

## **Robust Method for Evaluation of Catchment Response to Rainfall Variations Using Vegetation Indices and Surface Temperature**

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**Abstract :** Recent climate changes increase uncertainties in vegetation conditions such as health and biomass globally and locally. The detection is, however, difficult due to the spatial and temporal scale of vegetation coverage. Due to unique vegetation response to its environmental conditions such as water availability, the interplay between vegetation dynamics and hydrologic conditions leave a signature in their feedback relationship. Vegetation indices (VI) depict vegetation biomass and photosynthetic capacity that indicate vegetation dynamics as a response to variables including hydrologic conditions and microclimate factors such as rainfall characteristics and land surface temperature (LST). It is hypothesized that the signature may be depicted by VI in its relationship with other variables. To study this signature, several catchments in Asia, Australia, and Indonesia were analysed to assess the variations in hydrologic characteristics with vegetation types. Methods used in this study includes geographic identification and pixel marking for studied catchments, analysing time series of VI and LST of the marked pixels, smoothing technique using Savitzky-Golay filter, which is effective for large area and extensive data. Time series of VI, LST, and rainfall from satellite and ground stations coupled with digital elevation models were analysed and presented. This study found that the hydrologic response of vegetation to rainfall variations may be shown in one hydrologic year, in which a drought event can be detected a year later as a suppressed growth. However, an annual rainfall of above average do not promote growth above average as shown by VI. This technique is found to be a robust and tractable approach for assessing catchment dynamics in changing climates.

**Keywords :** vegetation indices, land surface temperature, vegetation dynamics, catchment

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