VEGETATION AND PRECIPITATION BASED DROUGHT ASSESSMENT

Vivek Raj K[1], Sharath L[2], Sivakumar N[3],Vinay Krishna H V[4], Vinayak Venkataraman Hebbar[5]
[1]Assistant Professor, [2, 3, 4,5]Students,
Department of Telecommunication Engineering,
Dayananda Sagar College of Engineering, Bengaluru, India

Abstract : Drought monitoring is an important element to manage the effects drought. The predictions of rainfall are not accurate, which might lead to floods or drought due to which risk occurs. This paper presents drought risk control wherein drought monitoring is an important element. It is being monitored by the use of drought indices. Remote sensing and hydrological modelling strategies are applied to provide a set of all types of drought indicators. Drought indicators which consist of dryness signs, SPI (standardized precipitation index) and start of seasons which are produced by the usage of Satellite-based rainfall estimators. Vegetation condition is taken to analyse Normalized Difference Vegetation Index (NDVI). Agro-hydrologic models are used to combine numerous satellite data to produce multiple indicators of droughts. All the data set are integrated using different parameters to offer statistics about the severity and intensity of drought situations.

Keywords- Drought monitoring, remote sensing, composite index.

I. INTRODUCTION

One of major known hazard is draught which causes many damages to the nature, which occurs frequently and causes damage to the agriculture, property and human life. There are mainly 4 different types of draught namely: meteorological draught, agricultural draught, hydrological draught and socio-economic draught. Draughts mainly occur due to variety of reasons causing a high damage to the society and economy. Even draught monitoring is very essential and found using draught monitoring indices. The parameters that comes into picture are (a) Normalized Difference Vegetation Index, (b) Land Surface Temperature, (c) Vegetation and Water Index. With all these parameters draught can be monitored and assisted very easily and can analyze to predict rainfall, vegetation condition, soil moisture, and ground water. Some countries (most developing countries) have not extended organizations and technologies to detect drought and to overcome its effects. However, information on drought onset 234 Risks, Hydrological and Meteorological Hazards, and Disasters and improvements were not effectively available for the organizations to take precautions on effects of droughts. Recent Advanced technologies in remote sensing using satellite becoming better to handle difficulties of economical observance in drought and early warning for alerting. Remote sensing using satellites allows to get sustained drought observation over a spread of region and temporal measures which helps to facilitate to get information on areal extent of the area and progress in drought monitoring.

II. PROPOSED SYSTEM

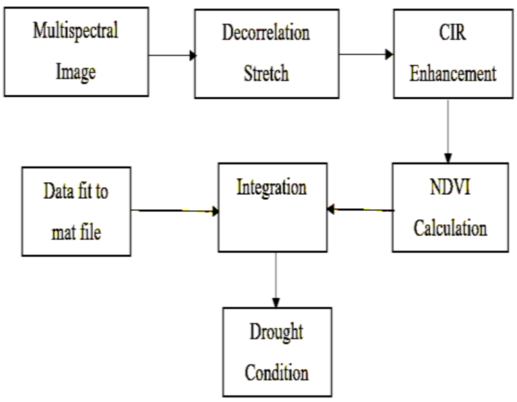

Figure 3.1 Block diagram

Vegetation is being monitored to know the conditions of drought using the NDVI (Normalized Difference Vegetation Index). To find the vegetation, multispectral image is taken from the satellite then it is enhanced and reconstructed to get NIR band

RED band. It is calculated using red band and NIR (near-infrared) band. NDVI (Normalized Difference Vegetation Index) = (Reflectance NIR (near-infrared) - Reflectance RED) / (Reflectance NIR (near-infrared) + Reflectance RED). NDVI is used to know the vegetation state based on the correlation of the vegetation characteristics with spectral reflectance. All the data set are integrated with vegetation index using different parameters to find the severity and intensity of drought situations.

