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Impact Of Temperature And Its Effects In Hydrology In Yercaud Hill

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Abstract

Land surface temperature (LST) is an important variable in climate, hydrologic, ecological, and biophysical and biochemical studies. The most effective way to obtain LST measurements is through satellites. Presently, LST from moderate resolution imaging spectra radiometer (MODIS) sensor is applied in various fields due to its high spatial and temporal availability over the globe, but quite difficult to provide observations in cloudy conditions. In our project is evolves of prediction of LST under clear and cloudy conditions using microwave vegetation indices (MVIs), elevation, latitude, longitude and Julian day as inputs employing an NDVI model. MVIs can be obtained even under cloudy condition, since microwave radiation has an ability to penetrate through clouds. Separate NDVI models were trained and tested for the grid cells for which both LST and MVI were available. The performance of the models was evaluated based on standard evaluation measures. The best performing model was used to predict LST where MVIs were available. Results revealed that predictions of LST using NDVI are in good agreement with the observed values. The NDVI approach presented in this study promises to be useful for predicting LST using satellite observations even in cloudy conditions.

Keywords: Impact, Temperature, Effects, Hydrology, Yercaud Hill

1.INTRODUCTION

Surface temperature is an important quantity for many environmental models, e.g. (1) energy and water exchange between atmosphere and surface, (2) numerical weather prediction, (3) global ocean circulation, (4) climatic variability, etc.. Only by remote sensing from satellites are measurements of surface temperature feasible on a regional or global scale. Satellite sensors measure the surface-leaving radiance modified by the atmosphere in different spectral channels; the corresponding brightness temperatures are calculated by reversing Planck’s function. Various algorithms exist to estimate Land Surface Temperature (LST) from brightness temperatures and auxiliary data. LST is sensitive to vegetation and soil moisture; hence it can be used to detect land surface changes, e.g. tendencies towards desertification. Geographical Information Systems allow a combined interpretation of satellite-derived LST and other geo-data, e.g. vegetation cover and soil-type maps. LST is the temperature measured at the Earth's surface and is regarded as its skin temperature. However, the land surface is far from being a skin or a homogenous two-dimensional entity: it is composed of different materials with various geometries both of which complicate LST estimation. Additionally, the surface is commonly even more inhomogeneous at low-resolution satellite spatial observations. Only for homogeneous surfaces at thermal equilibrium LST can be defined unambiguously. In remote sensing, LST is defined as the `surface radiometric temperature´ corresponding to the instantaneous field-of-view of the sensor or, more precisely, as the `ensemble directional radiometric surface temperature´ . The term `ensemble´ depicts the bulk contribution of an inhomogeneous pixel. For a given sensor viewing direction, LST depends on the distribution of temperature and emissivity within a pixel and the spectral channel of measurement. Thermodynamic temperature is measured at surface/atmosphere/thermometer point-of-contact, and is based on the `zeroth law of thermodynamics´, i.e. two systems in equilibrium with a third system, e.g. a thermometer, are also in equilibrium with each other. Here, the surface has to be clearly defined, i.e. it should be isothermal and homogeneous (the sub-systems have the same thermodynamic temperature). Only for homogeneous isothermal surfaces radiometric and thermodynamic temperatures are equivalent; even for a small-scale ensemble of black bodies at different temperatures there is no equivalent black body temperature yielding the same distribution of spectral radiance. LST represents the integrated effect of the whole 'ensemble' within a pixel; thus, LST is not confined to homogeneous isothermal surfaces. However, the definition of surface depends on the acquisition device, e.g. its scale/resolution, and should match the scale of the model. The definition of LST given above is probably the best for Earth's radiation budget and for canopy temperature estimation. Land Surface Temperature (LST) with high spatio-temporal resolution is in demand for hydrology, climate change, ecology, urban climate and environmental studies, etc. Moderate Resolution Imaging Spectroradiometer (MODIS) is one of the most commonly used sensors owing to its high spatial and temporal availability over the globe to obtain LST, but is incapable of providing this data under cloudy conditions, resulting in gaps in the data. In contrast, microwave measurements captured by the microwave sensors such as Advance Microwave Scanning Radiometer (AMSR)-Earth Observing System and AMSR2 are capable of penetrating through clouds. The current study proposes a methodology by exploring this property to predict high spatio-temporal resolution LST under cloudy conditions during daytime and nighttime without employing in-situ LST measurements. To achieve this, Artificial Neural Networks (ANNs) based models are employed for different land cover classes, utilizing Microwave Polarization Difference Index (MPDI) at finer resolution with ancillary data. MPDI was derived using resampled (from 0.25 to 1 km) brightness temperatures (Tb) at 36.5 GHz channel of dual polarization from AMSR-E and AMSR2 sensors. The proposed methodology is tested over Cauvery basin in India. Results indicated that the proposed methodology performed well for the considered land cover classes.

