

Document Control Sheet

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Title	Technical Note on Aggregated Flood Inundated area based on Historical Satellite Observations (AFIHSO) -2003-13*
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Abstract	NRSC has initiated a study to scientifically assess the flood prone area. As a first step, available historical satellite datasets acquire during the flood season (more than 100 historical satellite datasets) from Indian Remote Sensing Satellites (IRS) and foreign satellites have been analysed for generating the aggregated extent of flood inundated area. Only those datasets corresponding to either high flood situation or unprecedented floods were used in this study.
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** In addition to the satellite data of 2003-13, flood extents of some of the important flood events prior to 2003 are also included. These are 1998-Assam floods, 2000- West Bengal floods, 2002-Bihar floods and 1988-Delhi floods.*

Aggregated Flood Inundated area based on Historical Satellite Observations (AFIHSO) -2003-13

INTRODUCTION

India is one of the most flood prone countries in the world. The Indo-Gangetic and Brahmaputra river basins are the most chronic flood prone areas and are regarded as the worst flood affected region in the world (Agarwal and Sunita, 1991). Every year states like Assam located in Brahmaputra basin and Bihar, Uttar Pradesh and West Bengal located in Indo-Gangetic basin face severe flood problems due to the huge amount of discharge and large volume of sediments brought down from the Himalayas Rivers and their tributaries during the monsoon season. The recurring floods cause loss of life, destruction and damages to existing infrastructure, including roads, bridges, embankments and agricultural land stresses the need for identification of flood prone areas in the country. Identification of flood prone areas is one of the most important non-structural measures for mitigation of floods (Jain et.al., 2005).

With limited information available during 1970, Rashtriya Barh Aayog assessed the flood prone area of India to be about 40 mha. Various Expert Groups for Flood Management have expressed strong need for adopting scientific approach for arriving at reliable flood affected area in the country.

NRSC has initiated a study to scientifically assess the flood prone area. As a first step, available historical satellite datasets acquire during the flood season (more than 100 historical satellite datasets) from Indian Remote Sensing Satellites (IRS) and foreign satellites have been analysed for generating the aggregated extent of flood inundated area. Only those datasets corresponding to either high flood situation or unprecedented floods were used in this study.

METHODOLOGY

Generation of the Flood hazard zones was done based on the analysis of multi-temporal satellite data acquired during the floods of 2003-2013*. Following are the major steps involved in preparation of flood hazard zonation maps.

- **Satellite data Planning and Acquisition:** Satellite data from Indian Remote Sensing Satellites (IRS) and other foreign satellites was acquired during the floods. The water levels observed at different gauge stations were closely monitored during floods and attempts were made to program the satellite data during peak/near peak situations. Satellite data was also programmed and procured during progression and recession of the flood wave for studying the impact of the flood.
- **Rectification:** The acquired satellite datasets were geo-rectified to Lambert Conformal Conic projection system with Modified Everest Datum for achieving positional accuracy.
- **Flood inundation layer:** Using image processing classification algorithms water layer was extracted from the satellite data and integrated with the pre-flood river and water bodies layer to derive flood inundation layer. Fig 1 shows the methodology for extraction of flood inundation layer from satellite data.

- Annual Flood Layer: The flood inundation layers generated for different flood waves in a calendar year were integrated to generate the maximum flood inundation extent observed in that year.
- Aggregated Flood Inundated Extent Layer: The maximum flood inundation layers corresponding to various years (2003-2013*) were integrated to generate aggregated extent of flood inundated area.

