



Koneru Lakshmaiah Education Foundation

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Campus: Green Fields, Vaddeswaram - 522 302, Guntur District, Andhra Pradesh, INDIA.

Phone No. +91 8645 - 350 200; www.klef.ac.in; www.klef.edu.in; www.kluniversity.in

Admin Off: 29-36-38, Museum Road, Governorpet, Vijayawada - 520 002. Ph: +91 - 866 - 3500122, 2576129

Space Technology and Atmospheric Science Research Lab (STAR Lab) (L701)

Professor In-charge: Dr. D. Venkata Ratnam (Emp ID: 2684)

S.No	Item
1	Description
2	Geo-Tagged Photos
3	List of Projects
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Salient features:

- Expertise faculty in Atmospheric Science, statistical analysis of extreme temperatures, heat wave analysis, thunderstorm studies,
- Expertise in Ionospheric Total Electron Content, mitigation/prediction of ionospheric scintillations, ionospheric modeling, gradient analysis,
- Expertise in Global Navigation Satellite System and Wireless communication navigation systems
- A Stat of art GNSS receivers, VLF receivers, Atmospheric data processing work station, NAVIC receivers, software defined GNSS receivers, GNSS data processing Berense software.
- Executed more than 10 sponsored research projects and presently three projects are excocted
- More than 10 Ph.D. thesis awarded 10 patents are published and more than 100 SCI papers published in Atmpsheric, GNSS , ionosphere and wireless communication research areas.
- State, National and International research collabrations with APDMA, Nagoya, INGV, Italy, Nagoya University, Japan, Russian Academy of Science, Russia, CMFRI, Gujrat, TCIL, New Delhi, Dept of Telcome.

Description

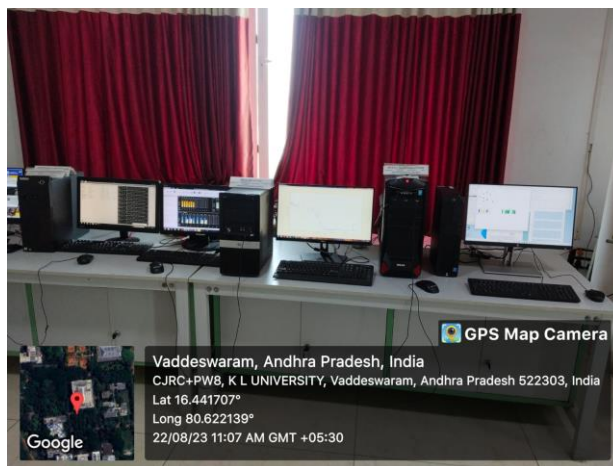
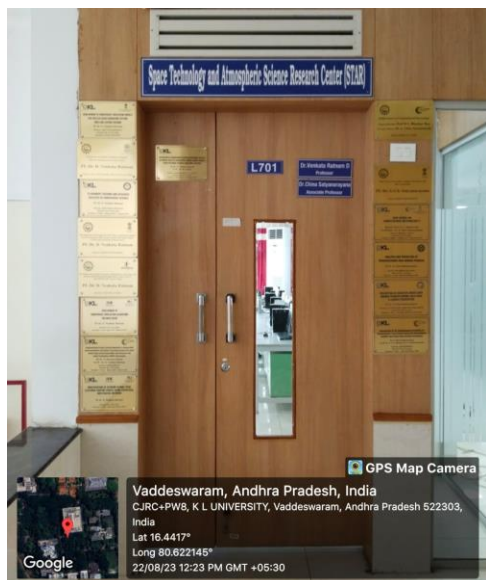
This Laboratory has mainly focused on teaching, research and industry collaboration to produce highly competent scientists/ engineers/ technologists in the field of space technology and atmospheric science and through focusing on specializations in Communication Sector, lower and upper atmosphere and satellite navigation systems, weather and climate data mining and applications.

Research areas like TEC prediction analysis, mitigation/prediction of ionospheric scintillations, ionospheric modeling, gradient analysis, development of data assimilation models, statistical analysis of extreme temperatures, heat wave analysis, thunderstorm studies, etc., are been conducted in the lab.