Land Surface Temperature (LST) with high spatio-temporal resolution is in demand for hydrology, climate change, ecology, urban climate and environmental studies, etc. Moderate Resolution Imaging Spectroradiometer (MODIS) is one of the most commonly used sensors owing to its high spatial and temporal availability over the globe, but is incapable of providing LST data under cloudy conditions, resulting in gaps in the data. In contrast, microwave measurements have a capability to penetrate under clouds. The current study proposes a methodology by exploring this property to predict high spatio-temporal resolution LST under cloudy conditions during daytime and nighttime without employing in-situ LST measurements. To achieve this, Artificial Neural Networks (ANNs) based models are employed for different land cover classes, utilizing Microwave Polarization Difference Index (MPDI) at finer resolution with ancillary data. MPDI was derived using resampled (from 0.25° to 1km) brightness temperatures (Tb) at 36.5GHz channel of dual polarization from Advance Microwave Scanning Radiometer (AMSR)-Earth Observing System and AMSR2 sensors. Land Surface Temperature (LST) is the thermodynamic temperature of the uppermost layer of the Earth's surface commonly measured using the thermal radiance obtained from the thermal infrared sensors over clear sky conditions. It is one of the key parameters in the field of climate research, weather forecast, land-surface interaction studies and it is a crucial parameter in global and regional models. The most commonly used infrared sensors available for the LST measurement are advanced very high radiometric resolution (AVHRR), moderate resolution imaging spectroradiometer (MODIS) which provide good spatial and temporal resolutions. Usually, LST obtained from the infrared measurements are derived using generalized split window algorithm, day and night algorithm or three channel LST algorithm. Nevertheless, there are many factors which affect the derivation of LST from the infrared sensors such as atmospheric absorption due to clouds and water vapor, which results in unavailability of LST data from the infrared sensors. This creates a lot of gaps in the LST data, which hinders their application in many fields. Many researchers have worked to overcome the effect of cloud in the measured radiance to reduce uncertainty of infrared thermal determinations, however, due to cloud cover lots of missing values can be noticed in the currently available LST data.

LST can also be measured from the microwave radiometers, which can be used as complement to the available infrared LST measurements. These microwave measurements can penetrate through non precipitating clouds and are less affected by the atmospheric absorption, due to which LST can also be derived over nearly all sky conditions which is an advantage over infrared measurements. But the LST obtained from the microwave measurements are of coarse resolutions, resulting in more uncertainty than the infrared LST. Many researchers had successfully derived LST from the microwave measurements over clear and cloudy conditions.

2.METHODOLOGY

2.1 Data Preprocessing

The LST and LULC data acquired from the MODIS sensor were in sinusoidal projection with the spatial resolution of 1km, To make all the data to be consistent with each other sinusoidal projection of MODIS datasets were changed to AMSR-E geographical projection using the MODIS reprojection tool (provided by NASA) by a nearest neighbor method.

2.2 Prediction Of Lst Over Clear And Cloudy Conditions

LST can be derived from the microwave brightness temperature of vertical polarization at 37GHz channel(Tb37V), because of the strong and linear relationship between them. But for the low vegetated surfaces, So In this context, we used microwave vegetation indices along with digital topographical and geographical data in the ANN model to predict LST under clear as well as cloudy conditions, because microwave vegetation indices used here are sensitive to short vegetated surfaces.

2.3 Evaluation Of Predicted LST

Pearson correlation coefficient (r), Nash Sutcliffe (NSE) and Root mean squared error (RMSE) evaluation measures were selected to evaluate the predicted LST with the available LST_ u images over clear sky conditions

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})\,(y_i - \bar{y}).}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 . \sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

$$NSE = 1 - \frac{\sum_{i=1}^{n}(x_i - y_i)^2}{\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

$$RMSE = \sqrt{\frac{\sum_{i=1}^{n}(x_i - y_i)^2}{n}}$$

where, x_i = observed values
$\bar{x}$= mean of the observed values
y_i = predicted values
n = number of observations

2.4 Microwave Vegetation Index (MVI)

Most remote-sensing-derived vegetation indices rely on light reflected in the red and near-infrared wavelengths as recorded by a passive sensor. This can present challenges of there is significant cloud cover or smoke in the atmosphere. Additionally, vegetation indices from passive sensors tend can be sensitive to soil background, atmospheric effects, and often experience saturation at high amounts/cover of vegetation.

