <http://dx.doi.org/10.1016/j.asr.2018.07.001>, 2018.
4. **Mridula N.**, Tarun Kumar Pant., on the role of horizontal wind shears in the generation of F0.5 layers over the dip equatorial location of Thiruvananthapuram: A numerical simulation study, *Journal of Atmospheric and Solar Terrestrial Physics*,doi:10.1016/j.jastp.2017.02.005, 2017.
5. Vineeth C., **N. Mridula** ,P. Muralikrishna , K.K. Kumar, T.K. Pant, First observational evidence for the connection between the meteoric activity and occurrence of equatorial counter electrojet, *Journal of atmosphere and solar terrestrial physics*, <http://dx.doi.org/10.1016/j.jastp.2016.07.007>, 2016.
6. **Mridula N.** and Tarun Kumar Pant, On the possible role of zonal dynamics in the formation and evolution of F3 layers over equator, *Journal of atmosphere and solar terrestrial physics*, doi: 10.1016/j.jastp.2015.09.019, 2015
7. **Mridula N.**, Tarun Kumar pant, C.Vineeth, K.Kishore Kumar ,Features of the occurrence of the additional stratification on the bottom-side F region over the equatorial location of Trivandrum, *Advances in space research*, <http://dx.doi.org/10.1016/j.asr.2013.12.036>, 2014.
8. Kumar P N, N Rasool, K Madhu Krishna, A.D Sharma, **N. Mridula**, Tarun Kumar Pant, P.Sreelatha,J.Rosmi,Santosh koli, Praveen Kumar and R Sharma, Ionospheric variability over low and equatorial latitude regions over India-A study using RaBIT onboard YOUTHSAT ,*Indian Jopurnal of Radio and Space Physics*,vol 42,2013,pages 136-142, 2013.
9. Pant T K, P Sreelatha, **N. Mridula**, S Trivedi, R M Das, S Koli, R Sharma, J Girija,Arun Alex, K K Mukundan, S B Shukla, P Purushottaman, J N Santosh, Biju Thomas,M Srikant, R

Sridharan, K Krishnamoorthy, Ratan Bisht, D V A Raghavamurthy, M P T Chamy & J D Rao, Radio Beacon for Ionospheric Tomography (RaBIT) onboard YOUTHSAT: Preliminary results, Ind. J. Radio Space Phys., 41 (2), 162-168, 2012.

10. Manju G., R. Sridharan , P. Sreelatha, S. Ravindran, M. Haridas, T. K. Pant, P.P.Kumar, S. Thampi, N. Naik, **N. Mridula**, L. Jose and S. G. Sumod, A Novel probe for in-situ Electron density and Neutral Wind (ENWi) measurements in the near Earth space , J., Atmos. Sol. Terr. Phys. 2011).
11. **Mridula. N.**, G. Manju, Tarun Kumar Pant, S. Ravindran, L. Jose, and S. Alex, On the significant impact of the moderate geomagnetic disturbance of March 2008 on the Equatorial Ionization Anomaly region over Indian longitudes, **J. Geophys .Res.**, doi:0.1029/2011JA016615, 2011.[This study was published in Journal of Geophysical Research JGR(USA) and was highlighted as an important study by Vertical news USA ,an agency which monitors and rates atmospheric studies].

Scientific report:

Mridula N and Tarun Kumar Pant, Mean And Extreme Bounds Of Atmospheric Temperature For The Altitude Of 60 km To 1000 km Over SHAR Region, SPL- SR-01-2017, June 2017.

Conference /Seminar/workshop presentation.

1. **Mridula N**, Tarun Kumar Pant, A Quantitative Analysis On The Roles Of F3 Layers As Well As Solar Flux In Modulating The Topside Ionization Over Indian Region , presented at 33rd National Symposium on Plasma Science & Technology, PLASMA 2018, Delhi University, New Delhi, during December 4-7, 2018.
2. **Mridula N**, Tarun Kumar Pant, The generation of F3 layers over the dip equatorial location of Thiruvananthapuram - A new perspective, International Symposium on Equatorial Aeronomy (ISEA), Physical Research Laboratory, Ahmedabad, **during October 22-26, 2018.**

3. **Mridula N**, Contribution of Women in Space Technologies and Science, International Women's day -National Conference for ISRO Women employees,8-9 March 2018, NRSC, Hyderabad
4. Pant T.K, **Mridula. N.**, F3 layers over Thiruvananthapuram: A comprehensive Analysis on their generation and evolution, presented at 32nd National Symposium on Plasma Science & Technology, PLASMA 2017, Institute for Plasma Research, Gandhinagar (Gujarat) **during 07-10 November, 2017.**
5. Pant T.K.,**Mridula. N.**, A numerical simulation study on the role of horizontal wind shears in the generation of F0.5 layers over the dip equatorial location of Thiruvananthapuram, presented at 32nd National Symposium on Plasma Science & Technology, PLASMA 2017, Institute for Plasma Research, Gandhinagar (Gujarat) during 07-10, November, 2017.
6. Manju G, Tarun Kumar Pant, Sreelatha P, Rosmy John, **Mridula N**, et al., Ionization Density and Electric field Analyzer (IDEA) Experiment for Probing near Earth Space Environment onboard PSLV, The 24th Session of the Asia-Pacific Regional Space Agency Forum (APRSAF-24), Bengaluru, India, November 14-17, 2017.
7. Pant T.K. and **Mridula. N**, Long Term Radio investigation of Equatorial Ionosphere - A comprehensive study of additional stratification in equatorial F-region ionosphere, 3rd URSI Regional Conference on Radio Science (RCRS), Tirupati, during 1 to 4 March 2017.
8. **Mridula .N** and T.K. Pant, The generation and evolution of F3 layer over dip equatorial location –A new insight, NSSS-2016, Thiruvananthapuram, Feb 2016
9. **Mridula .N** and T.K. Pant, Plasma layering in the bottom side of F region an analysis,2nd URSI Regional Conference on Radio Science (RCRS),New Delhi , during 16 to 19 November 2015.
10. **Mridula.N** and T.K.Pant, Observational evidence for the large variabilities in the location of Equatorial Ionization Anomaly Trough (EAT) over Indian longitudes,National seminar on advances in space science and space missions held at NSS Hindu college ,Changanachery, during 11 to 13 March 2015.
11. Pant T.K and **Mridula.N**, A study on the topside ionosphere over Indian region using tomographic observations with RaBIT onboard YOUTHSAT,National seminar on advances in space science and space missions held at NSS Hindu College, Changanachery, during 11 to 13 March 2015.

