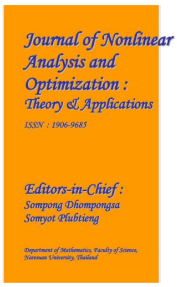
Journal of **N**onlinear **A**nalysis and **O**ptimization
Vol. 15, Issue. 1, No.10 : 2024
ISSN :**1906-9685**



Estimation model on precipitation by using google earth engine

J.VINAY Under Graduate, department of civil engineering, Vignan's Institute of Information Technology, Duvvada, 530049, India,E-mail::20l31a0152@vignaniit.edu.in
P.KIRNMAI Under Graduate, department of civil engineering, Vignan's Institute of Information Technology,Duvvada, 530049, India, E-mail:21l35a0135@vignaniit.edu.in
M.JITENDRA Under Graduate, department of civil engineering, Vignan's Institute of Information Technology, Duvvada, 530049, India, E-mail:20l31a0172@vignaniit.edu.in
K.VARAHALA RAJU Under Graduate, department of civil engineering, Vignan's Institute of Information Technology,Duvvada, 530049, India, E-mail:20l31a0169@vignaniit.edu.in
P.SHIVA KUMAR Asst.Professor,department of civil engineering,Vignan's Institute of Information Technology, Visakhapatnam,530049, India, E-mail:padmakarmaddala@gmail.com

Abstract:

- Precipitation patterns change more erratically as global temperatures rise.Increased precipitation in some areas could result in flooding and soil erosion, while extended droughts and water scarcity could affect other locations. For the storage, distribution, and use of water resources to be managed sustainably, precipitation must be controlled properly.A wide range of geospatial data, including precipitation data, is accessible through Google Earth Engine (GEE) for environmental study, monitoring, and analysis. The main sources of precipitation data in Google Earth Engine are reanalysis datasets and satellite-based observations. Climate Hazards Group InfraRed Precipitation with Station (CHIRPS): CHIRPS generates high-resolution precipitation estimates worldwide by fusing data from ground stations and satellite observations.

Keywords:*Earth observation,Water resource management,Climate data,Time-series analysis , Big data analysis*

1. INTRODUCTION

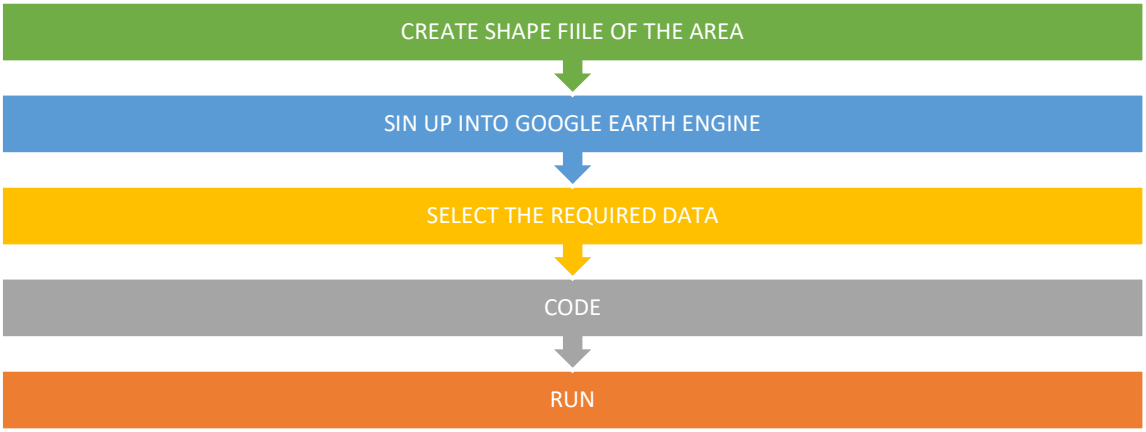
The constant movement of water on, above, and below the surface of the Earth is referred to as the hydrological cycle, or the water cycle. Water moves through a number of processes to and from the land, the ocean, and the atmosphere.[1]The hydrological cycle is essential to maintaining life on Earth and controlling the flow of water across the world. the main mechanisms in the hydrological cycle ispercipitation.**[2]**Any type of water, whether liquid or solid, that descends from the atmosphere to the Earth's surface is referred to as precipitation. It comes in a variety of forms, including hail, sleet, rain, and snow, and is an essential part of the water cycle.[3] When atmospheric water vapor condenses to create droplets or ice crystals that are heavy enough to fall under the force of gravity, precipitation happens. [4]Around the world, precipitation is essential for maintaining ecosystems, restocking freshwater supplies, promoting agriculture, and influencing weather and climate trendsGoogle created Google Earth Engine, a cloud-based platform for analyzing environmental data at the planetary scale. Scientists, researchers, and developers may examine and visualize changes on Earth's surface throughout time thanks to its advanced computational capabilities and extensive library of satellite photos and[5] geographical databases.Massive Data Archive: Landsat, Sentinel, MODIS, and other satellite images and geospatial datasets are among the many resources hosted by Google Earth