An emerging technique for indexing the amount and cover of vegetation is through the use of active remote sensors or passive sensors recording radiation that can pass through clouds, smoke, and vegetation. One of these new techniques is the Microwave Vegetation Index (MVI). Described by Shi et al. (2008), the MVI uses observations from the Advanced Microwave Scanning Radiometer (AMSR-E) sensor on board the Aqua satellite (this satellite also carries one of the MODIS sensors) to derive a vegetation index. While some microwave sensors are “active” sensors - they emit radiation (in this case microwaves) and then measure a response to the emitted energy - AMSR-E is a passive microwave sensor, recording naturally-occurring microwaves that are reflected from the earth's surface. Microwaves have the advantage that they can penetrate clouds and smoke and, in general, are much less influenced by atmospheric conditions than are the visible regions of the electromagnetic spectrum. The MVI developed by Shi et al. (2008) uses microwave readings from two different frequencies to determine the cover of vegetation. Each of these different frequencies has the ability to penetrate vegetation canopy to a different degree, and the relative different in reflectance between these two can be interepreted to give an index of vegetation cover. The formula for doing so is not as straightforward as a simple passive sensor vegetation index (e.g., NDVI), though, because it is based on a theoretical “radiative transfer” model of how different surfaces reflect microwave radiation. Because different frequencies of microwaves penetrate vegetation layers to differing degrees, vegetation indices based on reflected microwave readings can better estimate vegetation conditions than spectral indices like NDVI. Spectral indices are responding only to a thin layer of the vegetation that is exposed to, and therefore reflects, the incident light. Microwaves, on the other hand, can penetrate the canopy and therefore provide information on leafy and woods parts of plants in the overstory and even some of the understory.

2.4.1 Limitations

A significant limitation of MVI to date is that the current satellite microwave sensors are of very coarse resolution (10s of kilometers). This limits the application of MVI to global or very large regional applications. Shi et al. (2008) found that the MVI was highly correlated with NDVI calculated from MODIS imagery only for areas with “short vegetation.” Also, given how new microwave vegetation indices are, there have not been many applications or validation studies of this technique. However, this is likely to change as microwave sensors and MVI research matures.

2.5 Fraction Of Photosynthetically Active Radiation

Photosynthetically active radiation (PAR) is the spectral range from 400-700nm that is used by plants in photosynthesis. The fraction of PAR (fPAR) is a parameter used in remote sensing and in ecosystem modeling that signifies the portion of PAR used by plants. fPAR is commonly used in ecosystem models because it has an important influence on exchanges of energy, water vapor and carbon dioxide between the surface of the earth and the atmosphere. Precipitation and temperature are two of the major factors that determine the proportion of PAR absorbed by plants. It is an important parameter in measuring biomass production because vegetation development is related to the rate at which radiant energy is absorbed by vegetation. fPAR can be measured on the ground with handheld instruments or inferred from satellite imagery over large spatial scales. The major approaches to generating fPAR estimates from remotely sensed images are:

Linear Modeling - linear modeling approaches attempt to relate reflectance data recorded by a sensor to field measurements of fPAR using linear regression techniques. Such approaches may correlate field-measured fractional cover with sensor reflectance bands, or to vegetation indices like NDVI (eg. Law & Waring 1994)

Physical Models - Physical models use principles of how light energy is absorbed or reflected from different surfaces to estimate physical characteristics of vegetation such as fractional cover, LAI and fPAR. Biophysical models incorporate parameters related to how light interacts with processes like photosynthesis, evapotranspiration, stress, and decay of plant material.

Artificial Neural Networks (ANN) - ANN are networks of simple processes, decisions, or algorithms applied to data that are good at analyzing data from non-linear and non-parametric systems (see Trombetti et al. 2008). These methods require correction for atmospheric variation and sometimes require bidirectional reflectance normalization. The images are composited over multiple days (i.e., the value for any given pixel in the final image is taken from the highest-quality readings for that pixel across multiple images) to minimize the impact of atmosphere and screening by clouds or snow. The relationship between satellite measures of reflectance and estimates of fPAR will vary depending on the type of vegetation being considered, and thus major land cover type is an important input to calculating fPAR. Satellite measurements of reflected radiation are often used to estimate the fPAR values that are used as an intermediate variable in models of NPP.

2.5.1 Limitations
Remotely sensed fPAR estimates are only approximations of true fPAR values. The mathematical models used to calculate fPAR vary widely, and each model contains assumptions and requires specific inputs. It is important to understand the model assumptions and assess the suitability of the model based on the available data, how well the model characterizes the vegetation compared to field measurements, and the desired output. Most models work optimally at a particular scale and in a particular ecosystem type, and the application of an existing model to a new location may require changes to the model. fPAR is often derived from spectral vegetation indices, such as NDVI, but there is no single equation with a set of coefficients that can be applied to images of different surface types. Estimation of fPAR by satellite imaging requires corrections for atmospheric effects, topography and diurnal variations, and values change rapidly throughout the season with changing phenology. fPAR estimates from visible/near-infrared images require a cloudless, clear image, and thus fPAR values are typically chosen from the best quality images over a multiple day period (often an 8 or 10-day window). For areas that are continually cloudy, the use of radar or lidar may be necessary to assess vegetation characteristic

2.6 GIS Software
A Geographic Information System (GIS Software) is designed to store, retrieve, manage, display, and analyze all types of geographic and spatial data. GIS software lets you produce maps and other graphic displays of geographic information for analysis and presentation.

2.6.1 GIS Mapping Software
GIS software lets you produce maps and other graphic displays of geographic information for analysis and presentation. With these capabilities a GIS is a valuable tool to visualize spatial data or to build decision support systems for use in your organization.