The faculty, students and research scholars of KL University and also from other institutions are involved in effective research using the equipment available in this lab sanctioned under various sponsored projects. Full time scholars and part time scholars are using the facilities for their research work. 16 members completed their Ph.D work and several good quality papers have been published in Science citation indexed journals.

Geo-tagged Photos:





List of Projects:

S. No.	Name (s) of the Members	Title of the project	Amount sanctioned (in Rs.)	Funding Agency	Status
1.	Dr. D. Venkata Ratnam (PI)	Development of ionospheric forecasting models for satellite based navigation systems over low latitude stations	21.33 Lakhs	DST- Fast track Young Scientist Scheme, India	Completed
2.	Dr. D. Venkata Ratnam (PI)	Development of Ionospheric forecasting Algorithms for GNSS users	5.00 Lakhs	ISEE-Nagoya University, International Joint Research Program	Completed
3.	Dr. D. Venkata Ratnam (PI) Dr. M. Sridhar (Co-PI)	Mitigation of ionospheric scintillation noise effects on Indian Satellite Navigation System (NAVIC) signals using software defined radio GNSS receiver	22.37 Lakhs	AICTE- Research Promotion Scheme (RPS)	Ongoing
4.	Dr. M. Sridhar (PI) Dr.D.Venkata Ratnam (Co PI)	Development of machine learning based ionospheric scintillations forecasting algorithms using GNSS observations	20.46 Lakhs	SERB-Core Research Grant (CRG)	Ongoing

5.	Dr. D. Venkata Ratnam	To Augment teaching and Research Facilities of Atmospheric Science	47.00 Lakhs	DST-FIST	Completed
6.	Dr. G. Sivavara Prasad (PI) Dr. D. Venkata Ratnam (Co-PI)	Implementation of Deep Learning Algorithms to develop Web based Ionospheric Time Delays Forecasting System over Indian Region using ground based GNSS and NAVigation with Indian Constellation (NAVIC) observations	17.97 Lakhs	ECR-SERB	Completed
7.	Dr. D. Venkata Ratnam (PI)	Investigation of Extreme Global Total Electron Content Events using Statistical and Fractal Methods	5.00 Lakhs	ISEE-Nagoya University-International Joint Research Program	Completed
8.	Dr. G. China Satyanarayana (PI)	Analysis and Prediction of Thunderstorms over Andhra Pradesh	7.12 Lakhs	CSIR	Completed
9.	Prof. D. V. Bhaskar Rao (Director) Dr. G. China Satyanarayana (Co-Director)	SERB School on Computational Meteorology-2	20.5 Lakhs	DST-SERB	Completed
10.	Dr. G. China Satyanarayana (PI)	Projection of Disaster Events over Andhra Pradesh during 2023-2050: A Climate Perspective	94.71 Lakhs	Andhra Pradesh State Disaster Management (APSDMA)	Ongoing
11.	Dr. G. China Satyanarayana (PI) Dr. P. V. V. Kishore (Co-PI) Dr. D. Venkata Ratnam (CO-PI)	Investigation of the spatiotemporal variability of thunderstorms from ground-based and geostationary satellite data using Deep-Learning techniques	21.13 Lakhs	SERB- Core Research Grant (CRG)	Ongoing

List of Major Equipment:

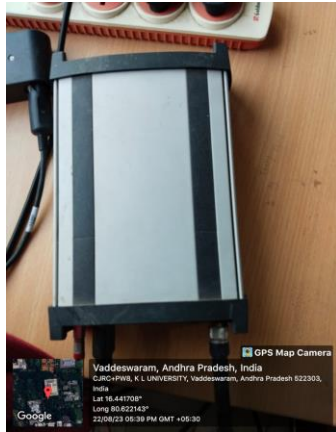
Equipment like GPStation-6 GNSS Ionospheric Scintillation and TEC Monitor (GISTM) receiver, Indian Regional Navigation System (IRNSS)/GPS/SBAS receiver, Bernese Software, Software Defined Radio, Parallel Computer System, etc., are available in this lab for GNSS studies, weather and climatic conditions.

