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Date: September 2, 2023

Ref No: 2023/FL/AS/21

Dear Sir,

Sub: Assam Heavy Rains 2023- Near Real Time Flood Mapping using satellite data

Please refer to our earlier mail dated 29-Aug-2023 regarding mapping and monitoring of flood inundation in Near Real Time in Assam State using multi-sensor satellite data. Heavy incessant rains in many regions of Assam during the last week of August , 2023 has led to floods in Assam State. We have analyzed RISAT-1A (EOS-04) MRS SAR satellite dataset of 31 Aug 2023 (1800 Hrs) and an inundation flood inundation map for part of Assam State is prepared. The map along with a brief report is enclosed herewith for your kind information. Since the image was acquired during/immediate to the rainfall event, large extents of wet areas were also observed.

Further, we request you to visit flood page in NDEM portal (<https://ndem.nrsc.gov.in>) and Bhuvan portal (<https://bhuvan-app1.nrsc.gov.in/disaster/disaster.php?id=flood>) for better visualization of flood extent in Assam State.

In addition, the flood layer in GIS ready format and inundation statistics are transmitted to Assam State Remote Sensing Application Centre and North Eastern State Application Centre by e-mail for further value addition and dissemination to user departments.

We will continue to keep a watch on the flood situation and update the information as and when required. Your support and active interaction is highly appreciated. Please provide feedback on the information being provided.

With kind regards

Yours sincerely,

(A V SURESH BABU)

As per the distribution list enclosed in the report.

Mapping and Monitoring of Flood situation in Assam State during 2023

1.0 Background

Floods were reported in Assam due to heavy rains followed by rise in water levels of Brahmaputra & its tributaries during the last week of August, 2023. River Brahmaputra and its tributaries were reported to be flowing above danger level.

(Source: CWC, News media, ASDMA-Assam)

2.0 Satellite Data

Flood Disaster Team is keeping a constant watch on the flood situation and checked the satellite data coverage over the affected areas RISAT-1A (EOS-04) MRS SAR satellite dataset of 31 Aug 2023 (1800 Hrs) are acquired & analyzed. (Refer Table-1).

Table-1 Satellite Data acquired over Flood Affected Area

S No	Date	Satellite / Sensor	Districts affected
1	16.06.2023 (1800 Hrs)	Sentinel-1A SAR	Goalpara,Dhubri,Bongaigaon,Barpeta*, Kokrajhar,Kamrup Rural*, Chirang, Baksa,South Salmara Mancachar
2	17.06.2023 (1800 Hrs)	RISAT-1A (EOS-4)- MRS	Dhemaji, Tinsukia, Sibsagar, Charaideo, Dibrugarh
3	18.06.2023 (1800 Hrs)	RISAT-1A (EOS-4)- CRS	Golaghat, Cachar, Biswanath*, Lakhimpur, Karimganj, Sonitpur, Jorhat*, Nagaon
4	16.06.2023 to 18.06.2023	Multi Satellite/ Sensor Data	Golaghat, Cachar, Goalpara, Biswanath, Dibrugarh*, Dhubri, Lakhimpur, Bongaigaon, Kokrajhar, Barpeta*, Karimganj, Sonitpur, Jorhat*, Nagaon
5	19.06.2023 (1800 Hrs)	RISAT-1A (EOS-4)- CRS	Dibrugarh, Sibsagar, Tinsukia
6	20.06.2023 (1800 Hrs)	RISAT-1A (EOS-4)- CRS	Barpeta, Kamrup Rural, Baksa, Cachar*, Karimganj, Nalbari, Bongaigaon, Goalpara*, Darrang, Marigaon
7	21.06.2023 (1800 Hrs)	RISAT-1A (EOS-4)- CRS	Cachar, Kamrup Rural*, Darrang, Karimganj, Nagaon, Baksa*
8	22.06.2023	RISAT-1A (EOS-4)- CRS	Sibsagar, Lakhimpur*, Jorhat