A GIS stores data on geographical features and their characteristics. The features are typically classified as points, lines, or areas, or as raster images. On a map city data could be stored as points, road data could be stored as lines, and boundaries could be stored as areas, while aerial photos or scanned maps could be stored as raster images.
Geographic Information Systems store information using spatial indices that make it possible to identify the features located in any arbitrary region of a map. For example, a GIS can quickly identify and map all of the locations within a specified radius of a point, or all of the streets that run through a territory.

In addition to the above capabilities, Maptitude implements a professional-strength relational database, a feature critical for GIS software. Attribute data may be freely joined to and detached from geographic layers and tables. Relational data manipulation is integrated with robust and powerful geoprocessing for spatial queries, polygon overlay, and other location-based analyzes. This is supported seamlessly so that data are moved easily to and from relational tables and geographic databases. In addition, the Maptitude fixed-format binary table supports 32,767 fields and 1 billion records, and has unlimited character field widths.

2.6.2 Maps And Layers
- The Create-a-Map Wizard allows users to easily create presentation-ready maps using their own data or the default maps
- The Display Manager allows a map to be customized on-the-fly
- User-defined preferences for map units, left/right side-of-road routing, file permissions, geocoding parameters, and many other settings
- Toolbox and mouse-based map navigation is supported and includes panning, zooming, and magnifying
- Map bookmark management allows the retrieval of custom map views
- Multi-layer map feature query tools allow direct interrogation of spatial locations
- A map librarian/manager allows the organization of various saved maps and comes with a library of pre-styled demographic maps
- Geographic database layering controls allow customization of layer visibility and drawing order
- Multiple maps can be open simultaneously, and can be duplicated, combined, synchronized, tiled, cascaded, and minimized/maximized
- There is explicit map scale control including undo
- Layer autoscaling allows customization of the scale at which layers are visible
- An interactive map overview window provides perspective as you work and the ability to zoom anywhere in the study region

2.6.3 VISUALIZATION
- Extensive layer style control includes font/style/opacity settings for points/lines/areas/labels/legends/drawings; point and area styles can use most image formats and their resolution can be controlled via scaling
- Thematic visualizations include color, pattern/icon, dot-density, chart, scaled-symbol, and 3D prism themes
- A drawing toolbox is provided, the drawing items are customizable, and there is a selection of north-oriented arrows
- Each map has an editable legend that automatically lists displayed features and has a live scale bar
- Stand-alone charting capabilities include pie, bar, line, area, scatter, and function charts
- Advanced text label placement and management tools include live label manipulation en-masse or individually, automated positioning, callouts/rotation, font control, multi-line, framing, hiding, styling, prioritizing, stretching, spacing, autoscaling, and additional text manipulation settings

- Maps and graphics can be copy/pasted or saved as pictures/bitmaps (with optional quality/resolution settings) for insertion into MS Office and other external applications
- Printing to any printer/paper size is supported, with a wide variety of spatial print options including using fixed scale, with actual point sizes, and as pre-rendered images
- Report/layout creation can utilize settings for snap grids, rulers, paper size/orientation, dimensions, margins, alignment, print options, automated district printing, and a variety of other graphics software oriented options
- Map interaction can be recorded to video
- Layer style/label/autoscale override is provided through the Feature Display tool
- Cartographic coloring uses Brelaz'sDsatur algorithm to assign colors that ensure that no two adjacent regions have the same color

2.6.4 Geocoding

- The tabular and geographic find tool can identify locations anywhere on earth
- Robust and flexible pin-mapping tools support geocoding by address, postal code, city/town, join, coordinate, longitude/latitude, by any populated place in the world (village, town, city), and also manually
- Custom geocodable indexes can be created to pin-map based on external datasets
- Geotagged images from smart phones, tablets, or GPS-enabled devices can be mapped imagery.
- Image layer and aerial photo tools include registration, a manager/librarian, contrast control, smoothing (from 2x2 to 10x10) and interpolation (nearest neighbor, bilinear, high quality bilinear, bicubic, high quality bicubic)
- The image servers supported are Google Earth and OGC Web Map Services (WMS)