Engine. Numerous environmental factors, including land cover, vegetation indices, climate data, and land surface temperature, are covered by these datasets.Tools for Data Analysis: A set of tools for processing, evaluating, and displaying geographic data is offered by Google Earth Engine[6]. With the help of the Earth Engine API, users may create Python or JavaScript scripts that do intricate analysis, gather data, and create unique visualizations.Scalable Computing architecture: To deliver high-performance and scalable computing resources, Google Earth Engine makes use of Google's cloud computing architecture. This makes it possible for users to effectively perform computationally demanding activities and evaluate big datasets.**[7]**Time-series Analysis: With Google Earth Engine, users may trace changes to the Earth's surface over time by performing time-series analysis on satellite imagery. Monitoring changes in land use and cover, deforestation, urbanization, and natural disasters can all benefit from this.Collaborative Platform: With common scripts, datasets, and visualization tools, Google Earth Engine enables user collaboration and data sharing. Users can benefit from the knowledge and resources of a large community of researchers and developers working on environmental concerns.Applications[8]: The Google Earth Engine finds its use in a multitude of sectors, including urban planning, forestry, agriculture, climate science, ecology, and disaster response. Numerous applications are supported by it, such as crop yield estimation, habitat modeling, land cover mapping, deforestation monitoring, and climate change analysis.

2. STUDY AREA:

.Situated amidst hills and woods, it is part of the Eastern Ghats region The location of Anakapalle is 34 kilometers northeast ofVisakhapatnam in the state of Andhra Pradesh.Anakapalle's climate is characterized by hot summers, mild winters, heavy rainfall during the monsoon season, and a relatively dry period during the rest of the year.[9] These climate conditions influence various aspects of life in the region, including agriculture, tourism, and daily activities.The CHIRPS (Climate Hazards Group InfraRed Precipitation with Station) dataset is a high-resolution precipitation dataset developed by the Climate Hazards Group at the University of California, Santa Barbara (CHG-UCSB). It combines satellite imagery with ground station data to produce gridded precipitation estimates at a spatial resolution of approximately 5 kilometers (0.05 degrees) globally. [10]The location of Anakapalle is 34 kilometers northeast of Visakhapatnam in the state of Andhra Pradesh. Validation Studies: A thorough validation process has been conducted on the CHIRPS dataset using observations from weather stations, rain gauges, and other sources of precipitation data that are collected on the ground. Numerous validation tests have been carried out worldwide, encompassing a broad spectrum of climate areas and conditions.[11]Comparison with Other Datasets: TRMM (Tropical Rainfall Measuring Mission), GPM (Global Precipitation Measurement), and satellite-based products like CMORPH (Climate Prediction Center Morphing method) are a few examples of other commonly used precipitation datasets with which CHIRPS has been compared[12].

3.METHODOLOGY:


CREATE SHAPE FIILE OF THE AREA
SIN UP INTO GOOGLE EARTH ENGINE
SELECT THE REQUIRED DATA
CODE
RUN

There are various phases involved in creating a shapefile in ArcGIS[13].The following is a basic how-to for creating a shapefile:

- Start ArcMap: ArcMap is a program that is included with the ArcGIS Desktop software package.
- To initiate a new map document, select "File" > "New" > "Map Document."
- Launch the Catalog Window: The Catalog window can be opened by selecting "Windows" > "Catalog". You can manage your data and make new shapefiles with this window.
- Go to the Location: Open the Catalog window and select the geodatabase or folder where the new shapefile is to be created.
- Right-click and choose Shapefile > New. To generate a shapefile, right-click on the folder or geodatabase and choose "New" > "Shapefile."
- Specify Shapefile Properties: Fill in the following properties in the "Create New Shapefile" dialog box:Name: Give the shapefile a name.Choose the feature type (Point, Polyline, Polygon, etc.) that you wish to build.[14]Select the coordinate system that works best for your shapefile. Either define a new coordinate system or choose one that already exists.Fields: Specify the names and data types of the attribute fields in your shapefile.
- Click OK: To create the shapefile after you've set its characteristics, click "OK".
- Edit the Shapefile: With ArcMap's editing capabilities, you may now add, remove, or alter features in the shapefile.
- Remember to click "File" > "Save" after making any updates to ensure that your changes are saved.