S. No.	Name of the Equipment	Model & Make	Cost in INR
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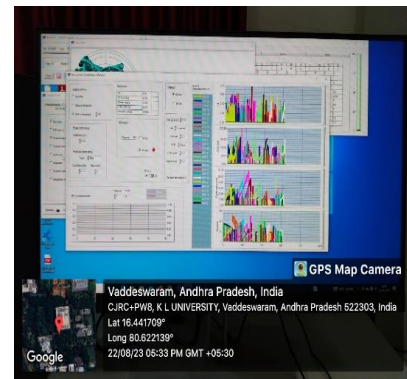
1.	MET4/4A Meteorological Sensor	Paroscientific Inc., US	8,24,844.00
2.	Dual Frequency GNSS Receiver- with antenna	GPStation 6, NovAtel Inc., Canada	13,60,000.00
3.	Bernese GNSS Software	University of Bern, Switzerland	8,29,207.00
4.	Indian Regional Navigation System (IRNSS)/GPS/SBAS Receiver	ISRO SAC and ACCORD Software and Systems Pvt. Ltd	8,00,000.00
5.	GNSS Software Defined Radio	iP-Solutions, Japan	16,77,999.00
6.	Parallel Computer System	Tyrone	9,09,477.00
7.	Mid Tower Workstation	Tyrone	1,49,757.00



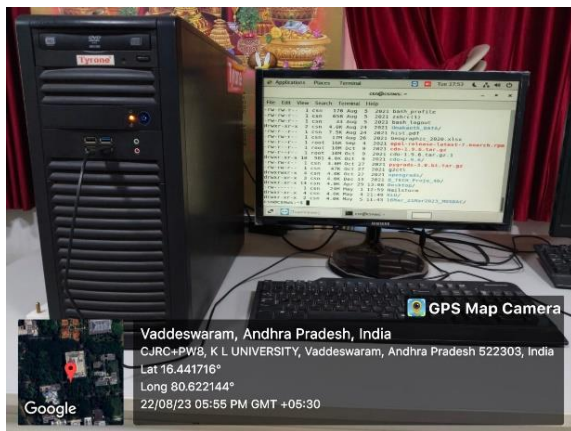
IRNSS Receiver and Antenna



GPStation-6 Receiver and Antenna



Software Defined Radio GNSS Receiver and Antenna



Parallel Computer System

MET4/4A Meteorological Sensor

List of Publications:

1. Emmela, S., Ratnam, D.V., Otsuka, Y., Shinbori, A., Sori, T., Nishioka, M. and Perwitasari, S., 2023. An Extreme Value Analysis of Long-term GNSS Ionospheric Total Electron Content Data Observed at Japan Grid Point Location (34.95° N and 134.05° E). *IEEE Geoscience and Remote Sensing Letters*.
2. Emmela, S., Ratnam, D.V. and Leong, T.E., 2023. Regional ionospheric TEC modeling during geomagnetic storm in August 2021-data fusion using multi-instrument observations. *Advances in Space Research*.
3. Sivakrishna, K., Venkata Ratnam, D. and Sivavaraprasad, G., 2023. An improved NeQuick-G global ionospheric TEC model with a machine learning approach. *GPS Solutions*, 27(2), p.85.
4. Emmela, S. and Ratnam, D.V., 2023. Regional ionospheric model response of geomagnetic storm during March 2015 using data fusion mechanism: GPS, COSMIC RO and SWARM. *Acta Geophysica*, 71(1), pp.553-566.
5. Rao, T.V., Sridhar, M., Ratnam, D.V. and Kumar, B.S., 2022, December. Study of Sporadic E layer effect on the F layer during 23 rd June 2015 geomagnetic storm event. In 2022 URSI Regional Conference on Radio Science (*USRI-RCRS*) (pp. 1-4). IEEE.
6. Sivakrishna, K., Ratnam, D.V. and Sivavaraprasad, G., 2022. Support Vector Regression model to predict TEC for GNSS signals. *Acta Geophysica*, 70(6), pp.2827-2836.
7. Sivakrishna, K., Ratnam, D.V. and Sivavaraprasad, G., 2022. A Bidirectional Deep-Learning Algorithm to Forecast Regional Ionospheric TEC Maps. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 15, pp.4531-4543.
8. Flavio Ferraz Vieira, Manuela Oliveira, Marco Aurélio Sanfins, Eugénio Garção, Hariprasad Dasari, Venkata Dodla, G. C. Satyanarayana, Joaquim Costa and José G. Borges (2022) "Statistical analysis of extreme temperatures in India in the period 1951–2020". *Natural Hazard*, <https://doi.org/10.21203/rs.3.rs-1469495/v1> (3.56 Impact factor)
9. Sivaramakrishna, S.S.V., Rao, B.R.S., Satyanarayana, G.C. et al. (2022) Simulation of Regional Climate over the Indian subcontinent through dynamical downscaling using WRF-