12. **Mridula.N**and T.K.Pant, Non Occurrence Of Equatorial Spread F Plasma Irregularities in the Ionospheric Plasma Over Thiruvananthapuram-A Case Study, 29th National symposium on plasma science and technology Plasma 2014 held at M.G university Kottayam during Dec 8 to 11,2014.
13. **Mridula.N** and T.K.Pant, Study on the layering of the ionospheric plasma over Thiruvananthapuram, 29th National symposium on plasma science and technology Plasma 2014 held at M.G university Kottayam during Dec 8 to 11, 2014.
14. **Mridula.N**and T.K.Pant ,Observations Of Equatorial Spread F Irregularities In F3 Ionospheric Plasma Layers Over The Dip Equatorial Location of Thiruvananthapuram, 29th National symposium on plasma science and technology Plasma 2014 held at M.G university Kottayam during Dec 8 to 11,2014.
15. Pant T.K and**Mridula.N**, Study on the Ionospheric Plasma Variabilities over Indian Region Using Tomographic Observations with RaBIT Onboard YOUTHSAT, 29th National symposium on plasma science and technology Plasma 2014 held at M.G university Kottayam during Dec 8 to 11, 2014.
16. **Mridula.N**, Solar terrestrial connection: A Journey from Sun to Earth,Astronomy workshop at Sreekrishnapuram Govt. Engineering College, Palakkad during Feb 2014.
17. Vineeth C, **Mridula.N** and Tarun Kumar Pant,Planetary wave tidal interactions and Equatorial Electrojet, COSPAR 2012, Mysore, June 2012.
18. Pant T K, P Sreelatha, N **Mridula**, S Trivedi, RaBIT and LiVHySI onboard ‘YOUTHSAT’: New Results,et al., NSSS-2012, Gadanki, Feb 2012
19. Sudha Ravindran, **Mridula.N**, R.S Dabas, A.D Sarma, Rajneesh sarma, Tarun Kumar Pant, Manju G. , Spatio temporal variability of the equatorial and low latitude ionosphere –Results from Indian Ionospheric Tomography Experiment,CRABEX, AOGS 2010, Hyderabad, 2010.
20. **Mridula.N** ,Sudha Ravindran, Lijo Jose, Tarun Kumar Pant ,Temporal evolution of equatorial and low latitude ionosphere over a day, , NSSS 2010, Rajkot, 28 –Mar 02 2010.
21. R.Sridharan, Manju.G,P.sreelatha,Sudha R,Neha Naik,P.Pradeep kumar,Satheesh T,Tarun.K.Pant, **Mridula.N**,Lijo Jose, In-situ electron density and neutral wind (ENWi) measurements in the near earth space – results from solar eclipse campaign 2010, NaWROSE 2010 at SPL Thiruvananthapuram, Jan 27-28 2010.

Conference /Training /workshop participation.

1. Attended training on 6 sigma-Phase -2at at VSSC, Thiruvananthapuram from 11to 13 September 2018.
2. Attended training on 6 sigma-Phase -1 at at VSSC, Thiruvananthapuram from 31July to 2 August, 2018.
3. Attended National Workshop on Space Applications for Sustainable Growth and Advancement (SAGA), held at Thiruvananthapuram, 19-20 May, 2017.
4. Attended training on Big data at VSSC Thiruvananthapuram, during September 2016.
5. Workshop on Technical writing and presentation skills, held during December 2016, at VSSC, Thiruvananthapuram
6. Workshop on Adaptive finite element methods organized by the department of Mathematics, IIST, from 16 to 25 March **2012**.
7. Seminar on ‘Raman spectroscopy and its application in Space ’at IIST on November 13, **2011**.
8. Workshop on YOUTHSAT Data utilization for ionospheric studies and hands on training (DUIS-- 2011), October 14,15 **2011** at VSSC
9. Space Physics Laboratory Silver Jubilee Symposium: ‘Expanding Frontiers of Atmospheric and Space Science’, organized by SPL, VSSC, 24-25 April **2009** at VSSC, Thiruvananthapuram.
10. International Conference on solar cells, at CUSAT from January 21to 23, **2008**.
11. National Conference on New horizons in theoretical and experimental physics at CUSAT from October 8 to 11, **2008**.
12. Seminar on Quantization of Fields at Vimala College, Thrissur on December 12, **2005**.
13. Seminar on statistical mechanics at Christ College, Thrissur, on March 29, **2005**.
14. Workshop on Innovative experiments, organized by Nuclear science centre, New Delhi and Dept of Physics St Thomas College, at Thrissur on March 10, **2005**.
15. Seminar on Changes in the concepts of Physics at St. Aloysius College, Thrissur on October 17, **2003**.

Thesis Advisor:

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