2.6.5 Database

- The Maptitude GIS program has a powerful proprietary relational database
- Support is provided for over 50 file types and more than 100 GIS and CAD formats, some natively including Excel, MS Access, ODBC, dBase, CSV, ASCII, Arc GIS platform formats (EsriShapefile and Personal Geodatabase), MapInfo TAB, Oracle Spatial, and SQL Server Spatial
- Support is provided for exporting to many formats including Excel, dBase, CSV, ASCII, Lotus, Google KML, ArcGIS platform formats (EsriShapefile and ArcMap Document), MapInfo MIF, Oracle Spatial, SQL Server Spatial and AutoCAD DXF
- Table tools include the ability to transpose, group/aggregate, identify duplicates, calculate statistics, convert longitude/latitude to XY coordinates, print mailing labels, copy/paste values, and perform undo/redo of edits
- Regression and binary logic models can be estimated on any map layer or table
- Table field tools include the ability to hide, show, filter, lock, format, multi-field sort, create live expression/formula fields, and perform multi-cell fills
- Database modify tools include the ability to add/delete records/fields, delete filtered records, set aggregation rules, apply look-up table coding, and define field header balloon pop-up text
- Database joins can be aggregate/non-aggregate and as one-to-one, one-to-many, or many-to-one joins
- Multiple filters per layer or database can be created using SQL type queries, spatial queries (coincident, adjacent, within, and many more), and data classification methods
- Topological/non-topological spatial databases can be created for points, lines, areas, or grids
- Topological/non-topological layer (line/point/area) editing tools include the ability to use digitizers, create one-way streets, copy and paste lines, merge/split features/attributes, add/delete/move features, line/area conversion, point-to-line conversion, merging layers, clipping/masking geography by region/area, and undo/redo of edits
- There is comprehensive projection, datum, and coordinate system support both natively and via import/export, and this operates in conjunction with tools such as vector rubber sheeting and on-the-fly raster layer reprojection.
- Any record can be linked to multiple files including photos, documents, web pages, and slide-shows.

2.6.6 Development Platform

The Geographic Information System Developer's Kit (GISDK™) has 850+ Caliper Script functions that can be called to create add-ins, build custom applications, and to access Maptitude from .NET or as a COM Object

Processing

- Maptitude supports the latest Windows operating systems, file types, and common design elements. Maptitude runs as a 32-bit or 64-bit application on 32-bit or 64-bit Windows. Advantages of a 64-bit Maptitude include:
- Save to much higher resolution images
- Use more memory than the previous 4GB 32-bit limit
- Open/import files via 64-bit Microsoft Office (e.g. Excel and Access).

3. ABOUT STUDY AREA

Yercaud is a hill station in Salem District, in Tamil Nadu, India. It is located in the Shevaroys range of hills in the Eastern Ghats. It is situated at an altitude of 1515 metres (4970 ft) above sea level, and the highest point in Yercaud is the Servarayan temple, at 5,326 feet (1,623 m). The hill station is named owing to the abundance of forest near the lake, the name signifying Lake Forest. As a popular tourist destination, Yercaud is also called as Jewel of the South. Yercaud is connected to the city of Salem, Tami Nadu through a Highway of 28 km. Coffee and citrus fruits, most notably oranges, are grown in abundance, as well as bananas, pears and jackfruit. Scenically, Yercaud is as enchanting and picturesque as the hill stations on the Eastern Ghats and trekking will be an experience. The total extent of Yercaud Taluk is 382.67 km^2, including reserve forest. The entire county is administered as a township. Yercaud also has a village council. Stone-age implements have been found from the ancient shrine located near Shevaroy Hills (also known as Shevarayan Hills), which is about 5 km from the Yercaud lake.(Figure.1)

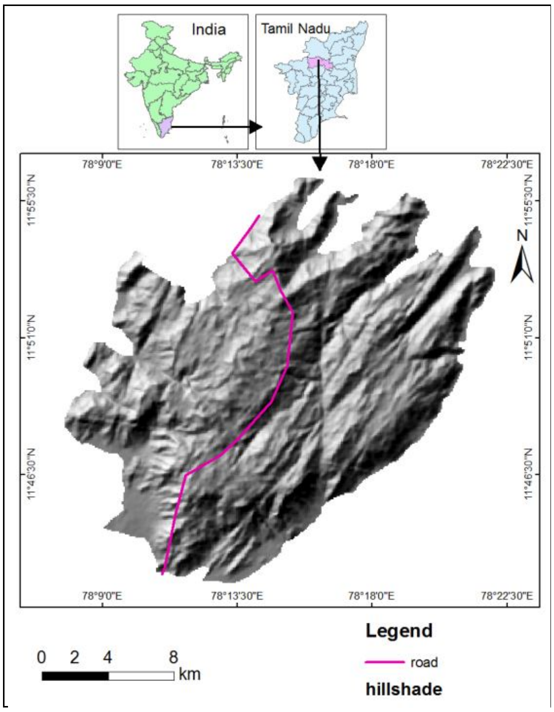

Figure 1: Study area

The National Orchidarium and Botanical garden is situated in Yercaud, it is maintained by southern circle of Botanical Survey of India. The National Orchidarium established in the year 1963. The total area of orchidarium is 18.4 hectares. There are 3000 trees and 1800 shrubs grown in Orchidarium. Insectivorous pitcher plant is among the interesting plants grown in the Botanical garden. Some of the original forests still exist in the Yercaud hills and contain several endemic species of plants and fauna. The Yercaud hills have many faunal and floral similarities to the Western Ghats. Coffee and citrus fruits, most notably oranges, are grown in abundance, as well as bananas, pears and jackfruit.