ARW model. *TheorApplClimatol* 148, 391–413. <https://doi.org/10.1007/s00704-021-03905-5> (3.375 impact factor)

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11. N. Umakanth, G. Ch. Satyanarayana, et al., (2022) Power spectrum analysis of pre-monsoon season rainfall over Andhra Pradesh and Telangana. *AIP Conference Proceedings* 2357, 030025 (2022); <https://doi.org/10.1063/5.0080932>.
12. N. Naveena, G. Ch. Satyanarayana, N. Umakanth, et al. (2022) An observational analysis of pollution concentration from two major cities in Andhra Pradesh, India, *AIP Conference Proceedings* 2357, 030032; <https://doi.org/10.1063/5.0081085>
13. N. Naveena, G. Ch. Satyanarayana, N. Umakanth, et al. (2022) Statistical downscaling in maximum temperature future climatology, *AIP Conference Proceedings* 2357, 030026 (2022); <https://doi.org/10.1063/5.0081087>
14. KCT, Swamy, Devanaboyina, Venkata Ratnam, Shaik, TA. Double difference method with zero and short base length carrier phase measurements for Navigation with Indian Constellation satellites L5 (1176.45 MHz) signal quality analysis. *Int J SatellCommun Network.* 2022; 1- 11. doi:10.1002/sat.1441
15. K Siri Lakshatha, D Venkata Ratnam, K Sivakrishna. Applicability of NeQuick G ionospheric model for single-frequency GNSS users over India[J]. *AIMS Geosciences*, 2022, 8(1): 127-136. doi: 10.3934/geosci.2022008
16. T. V. Rao, M. Sridhar and D. V. Ratnam, "An Automatic CADI's Ionogram Scaling Software Tool for Large Ionograms Data Analytics," in *IEEE Access*, vol. 10, pp. 22161-22168, 2022, doi: 10.1109/ACCESS.2022.3153470.
17. Khan, Pathan I., Devanaboyina V. Ratnam, Perumal Prasad, Ghouse Basha, Jonathan H. Jiang, Rehana Shaik, Madineni V. Ratnam, and Pangaluru Kishore. 2022. "Observed Climatology and Trend in Relative Humidity, CAPE, and CIN over India" *Atmosphere* 13, no. 2: 361. <https://doi.org/10.3390/atmos13020361>

