

# RES-NRSC-2022-004

## Name of ISRO Centre/Unit

National Remote Sensing Centre, Hyderabad

## Title of the researchproposal

Modelling Gross Primary Production and Evapotranspiration for Drought Monitoring over India.

## Name of Co PI from ISRO Centre/Unit

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## Area of Research

- Earth, Ocean, Atmosphere, Planetary Sciences and Applications
- Water Resources Studies
- Drought Assessment and monitoring using remote sensing

## Summary of the proposed research and expected deliverables

Precipitation and vegetation indices such as NDVI have been frequently used for drought monitoring because of the complete understanding of the performance such indicators and near-real time data availability. Even in the Indian context, these two variables have been used for a long time for drought monitoring. However, ET and GPP have not been used for drought monitoring and impact assessment over India primarily owing to the lack of long term consistent datasets on ET and GPP.

We have developed an algorithm to map ET using TIR data from INSAT-3D, MODIS, NPP-Soumi and Lansat TM which can be used operationally to generate ET product towards drought monitoring. The class of ET model which will be beneficial across different parts of India to monitor droughts is questionable.

The global GPP products are not available on a continuous basis except MODIS 17 GPP product. However, the performance of the MOD 17 GPP product had varied across the globe and not been studied over India. In addition, almost all the GPP models require biome/plant functional type specific calibration. The calibration has been carried out based on flux tower data obtained predominantly

over North America, Europe, China and Australia. Thus, it is not sure if the datasets will be performing better over India which has diverse climatic and land use practices when compared these countries.

Hence, it is necessary to compare the performance of different ET and GPP models over Indian region and to understand their co-evolution particularly during and after drought events. This will help in developing a model for GPP estimation over India and include ET and GPP in a multi-variate drought index.

#### Scope of the Work:

- The aim of this study is to test the use of ET and GPP for drought monitoring and drought impact assessment. Towards this aim, the following objectives are framed:
  - To estimate the Gross Primary Productivity using semi-empirical and physical models over India.
  - To compare and understand how ET and GPP estimated using different models captures
  - To compare the modelled ET and GPP with variables/indices such as Solar Induced Chlorophyll Fluorescence (SIF) and LST that are directly observable from satellites to understand their relative advantages and disadvantages for drought monitoring.
  - To develop a multivariate drought index that can potentially monitor water stress and vegetation productivity and compare it with traditionally used drought indices.

#### Deliverables:

- Detailed analysis of existing ET and GPP products (both global products and the ET products developed over India from the PI's research group) in order to understand the relationship between ET and GPP as indicated by different products especially during drought events.
- Development of algorithms for GPP modelling.
- Development of ET based drought Indices & GPP and comparison with different variables and traditional drought indices.
- Development of a multi-variate, composite drought index.