	(1800 Hrs)		
9	23.06.2023 (1800 Hrs)	Sentinel-1A SAR	Barpeta*, Kamrup Rural, Darrang, Cachar, Nalbari, Nagaon, Karimganj, Baksa*, Marigaon*, Sonitpur*, Udalguri*, Hojai, Goalpara*, Hailakhandi, Bongaigaon*
10	25.06.2023 (1800 Hrs)	Sentinel-1A SAR	Sibsagar*, Dibrugarh
11	26.06.2023 (0600 Hrs)	Sentinel-1A SAR	Kamrup Rural*, Darrang, Marigaon, Nalbari, Cachar, Karimganj, Nagaon
12	26.06.2023 (1800 Hrs)	RISAT-1A (EOS-4) CRS SAR	Jorhat, Golaghat, Sibsaagar*, Biswanath
13	27.06.2023 (1800 Hrs)	RISAT-1A (EOS-4) CRS SAR	Sibsagar, Jorhat
14	29.06.2023 (1800 Hrs)	RISAT-1A (EOS-4) CRS SAR	Kamrup Rural, Karimganj*, Cachar, Darrang
15	07.07.2023 (1800 Hrs)	RISAT-1A (EOS-4) CRS SAR & Sentinel-1A SAR	Sibsagar*, Barpeta, Dhubri, Kamrup Rural, Dibrugarh, Dhemaji*, Charaideo
16	12.07.2023 (0600 Hrs)	RISAT-1A (EOS-4) MRS SAR	Sibsagar, Lakhimpur, Biswanth, Jorhat, Golaghat and Dhemaji*
17	15.07.2023 (1800 Hrs)	RISAT-1A (EOS-4) MRS SAR	Barpeta, Goalpara*, Dhubri*, Kamrup Rural*, Bongaigaon
18	20.07.2023 (0600 Hrs)	RISAT-1A (EOS-4) MRS SAR	Marigaon, Darrang, Kamrup metro
19	29.08.2023 (1800 Hrs)	Sentinel-1A SAR	Lakhimpur, Sibsaagar, Biswanath, Majuli, Golaghat, Sonitpur*, Jorhat, Nagaon*, Dibrugarh*, Charaideo*
20	31.08.2023 (1800 Hrs)	RISAT-1A (EOS-4) MRS SAR	Barpeta, Kamrup Rural*, Nalbari, Goalpara*, Darrang*, Bongaigaon, Bajali, Dhubri*, Baksa

3.0 Satellite Data Analysis

Satellite data is rectified and flood inundation layer is extracted. Further, flood inundation map was composed for part of Assam state based on the analysis of RISAT-1A (EOS-04) MRS SAR satellite dataset of 31 Aug 2023 (1800 Hrs). The cumulative flood inundation layer is integrated

with district boundary layer, for extracting district-wise flood inundation statistics which are shown in the Table-2.

4.0 Observations from Satellite Images

Based on the analysis of satellite data, the following points were observed.

- Satellite data covers part of Assam State
- Major inundation was observed in Barpeta, Kamrup Rural, Nalbari and Goalpara districts.
- The Inundation may include water accumulation in low lying areas due to heavy incessant rainfall.

Table-2:

S. No.	District	Inundated Area (ha)
1	BARPETA	20546
2	KAMRUP RURAL *	12617
3	NALBARI	6666
4	GOALPARA*	5320
5	DARRANG*	3520
6	BONGAIGAON	2914
7	BAJALI	1655
8	DHUBRI*	1631
9	BAKSA	203
	TOTAL	55071

Note: Districts with inundation less than 100 ha are not included in the statistics ; * Partially covered in satellite data.

Disclaimer : Flood inundation may include rain water accumulation / flood water in low lying areas. Estimated flood extent depends on availability of satellite data, it's date of overpass and coverage over flooded areas. Some of the Flash flood events could not be mapped due to non availability of satellite data in short duration. Flood affected area estimated in the study excludes river portion, permanent water bodies. Hence, actual flooded area may be more than the area estimated by satellite images.