18. Vankadara, Ram K., Sampad K. Panda, Christine Amory-Mazaudier, Rolland Fleury, Venkata R. Devanaboyina, Tarun K. Pant, Punyawati Jamjareegulgarn, Mohd A. Haq, Daniel Okoh, and Gopi K. Seemala. 2022. "Signatures of Equatorial Plasma Bubbles and Ionospheric Scintillations from Magnetometer and GNSS Observations in the Indian Longitudes during the Space Weather Events of Early September 2017" *Remote Sensing* 14, no. 3: 652. <https://doi.org/10.3390/rs14030652>
19. Shafi, S., Ratnam, D.V. A trust based energy and mobility aware routing protocol to improve infotainment services in VANETs. *Peer-to-Peer Netw. Appl.* 15, 576–591 (2022). <https://doi.org/10.1007/s12083-021-01272-6>.
20. G. Sivavaraprasad, I. Lakshmi Mallika, K. Sivakrishna, D. Venkata Ratnam, A novel hybrid Machine learning model to forecast ionospheric TEC over Low-latitude GNSS stations, *Advances in Space Research*, Volume 69, Issue 3, 2022, Pages 1366-1379, ISSN 0273-1177, <https://doi.org/10.1016/j.asr.2021.11.033>.
21. Satyanarayana Gubbala, C., Dodla, V.B.R. & Desamsetti, S (2021). Assessment of wind energy potential over India using high-resolution global reanalysis data. *J Earth Syst Sci* 130, 64 . <https://doi.org/10.1007/s12040-021-01557-7>(1.8 Impact factor),
22. Umakanth, N., Satyanarayana, G. C., Naveena, N. et al. (2021). Statistical and dynamical based thunderstorm prediction over southeast India. *J Earth Syst Sci* 130, 71. <https://doi.org/10.1007/s12040-021-01561-x> (1.8 Impact factor)
23. Naveena, N., Satyanarayana, G. C., Rao, K.K. et al. (2021) Heat wave characteristics over India during ENSO events. *J Earth Syst Sci* 130, 166. <https://doi.org/10.1007/s12040-021-01674-3> (1.8 Impact factor).
24. Neelam, N., Satyanarayana, G. C., Rao, K. S., Umakanth, N., & Raju, D. (2021). Centuries of Heat Waves over India during 20th and 21st Century. *Applied Environmental Research*, 43(4), 1-13. <https://doi.org/10.35762/AER.2021.43.4.1>
25. N. Naveena ,G. Ch. Satyanarayana, A. Dharma Raju , K Sivasankara Rao and N. Umakanth (2021) Spatial and statistical characteristics of heat waves impacting India, *AIMS Environmental Science*, 8(2): 117–134. DOI: 10.3934/environsci.2021009.

26. N. Naveena; G. Ch. Satyanarayana, A. Dharma Raju; N. Umakanth; D. Srinivas; K. Sivasankar Rao; M. Suman (2021)“Prediction of Heatwave 2013 over Andhra Pradesh and Telangana, India using WRF Model”, Asian Journal of Atmospheric Environment - Vol. 15, No. 3. DOI: <https://doi.org/10.5572/ajae.2020.117>.
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29. Sri Harsha, N.C., Anudeep, Y.G.V.S., Vikash, K., Ratnam, D.V., Performance Analysis of Machine Learning Algorithms for Smartphone-Based Human Activity Recognition, (2021) 121 (1), pp. 381-398.
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36. Priyanka, Ch., Venkata Ratnam, D., Sai Krishna Santosh, G.A review on design of low noise amplifiers for global navigational satellite system(2021) *AIMS Electronics and Electrical Engineering*, 5 (3), pp. 206-228.
37. Siva Krishna, K., Venkata Ratnam, D. Analysis of differential code biases and inter-system biases for GPS and NavIC satellite constellations(2021) *AIMS Electronics and Electrical Engineering*, 5 (3), pp. 194-205.
38. Rao, T.V., Sridhar, M., Ratnam, D.V., Harsha, P.B.S., Srivani, I.A Bidirectional Long Short-Term Memory-Based Ionospheric foF2 and hmF2 Models for a Single Station in the Low Latitude Region,(2021) *IEEE Geoscience and Remote Sensing Letters*, .
39. Naveena, N., Satyanarayana, G.C., Rao, D.V.Bhaskar Rao and D. Srinivas (2021). An accentuated “hot blob” over Vidarbha, India, during the pre-monsoon season. *Nat Hazards*. <https://doi.org/10.1007/s11069-020-04357-2> (3.4 Impact factor)
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44. Umakanth, N., Satyanarayana, G.C., Simon, B. et al. Analysis of various thermodynamic instability parameters and their association with the rainfall during thunderstorm events over