In the north eastern boundary has a Valapadi taluk in Salem District, while its southern boundary is located in Salem taluk, which forms a boundary of northern side is Papirettipatti taluk in Dharmapuri District and the weastern boundary located in Omalur taluk in Salem District. The temperature never rises above 30 °C or goes below 13 °C. The general elevation ranges from 300 to 520 m above MSL and higher elevation of 1200 to 1500 m confine to hill ranges due north with the exception of Yercaud which is at 1524 m above MSL The study area falls in three river namely 1)Thirumanimutharu, 2) Sarabanga and 3) Vaniyar River basin.The flow in the River is seasonal and surface flow could be seen during peak monsoon seasons.

4.ANALYSIS DATA

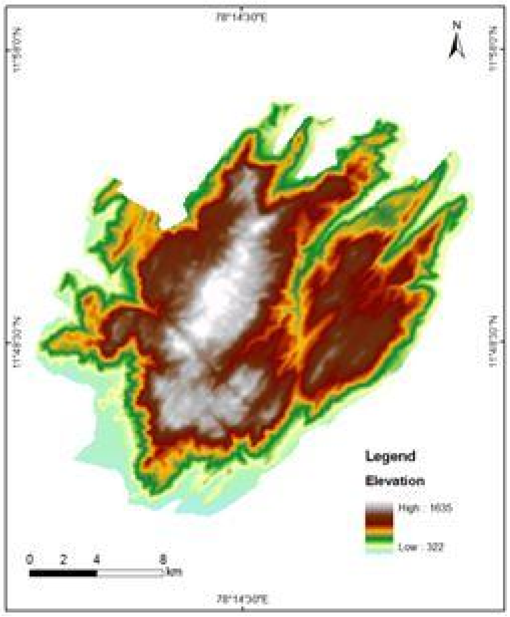

Figure 2 LST legend

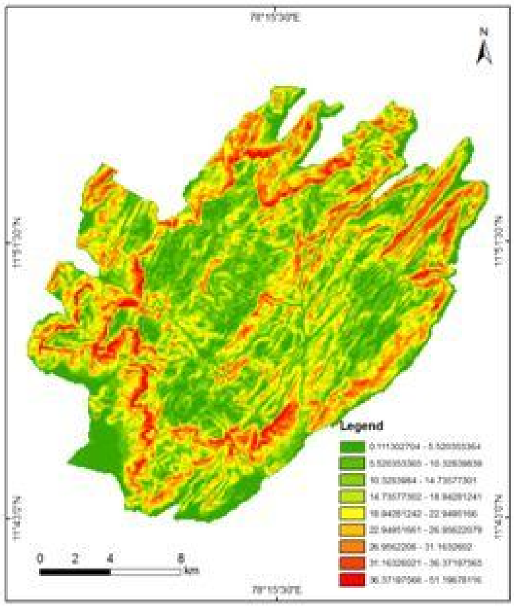

Figure 3 Legend

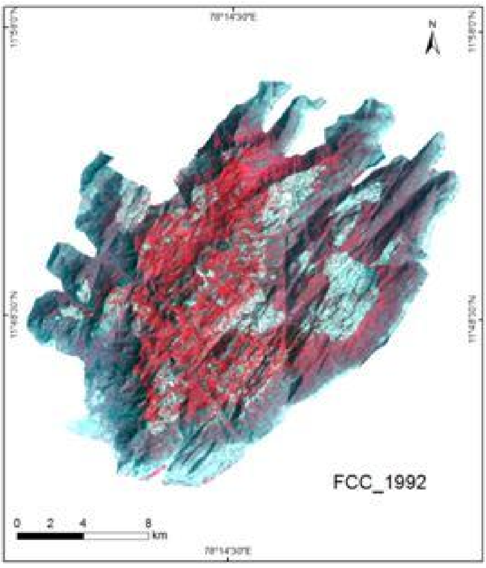

Figure 4 FCC data for 1992

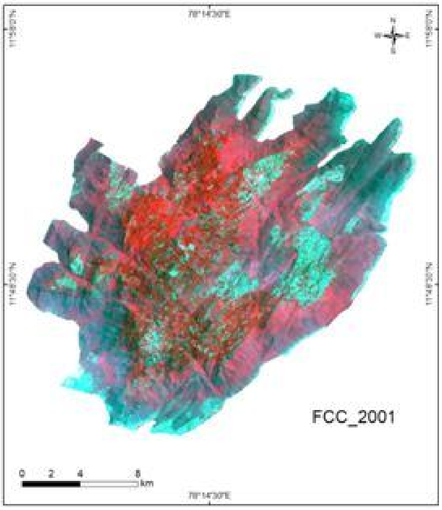

Figure 5 FCC data for 2001

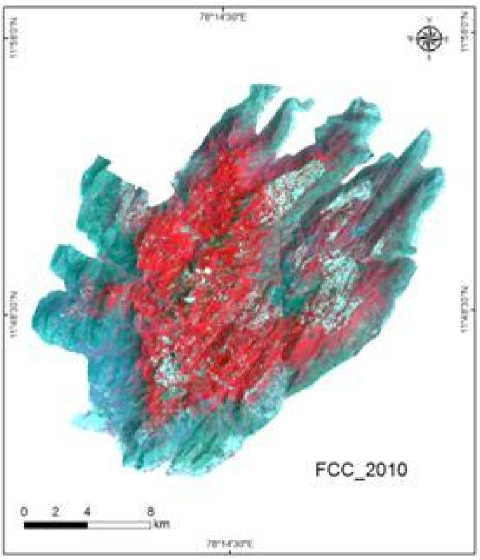

Figure 6 FCC data for 2010

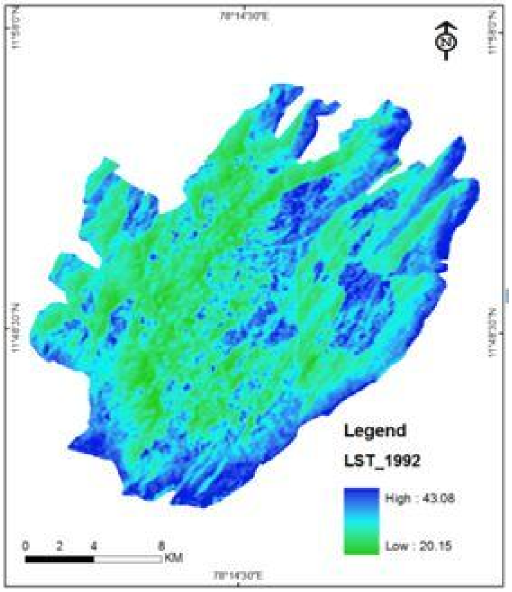

Figure 7 LST data for 1992

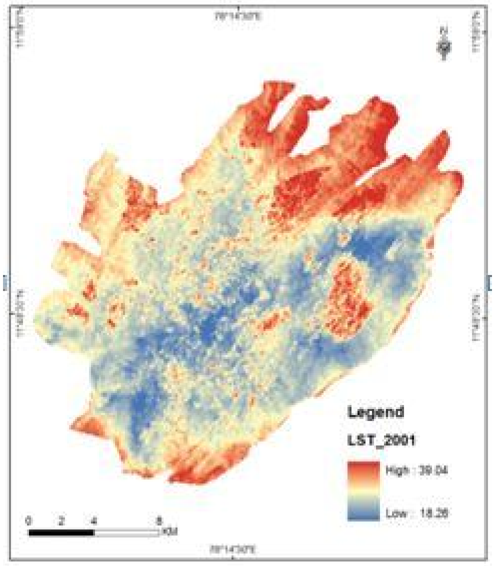

Figure 8 LST data for 2001

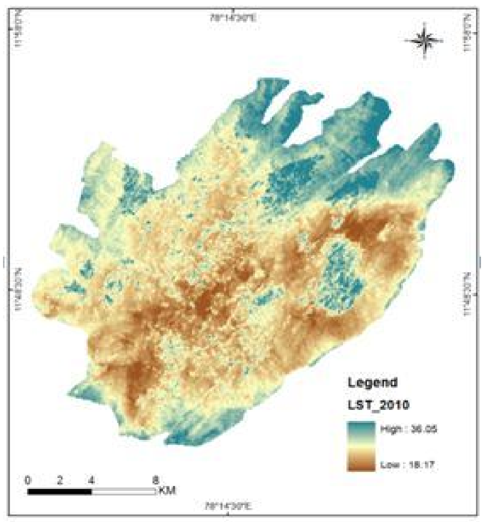