Distribution List:

1	MHA	<ol style="list-style-type: none">1. Additional Secretary,(DM & FFR), Ministry of Home Affairs, Govt. of India, Room No.171-B, North Block, New Delhi-110001.2. Joint Secretary, NDM, Ministry of Home Affairs, North Block, New Delhi - 110 001.3. NDM control Room, Ministry of Home Affairs, North Block, New Delhi - 110 001.4. DG, NDRF, New Delhi
2	NODAL MINISTRIES	<ol style="list-style-type: none">1. Director, FCA, Central Water Commission, Sewa Bhavan, R K PURAM, New Delhi-1100662. Deputy Director General, Hydrology, India Meteorological Department, Mausam Bhavan, New Delhi -110003
3	STATE	<ol style="list-style-type: none">1. Additional Chief Secretary & Relief Commissioner, Govt. of Assam, Janatha Bhavan, Assam Secretariat, Dispur, GUWAHATI-781005.2. Scientific Officer, Assam State Remote Sensing Application Centre (ARSAC) Govt of Assam, Guwahati, Assam.
4	ISRO/DOS	<ol style="list-style-type: none">1. Director, EDPO, ISRO Head Quarters, Antariksh Bhavan, New BEL Road, Bangalore-560094.2. Programme Director, EDPO, ISRO Head Quarters, Antariksh Bhavan, New BEL Road, Bangalore-560094.3. Associate Director, EDPO, ISRO Head Quarters, Antariksh Bhavan, New BEL Road, Bangalore-560094.
5	NRSC	<ol style="list-style-type: none">1. Group Director, DMSG, NRSC2. Deputy Director (RSA) & Project Director, RRES3. Associate Director, NRSC4. Director, NRSC

Based on the analysis of RISAT-1A MRS SAR Satellite Image of 31-08-2023 (1800 Hrs IST)



Map

ID: 2023/FL/AS/21/31082023

Date of Issue: 02.09.2023

About the Event

Floods were reported in parts of Assam during the fourth week of August, 2023 due to heavy rains followed by rise in water levels of Brahmaputra river. (Source: CWC, News media)

Satellite Observations:

This map highlights the flood inundation in 8 districts of Assam as on 31.08.2023 (1800 Hrs)