A. Remote Sensing

Remote sensing is a getting some characteristics of an object with no direct contact between object even the earth remote sensing is used in many fields. Limit on earth remote sensing by optical signal is highly given importance here. Remote sensing, one of the method to find and observe the information of particular area by taking the reflected and electromagnetic waves emitted at a distance from the selected area. Cameras like multi-lens cameras are used to sense the images and collect the characteristics of the earth, which are used to observe the different parameters of the earth.

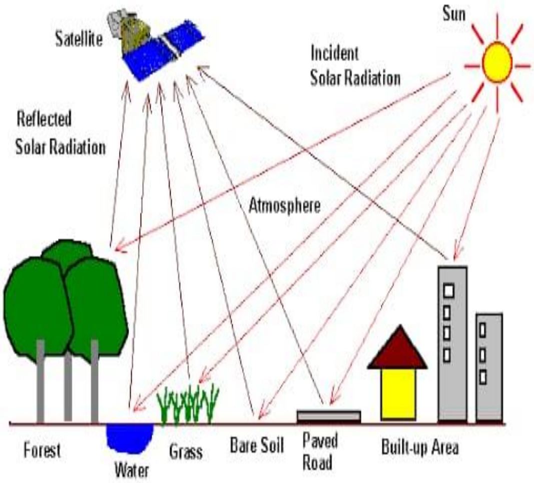

Figure. 4 (a) remote sensing satellite

B. Evapotranspiration (ET)

Evapotranspiration (ET) plays an important role in water cycle and has of two mini processes: vegetation surfaces and soil evaporation and transpiration. Since ET may be hard to live accurately, many hydrological modeling strategies are evolved to find the real ET victimization remote sensing using satellite. Generally, the Evapotranspiration modeling strategies may classified by two major types which encompasses models primarily based on water stability and surface strength balance.

C. SPI (Standardized Precipitation Index)

The SPI (Standardized Precipitation Index) is an important tool to find the duration and intensity of drought events. The Standardized Precipitation Index usually shows the rainfall details. Generally, SPI indicates the degree of dryness and wetness by investigating the collected rainfall data over different period of time. Following table shows the Standardized Precipitation Index values, which is more than 0 indicates wetter than the average, similarly negative SPI values indicates drier than average condition.

SPI value	Drought condition
2.00 and above	Extremely wet
1.50 to 1.99	Very wet
1.00 to 1.49	Moderately wet
-0.99 to 0.99	Normal
-1.00 to -1.49	Moderately dry
-1.50 to -1.99	Severely dry
-2.00 and less	Extremely dry

D. Soil Moisture

Soil moisture can be good index of drought which reflects environment conditions like precipitation. The soil column acts like a channel between approaching throughfall and precipitation and which makes to expel water from the hydrological system, i.e., drainages of subsurface and evapotranspiration. The drought index depends on the combined likelihood of dampness in the soil. Soil moisture also helps to to know about underground water level.

III. RESULTS

The results are obtained using MATLAB algorithms and "GUI" tool from MATLAB with collected data matrix and algorithm which describes about:

(a)Vegetation index-based drought monitoring, NDVI (Normalized Difference Vegetation Index)

(c) The Standardized Precipitation Index (SPI)

(d) Soil moisture

(e) Evapotranspiration

Some results are shown in following figures:

