

## **Fire Regime**

### **1.1 Overview**

Fire regimes refer to average fire conditions occurring over a long period of time. NRSC has been providing MODIS based forest fire alerts to forest department users for over a decade. MODIS near real-time (NRT) active fire / hotspot locations are processed using the standard MODIS MOD14/MYD14 Fire and Thermal Anomalies product produced using the DRL code. Each active fire location represents the center of a 1km pixel that is flagged as active fire by the algorithm. The MODIS geolocation uses predicted attitude and ephemeris. While the difference between geolocation using definitive vs predicted ephemeris is typically less than 100 meters, the recommendation from EOSDIS is to utilize the standard product data which is reprocessed using the definitive attitude and ephemeris data for long term temporal data sets. This data set is based on the MCD14ML product.

The Global Monthly Fire Location Product (MCD14ML) was used to analyze fire density, its standard deviation and the length of the fire period.

### **1.2 Scope of the study**

National, 5km grid based characterization of annual average fire density, standard deviation of annual average fire density and the length of the fire period.

### **1.3 Data Source**

NASA Near Real-Time and MCD14DL MODIS Active Fire Detections (TXT format). Data set. Available on-line [<https://earthdata.nasa.gov/active-fire-data>]

### **1.4 Methodology**

A fire regime is the pattern, frequency and intensity of fires in an area.

The MODIS fire record (2000 onwards) is the first consistent long term global record on fires. Fire detections are reported as center of 1 km pixel. Both TERRA and AQUA MODIS are available from 2003.

To characterize fire regime over India we used the MODIS fire record from 2003 to 2015.

The analysis used AQUA MODIS daytime fires for the 2003 – 2015 time period. Only detections with a detection confidence of over 10% and flagged as forest by using the NRSC forest fraction layer were used in the analysis.

Fire occurrence over India was spatially analyzed using 5 km grid to compute the average fire density, seasonality and inter-annual variability, following by Chuveico et al (2008)<sup>1</sup>.

The Average fire density (AFD) is the density of detected fires over all years and months and its standard deviation (SDAFD) and is measure by counts km<sup>-2</sup> month<sup>-1</sup> for each grid cell. The length of fire period (LFP) is a measure of the number of months with significant fire activity, calculated as number of months with greater than 10% of the annual fire density

Time period (month)

a) Average fire density (AFD; counts km<sup>-2</sup>timeperiod<sup>-1</sup>)

$$AFD_c = \frac{\sum_{y=1}^k AAFD_{y,c}}{k}$$

where AAFD is the average annual fire density (AAFD, counts km<sup>-2</sup> timeperiod<sup>-1</sup>) defined as the average density of counts per year, y the year, c the grid cell and k is the number of years.

b) Length of fire period (LFP; time period)

$$LFP_c = \sum SF_i$$

Where  $SF_m = 1$  if  $AFMD_{m,c} \geq 0.1 \times AFD_c$  Otherwise  $SF_m = 0$

where AMFD is the average monthly fire density (time period) and SF is an indicator of whether the time period has more than 10% of the annual fire density.

c) *Standard deviation of AFD (SDAFD; counts km<sup>-2</sup>time period<sup>-1</sup>)*

$$SDAFD_c = \sqrt{\frac{\sum_{y=1}^k (AAFD_{y,c} - AFD_c)^2}{k-1}}$$

variability for all years and months, as an indicator of fire interannual persistency Standard deviation of AFD (SDAFD; counts per sq km per time period)

### 1.5 Publications using the study

NIL

### 2.7 Contributors:

Fire Team, NRSC

### 2.8 Recommended Citation

NRSC RSA GRIDDED 5KM SPATIAL FOREST MODIS DAYTIME ACTIVE FOREST FIRE REGIME 2003 - 2015

### 2.9 Metadata

**Keywords**                      **MODIS ACTIVE FOREST FIRE, FIRE REGIME**

**Language**                        :English

**Start Date**                      :01-01-2003

**Stop Date**                        :31-09-2015

**Geographic Coverage:**05°N -40°N; 50°E-110°E

**Category**                        :Indian landmass

**Unit**                                :Meter

**Spatial Resolution** :5km x 5km

**File Format (Data)** :

**File Format (Image)** :GTIF, .asc

**Theme** :Fire

**Contact Address** :Forestry and Ecology Group

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Indian Space Research Organisation  
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## 2.10 Application

Fire Science Studies, Fire regime assessment

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<sup>i</sup>Chuvieco, E., Giglio, L. & Justice, C. (2008). Global characterization of fire activity: toward defining fire regimes from Earth observation data. *Global Change Biology*, 14(7), 1488–1502.