You must take the following actions in order to register for Google Earth Engine:

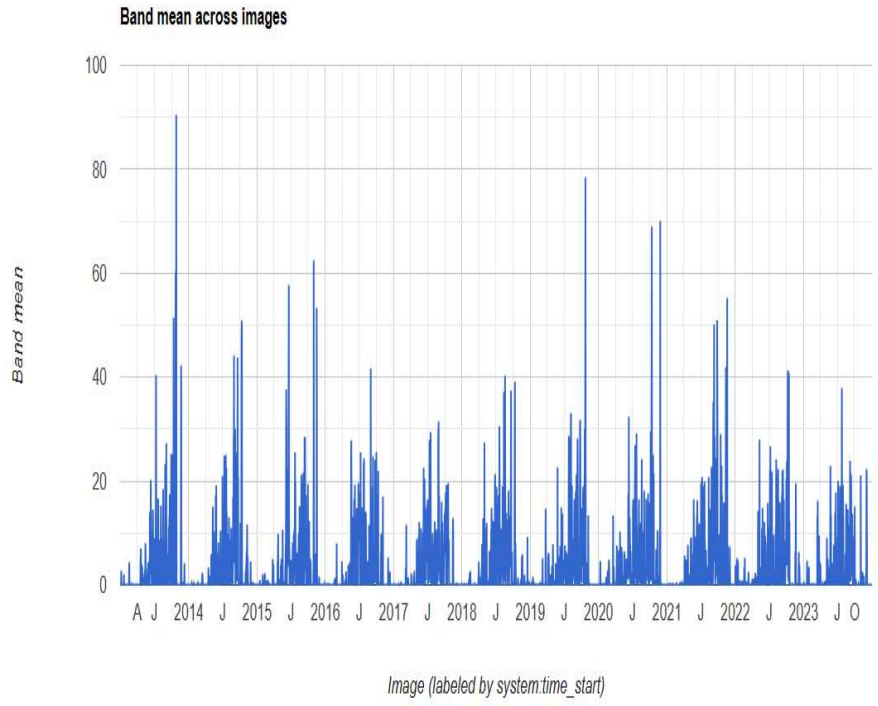
- Go to the website for Google Earth Engine[15]: Visit https://earthengine.google.com/ to access the Google Earth Engine website, then click the "Sign Up" button in the upper right corner of the screen.
- Give the necessary information. [16]Provide the required details on the sign-up form, such as your email address, nationality, organization (if any), and reason for access request. Additionally, you might be prompted to accept the privacy statement and terms of service.
- Submit Request: To submit your request for access to Google Earth Engine, fill out the necessary fields and then click the "Submit" or "Request Access" button.
- Await Approval: Google staff usually reviews access requests for Google Earth Engine before granting-permission.
- Await acceptance: The Google team normally reviews requests for access to Google Earth Engine, and acceptance may take some time[17,18,19]. You will receive an email message with access details to the platform as soon as your request is accepted.
- Access Earth Engine: After being approved, use your Google account login credentials to

access Google Earth Engine. To log in and use the platform, go to the Google Earth Engine website and click the "Sign In" option

High spatial and temporal resolution worldwide precipitation estimates are provided by the CHIRPS (Climate Hazards Group InfraRed Precipitation with Station) dataset[20,21,22]. This is a summary of the precipitation data from CHIRPS:

- Data Source: To generate precipitation estimates, CHIRPS integrates ground-based precipitation data from meteorological stations with satellite infrared photography.[23,24,25,26] While precipitation can be directly measured using data from ground stations, temperature and cloud cover can be determined using information from satellites.(data we had untill 2024)

RESULT:



CONCLUSION:

In summary, rainfall data is essential for comprehending and tracking patterns and variability in precipitation at both regional and global scales[27,28,29,30]. One example of such data is the CHIRPS (Climate Hazards Group InfraRed Precipitation with Station) dataset.it helps us to monitor the daily data in place which you are.it is a easy process.there is no any delay on the work.it may be our mistake that will take place in error[31,32]. Check the code line to line if any mistake is was take place the java will run on line to line. The code will stop at error place and we can recorrect code by observing it.[33,34] This code which we obtained for chirps we can modify it and convert into our requirment and work on it.