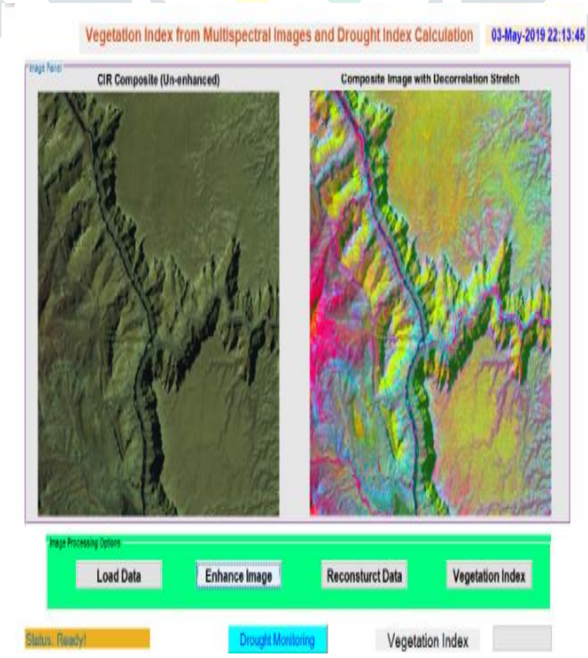

Figure: 4.1 Unenhanced and enhanced image of Hyperspectral image

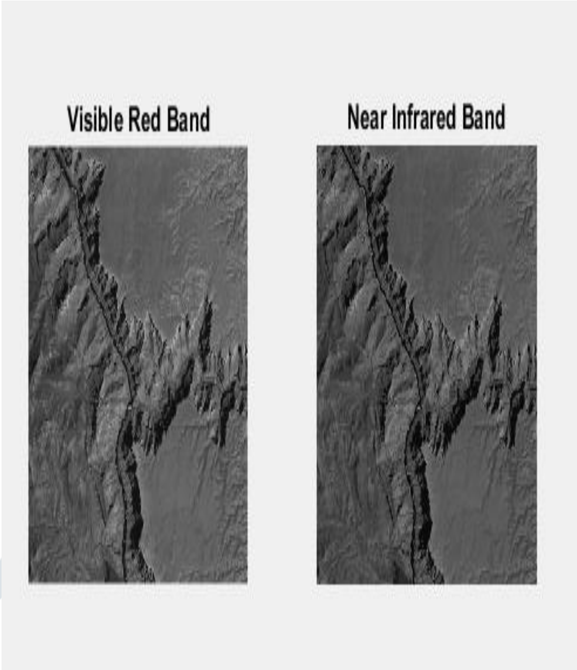

Figure: 4.2 Red band and near infrared band of enhanced image

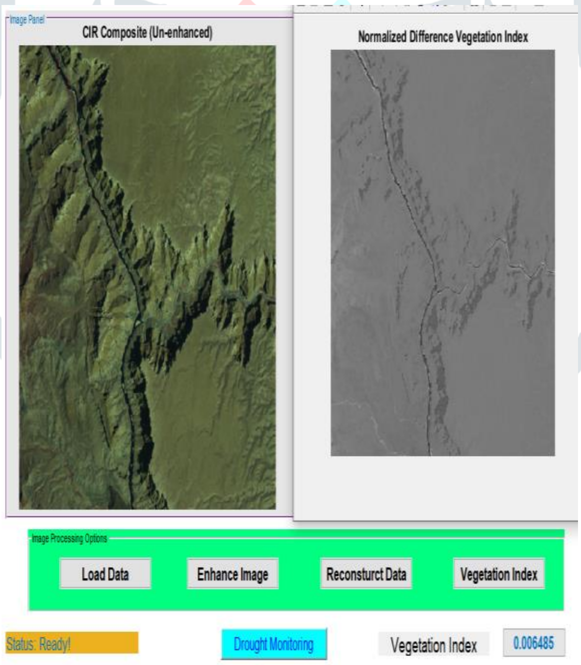

Figure: 4.3 Vegetation index

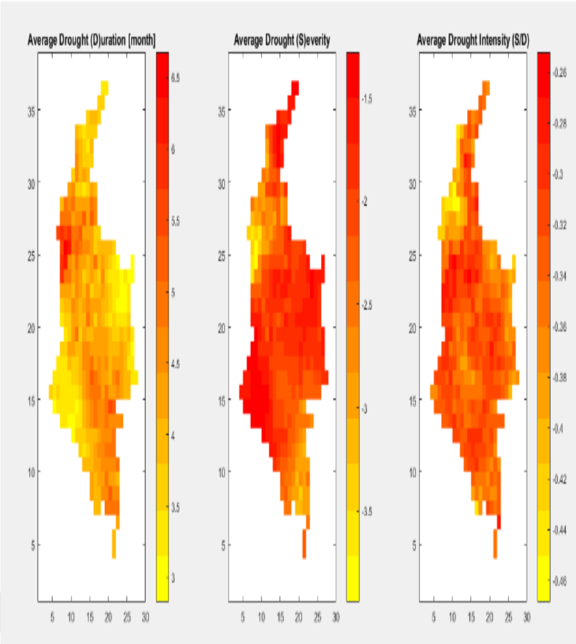

Figure: 4.4 Duration, severity and intensity of the drought

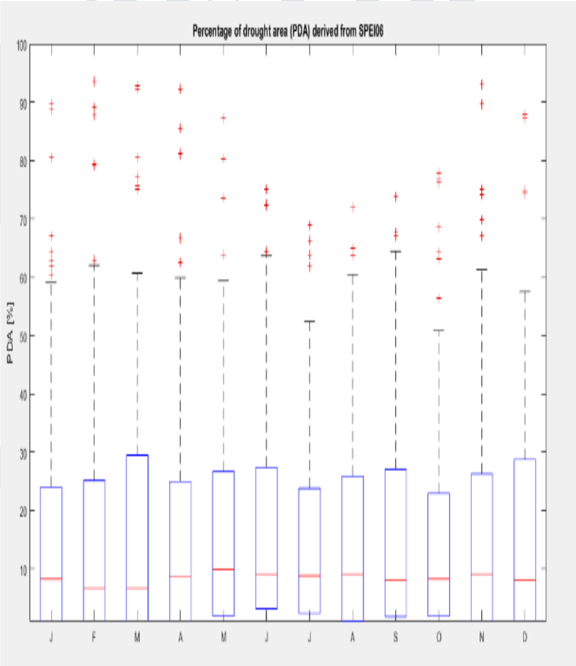

Figure: 4.5 Average month wise drought indication

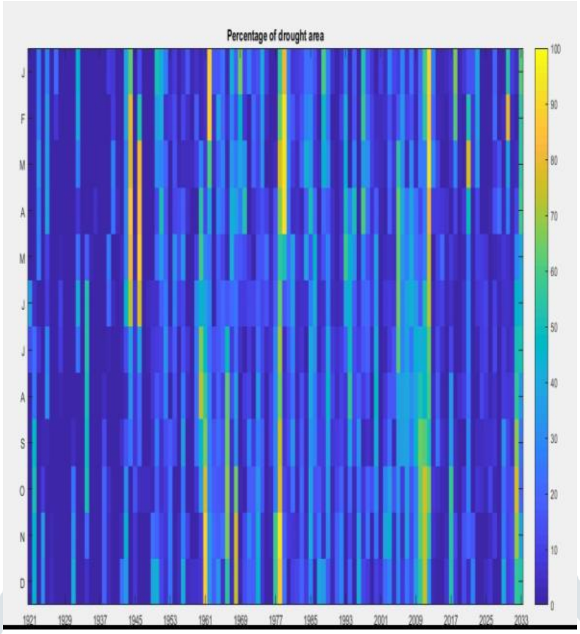

Figure: 4.6 Average year wise drought indication

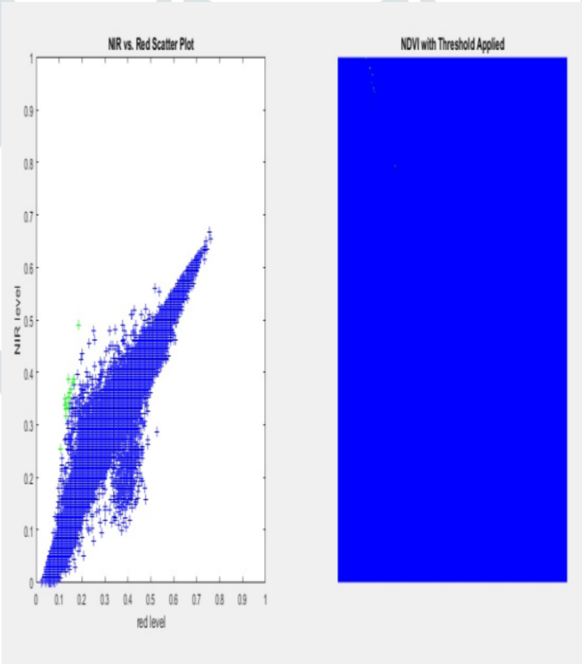

Figure: 4.7 NDVI vs Red scatter

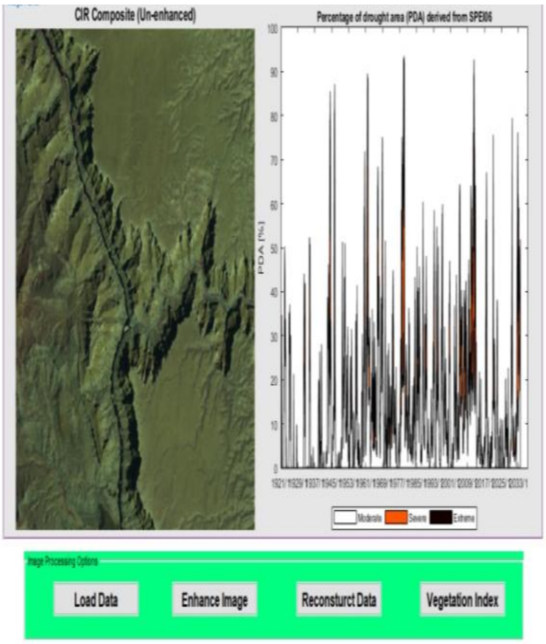

Figure: 4.8 Percentage of drought area

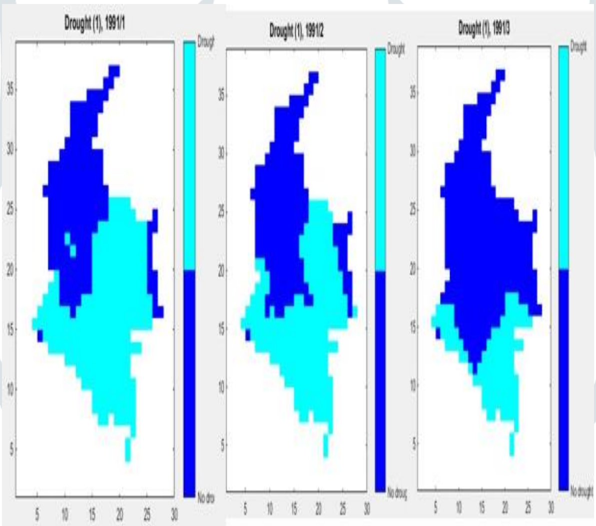

Figure: 4.9 Drought and non-drought area

On successful research and development, some valid results of drought monitoring through MATLAB tool obtained and few results are shown below, Figure 4.1 shows the enhanced image of the multispectral image, after enhancing red band NIR band image obtained to find the vegetation. Integrating vegetation index (shown in figure 4.3) with matrix data which is taken from data sets, drought condition is observed and prediction also found. Percentage of drought area is shown in Figure 4.8 and drought and non-drought area is shown in Figure 4.9.

IV. CONCLUSION

The different types of definitions and some methodologies for agricultural, hydrological and meteorological drought monitoring and assessments had been reviewed. A much better knowledge of the drought condition and its characteristics is evaluated. It can also help to understand information and importance of the present status of the drought problem to study briefly. Existing techniques of drought assessments either have qualitative assessments or use just a few drought causing parameters. It is known that the use of satellite remote sensing and other strategies would enhance the spatial analysis of drought condition. Use of vegetation index analysis with data analytics will give better integrated (combining various drought causing parameters) drought assessments. Hence, it is proposed to develop methodologies for meteorological, agricultural and other drought assessments.

V. REFERENCES

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