- Anakapalle (Visakhapatnam district), India. *Acta Geophys.* 68, 1549–1564 (2020).
<https://doi.org/10.1007/s11600-020-00478-1>(2.4 Impact factor)
45. Umakanth, N., Satyanarayana, G.C., Simon, B. et al. (2020) Long-term analysis of thunderstorm-related parameters over Visakhapatnam and Machilipatnam, India. *Acta Geophys.* 68, 921–932 (2020). <https://doi.org/10.1007/s11600-020-00431-2>(2.4 Impact factor)
46. N. Umakanth, G. Ch.Satyanarayana, Baby Simon and Myla Chimpiri Rao (2020) Satellite Based Interpretation of Stability Parameters on Convective Systems over India and Srilanka, *Asian Journal of Atmospheric Environment* 14(2):119-132, DOI: 10.5572/ajae.2020.14.2.119 (1.4 Impact factor)
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48. N. Umakanth, G. Ch. Satyanarayana, B. Simon, M.C. Rao and N. Ranga Babu (2020) Climatological analysis of lightning flashes over Kerala, *AIP Conference Proceedings* 2220(1):140040, DOI: 10.1063/5.0001292
49. Vishnu Vardhan, A., Babu Sree Harsha, P., Venkata Ratnam, D., Upadhyaya, A.K.Low latitude ionospheric response to March 2015 geomagnetic storm using multi-instrument TEC observations over India,(2020) *Astrophysics and Space Science*, 365 (12), art. no. 187, .
50. Harsha, P.B.S., Ratnam, D.V., Nagasri, M.L., Sridhar, M., Padma Raju, K., Kriging-based ionospheric TEC, ROTI and amplitude scintillation index (S4) maps for India(2020) *IET Radar, Sonar and Navigation*, 14 (11), pp. 1827-1836.
51. Sivavaraprasad, G., Venkata Ratnam, D., Sridhar, M., Sivakrishna, K. Modelling and forecasting of ionospheric TEC irregularities over a low latitude GNSS station(2020) *Astrophysics and Space Science*, 365 (10), art. no. 168, .
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53. Mallika I, L., Ratnam, D.V., Raman, S., Sivavaraprasad, G. Performance analysis of Neural

Networks with IRI-2016 and IRI-2012 models over Indian low-latitude GPS stations(2020) *Astrophysics and Space Science*, 365 (7), art. no. 124, .

54. Sridhar, K.M., Sridhar, M., Raghunath, S., Venkata Ratnam, D. Ionospheric anomaly detection and Indian ionospheric climatology from GAGAN receivers(2020) *Acta Geodaetica et Geophysica*, 55 (2), pp. 223-235.
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58. Babu Harsha, P., Venkata Ratnam, D. Generation of Regional Ionospheric TEC Maps with EIA Nowcasting/Forecasting Capability during Geomagnetic Storm Conditions (2020) *IEEE Access*, 8, art. no. 9044338, pp. 57879-57890.
59. Lakshmi Mallika, I., Venkata Ratnam, D., Raman, S., Sivavaraprasad, G. A New Ionospheric Model for Single Frequency GNSS User Applications Using Klobuchar Model Driven by Auto Regressive Moving Average (SAKARMA) Method over Indian Region(2020) *IEEE Access*, 8, art. no. 9039612, pp. 54535-54553.
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List of MoUs:

S.No.	Details of MoU	Duration
1.	MoU for IRNSS Navigation Receiver Field Trial and Data Collection between Space Applications Centre (SAC) – ISRO, Ahmedabad and KLEF, Vaddeswaram.	Five Years (December 2015 to December 2020)
2.	MoU for Installation of Indian Lightning Detection Network (ILDN) Receiver System and Data Collection between Department of Physics, Tripura University (A Central University) and Department of ECE, KLEF, Vaddeswaram.	Five Years (April 2022 to April 2027)
3.	MoU between KLEF (Vaddeswaram) and Indian Council of Agricultural Research- Central Marine Fisheries Research Institute (CMFRI), Kochi' India	Five Years (January 2022 to January 2027)
4.	MoU for Collaboration for the Promotion of Academic Cooperation and Exchange of Research Activities between	Nine Years (August 2017 to August 2028)

	Andhra Pradesh State Disaster Management Authority (APSDMA), Andhra Pradesh and KLEF, Vaddeswaram	
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