REFERENCES:

1. Keshav, Vasanth, and Sudhir Vummadisetti. "Non-rectangular plates with irregular initial imperfection subjected to nonlinear static and dynamic loads." *International Journal of Advances in Engineering Sciences and Applied Mathematics* 15, no. 4 (2023): 155-158.
2. Vummadisetti, Sudhir, and S. B. Singh. "The Influence of Cutout Location on the Postbuckling Response of Functionally Graded Hybrid Composite Plates." In *Stability and Failure of High Performance Composite Structures*, pp. 503-516. Singapore: Springer Nature Singapore, 2022.
3. Sathi, Kranthi Vijaya, Sudhir Vummadisetti, and Srinivas Karri. "Effect of high temperatures on the behaviour of RCC columns in compression." *Materials Today: Proceedings* 60 (2022): 481-487.
4. Vummadisetti, Sudhir, and S. B. Singh. "Buckling and postbuckling response of hybrid composite plates under uniaxial compressive loading." *Journal of Building Engineering* 27 (2020): 101002.
5. Vummadisetti, Sudhir, and S. B. Singh. "Postbuckling response of functionally graded hybrid plates with cutouts under in-plane shear load." *Journal of Building Engineering* 33 (2021): 101530.
6. Vummadisetti, S., and S. B. Singh. "Boundary condition effects on postbuckling response of functionally graded hybrid composite plates." *J. Struct. Eng. SERC* 47, no. 4 (2020): 1-17.
7. Singh, Shamsher Bahadur, Sudhir Vummadisetti, and Himanshu Chawla. "Development and characterisation of novel functionally graded hybrid of carbon-glass fibres." *International Journal of Materials Engineering Innovation* 11, no. 3 (2020): 212-243.
8. Vummadisetti, Sudhir, and S. B. Singh. "Buckling and postbuckling response of hybrid composite plates under uniaxial compressive loading." *Journal of Building Engineering* 27 (2020): 101002.
9. Singh, S. B., Himanshu Chawla, and Sudhir Vummadisetti. "Experimental and Analytical Studies of Failure Characteristics of FRP Connections." In *Recent Advances in Structural Engineering, Volume 2: Select Proceedings of SEC 2016*, pp. 755-757. Springer Singapore, 2019.
10. Singh, S. B., Sudhir Vummadisetti, and Himanshu Chawla. "Assessment of interlaminar shear in fiber reinforced composite materials." *Journal of Structural Engineering* 46, no. 2 (2019): 146-153.
11. Singh, S. B., Himanshu Chawla, and Sudhir Vummadisetti. "Experimental and Analytical Studies of Failure Characteristics of FRP Connections." In *Recent Advances in Structural Engineering, Volume 2: Select Proceedings of SEC 2016*, pp. 755-757. Springer Singapore, 2019.
12. Singh, S. B., Sudhir Vummadisetti, and Himanshu Chawla. "Influence of curing on the mechanical performance of FRP laminates." *Journal of Building Engineering* 16 (2018): 1-19.
13. Rakesh, Pydi, Padmakar Maddala, Mudda Leela Priyanka, and BorigarlaBarhmaiah. "Strength and behaviour of roller compacted concrete using crushed dust." (2021).
14. Barhmaiah, Borigarla, M. Leela Priyanka, and M. Padmakar. "Strength analysis and validation of recycled aggregate concrete." *Materials Today: Proceedings* 37 (2021): 2312-2317.
15. Padmakar, M., B. Barhmaiah, and M. Leela Priyanka. "Characteristic compressive strength of a geo polymer concrete." *Materials Today: Proceedings* 37 (2021): 2219-2222.