Satellite Data Used

Pre Flood Data

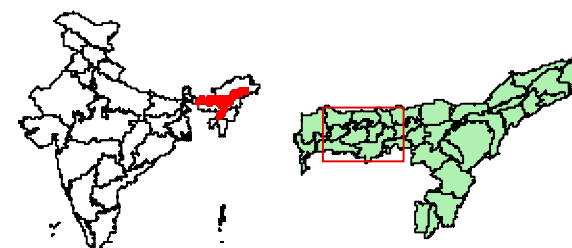
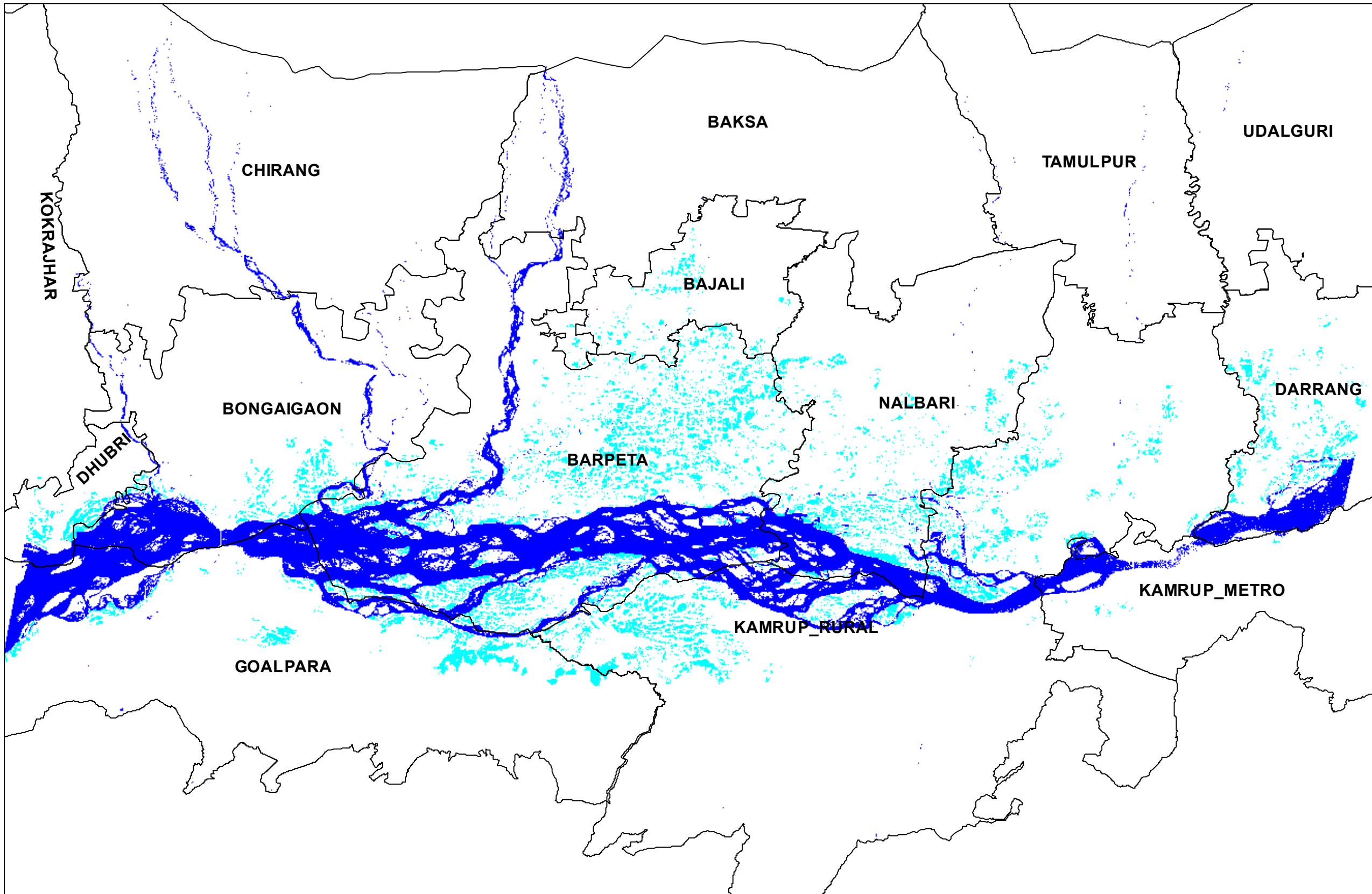
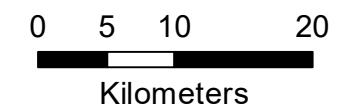
Satellite: Resourcesat-2A AWiFS
Date of Pass: 05-03-2023

Post Flood Data

Satellite: RISAT-1A MRS SAR
Date of Pass: 31.08.2023

Reference Data Used

NRSC Landuse/Landcover Data of 2018-2019, Bhuvan Geospatial Legacy Data



Disclaimer : This product is prepared on rapid mapping mode for immediate use and sharing amongst official agencies. This provides preliminary results. Flood inundation may include rain water accumulation / flood water in low lying areas. All geographic information has limitations due to the scale, resolution, date and interpretation of the original source materials. No ground verification is done

Citation 'NRSC (2023) - Flood Inundated areas in Part of Bihar State (as on 31.08.2023)' dated 2023 Map no : 2023/FL/AS/21/31082023, NRSC/ISRO,Hyderabad

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- District Boundary
- River/ Waterbody
- Flood Inundation