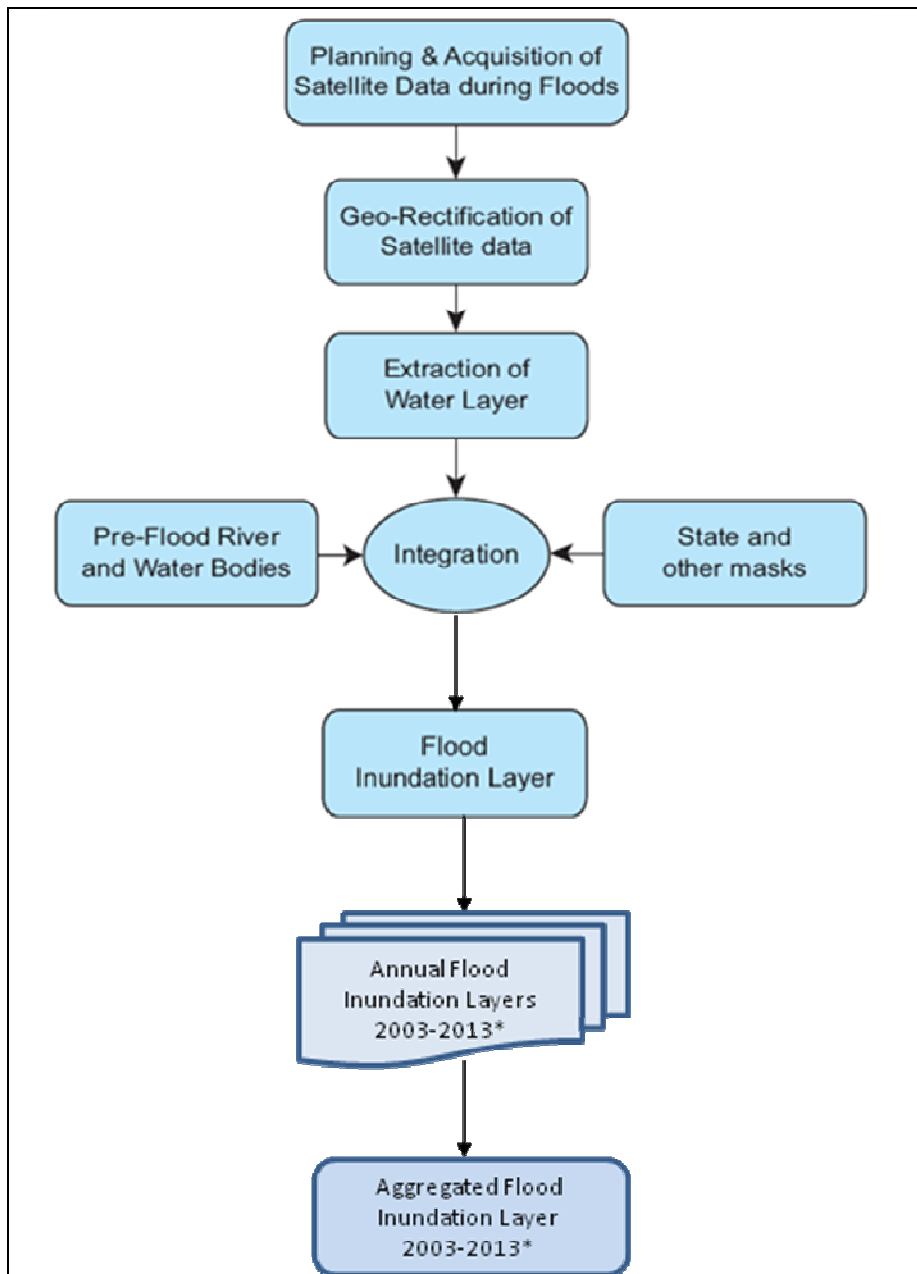


Fig 1 Extraction of Flood Inundation layer from Satellite data

DATASETS

About 100 multi-temporal satellite datasets comprising of either IRS WiFS(188m)/ IRS P6/Resourcesat-2 AWiFS (56m) & Radarsat-2 ScanSAR Wide & Narrow (100m & 50m) & RISAT-1 spanning a 12-year period acquired during 2003-2013* are used .

SUGGESTED USE

The Aggregated Flood Inundated Extent Layer should be used at broad level for the following purposes:

- Regulate land use in the flood plain areas.
- Preparation of District Disaster Management plan.

DISCLAIMER

- The satellite datasets acquired during the calendar years of 2003-2013* are available with DSC, NRSC.
- Most of the flood inundation layers were derived from microwave data. Since optical data was found to be cloudy during flood season. However, partially cloud-free datasets were considered for analysis.
- For areas with gentle slopes, the flood inundation remains same for few days, even after the peak has passed. Hence, in most of the cases, satellite data acquired even after the flood peak resembles the peak situation.
- Observed flood inundation includes flooding due to embankment breaches and also due to rainwater accumulation in low lying areas

USER RESTRICTION

- I. Database could be used up to 1:250,000 scale.
- II. User of this data/information will consult NRSC to commercially exploit/ use the intellectual property generated in the Projects.

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