16. Priyanka, Mudda Leela Leela, Maddala Padmakar, and BorigarlaBarhmaiah. "Establishing the need for rural road development using QGIS and its estimation." *Materials Today: Proceedings* 37 (2021): 2228-2232.
17. Srinivas, K., M. Padmakar, B. Barhmaiah, and S. K. Vijaya. "Effect of alkaline activators on strength properties of metakaolin and fly ash based geo polymer concrete." *JCR* 7, no. 13 (2020): 2194-2204.
18. Mathew, Rojeena, and M. Padmakar. "Defect development in KDP Crystals produced at severe Supersaturation."
19. Sathi, Kranthi Vijaya, Sudhir Vummadisetti, and Srinivas Karri. "Effect of high temperatures on the behaviour of RCC columns in compression." *Materials Today: Proceedings* 60 (2022): 481-487.
20. Jagadeeswari, Kalla, Shaik Lal Mohiddin, Karri Srinivas, and Sathi Kranthi Vijaya. "Mechanical characterization of alkali activated GGBS based geopolymer concrete." (2021).
21. Srinivas, Karri, Sathi Kranthi Vijaya, Kalla Jagadeeswari, and Shaik Lal Mohiddin. "Assessment of young's modulus of alkali activated ground granulated blast-furnace slag based geopolymer concrete with different mix proportions." (2021).
22. Kalla, Jagadeeswari, Srinivas Karri, and Kranthi Vijaya Sathi. "Experimental analysis on modulus of elasticity of slag based concrete." *Materials Today: Proceedings* 37 (2021): 2114-2120.
23. Srinivas, Karri, Sathi Kranthi Vijaya, and Kalla Jagadeeswari. "Concrete with ceramic and granite waste as coarse aggregate." *Materials Today: Proceedings* 37 (2021): 2089-2092.
24. Vijaya, Sathi Kranthi, Kalla Jagadeeswari, and Karri Srinivas. "Behaviour of M60 grade concrete by partial replacement of cement with fly ash, rice husk ash and silica fume." *Materials Today: Proceedings* 37 (2021): 2104-2108.
25. Mohiddin, Shaik Lal, Karri Srinivas, Sathi Kranthi Vijaya, and Kalla Jagadeeswari. "Seismic behaviour of RCC buildings with and without floating columns." (2020).
26. Kranthi Vijaya, S., K. Jagadeeswari, S. Lal Mohiddin, and K. Srinivas. "Stiffness determination of alkali activated ground granulated blast furnace slag based geo-polymer concrete." *Mater. Today Proc* (2020).
27. Srinivas, K., M. Padmakar, B. Barhmaiah, and S. K. Vijaya. "Effect of alkaline activators on strength properties of metakaolin and fly ash-based geo polymer concrete." *JCR* 7, no. 13 (2020): 2194-2204.
28. Borigarla, Barhmaiah, and S. Moses Santhakumar. "Delay Models for Various Lane Assignments at Signalised Intersections in Heterogeneous Traffic Conditions." *Journal of The Institution of Engineers (India): Series A* 103, no. 4 (2022): 1041-1052.
29. Barhmaiah, Borigarla, A. Chandrasekar, Tanala Ramya, and S. Moses Santhakumar. "Delay models for Signalised Intersections with Vehicle Actuated Controlled system in Heterogeneous Traffic Conditions." In *IOP Conference Series: Earth and Environmental Science*, vol. 1084, no. 1, p. 012038. IOP Publishing, 2022.
30. Borigarla, Barhmaiah, Triveni Buddaha, and Pritam Hait. "Experimental study on replacing sand by M− Sand and quarry dust in rigid pavements." *Materials Today: Proceedings* 60 (2022): 658-667.
31. Singh, Sandeep, BorigarlaBarhmaiah, Ashith Kodavanji, and Moses Santhakumar. "Analysis of two-wheeler characteristics at signalised intersection under mixed traffic conditions: A case study of Tiruchirappalli city." In *13th Asia Pacific Transportation Development Conference*, pp. 35-43. Reston, VA: American Society of Civil Engineers, 2020.

32. Brahmaiah, B., and A. Devi Prasad. "Study &Analysis Of An Urban Bus And Metro Route Using Vissim Simulated Data." *International Journal of Latest Trends in Engineering and Technology* 8, no. 1 (2017): 406-412.
33. Brahmaiah, B., M. Tech-IITR, A. D. Prasad, and K. Srinivas. "A Performance Analysis Of Modelling Route Choice Behavior On Urban Bus And Multi Mode Transit Route." *Int. J. Adv. Inf. Sci, Technol* (2017): 11.
34. Brahmaiah, B., and A. Devi Prasad. "PERFORMANCE ANALYSIS OF AN URBAN BUS AND METRO ROUTE USING COMMUTER SURVEY & TRAFFIC DATA."