Figure 9 LST data for 2010

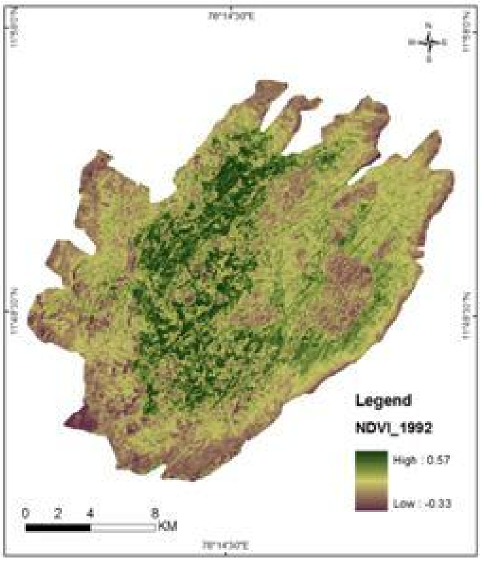

Figure 10 NDVI data for 1992

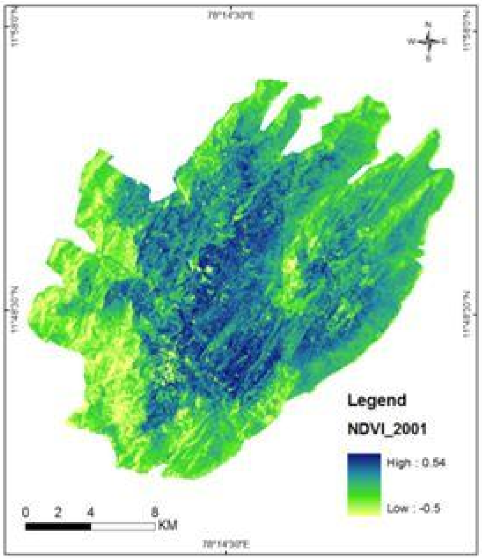

Figure 11 NDVI data for 2001

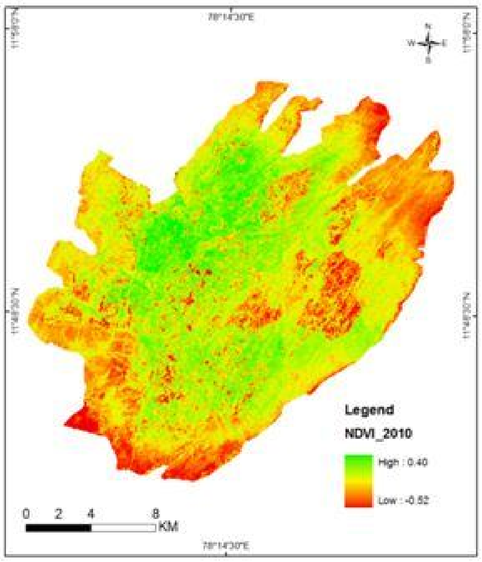

Figure 12 NDVI data for 2010

Figure.2,3,4,5,6,7,8,9,10,11 and 12 gives the LST,FCC and NDVI data for different years. Table.1. shows LANDSAT data.

Table 1 LANDSAT data

S.No	Data type	Resolution	Year of product	Source
1	Land sat 5	30m*	11-03-1992	Usgs
2	Land sat 7	30m*	15-05-2001	Usgs
3	Land sat 5	30m*	09-02-2010	Usgs

* **-** spatial resolution in thermal infrared is 120m, but is resampled in 30pixels

Figure.13 shows the methodology adopted in this study.

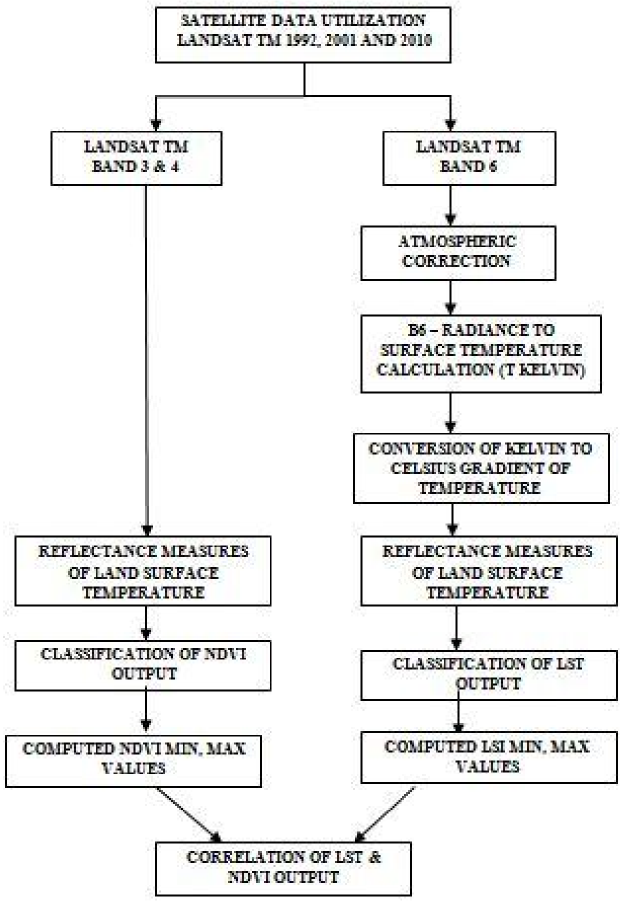

Figure 13 Methodology Adopted For Computation of LST and NDVI

5.CONCLUSION

In our study, potential of GIS to study the temperature variation in the study area by estimating the spatial distribution of LST with the help of different Landsat satellite data provided by the USGS with free of cost.

Satellite remote sensing technology is widely used for monitoring crops and agricultural drought assessment. Different vegetation indices are available today, but none of the major indices is considered inherently superior to the rest in all circumstances, some indices are better suited than others for certain uses.

NDVI due to its simple calculation is largely used for the vegetation studies in a regional as well as global level. Surface temperature variation controls the surface heat and water exchange with the atmosphere resulting climatic change in our study area. In our project study area falls in yercaud which is our study area, the major role such as land conversion due to rapid tourism development, ever increasing automobile carbon emission, periodical removal of firewood for example eucalyptus and forest replaced by settlement etc are resulting in temperature variation. By computing the values of NDVI and LST of the years 1992, 2001 and 2010 in a line graph it can be clearly noticed that both the parameters are inversely proportional to each other. When the temperature is greater, the NDVI value is lesser which points out the decrease in the vegetation density. The result help us to estimate the micro climate, heat pocket and maximum temperature vulnerable regions in the study area and also take the necessary scientific action to curbs the temperature increase.

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