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**Dr. K.H.V.DURGA RAO**, Scientist/Engineer 'SG'  
Head, Disaster Management Support Division

Date: Oct 16, 2018

No: 06-FL-2018-OD/14

Dear Sir,

Sub: Cyclone 'Titli'- Odisha-Near Real Time Cyclone Inundation Mapping using satellite data

Please refer to our earlier mail dated 15<sup>th</sup> Oct 2018 regarding 'Near Real Time Flood Mapping' project using satellite data. So far we have sent 14 flood maps covering floods in part of Odisha State. Heavy rains were reported in Odisha state during second week of October, 2018 due to Cyclone 'Titli'. We have analyzed MODIS TERRA data of 16<sup>th</sup> October 2018 flood map for part of Odisha State is being prepared. However, rain induced inundation is observed hence, the reported inundation may include wet areas/ rain water accumulation / water in low lying areas. The inundation 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 Bhuvan portal ([bhuvan-noeda.nrsc.gov.in/disaster/disaster/disaster.php](http://bhuvan-noeda.nrsc.gov.in/disaster/disaster/disaster.php)) NDEM portal for better visualization of inundation extent in Odisha State.

In addition, the inundation layer in GIS ready format and inundation statistics are transmitted to Odisha State Disaster Management Authority (OSDMA) and Flood Management Information System Cell (FMISC), Bhubaneswar, through 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 us a feedback on the information being provided.

With kind regards

Yours sincerely,

(K H V Durga Rao)

As per the distribution list enclosed in the report.

# Odisha- Cyclone 'Titli'– 2018

## 1.0 Background

Cyclone storm Titli hit Odisha coast near Gopalpur early on 11-October-2018 which triggered heavy rains during second week of October, leading to flood like situation in low lying areas of Ganjam, Puri, Jagatsingpur , Khordha, Kendrapara and Jajapur districts.

(Source: News Media)

## 2.0 Satellite Data

Flood Disaster Team is keeping a constant watch on the flood situation and checked the satellite data coverage over the flood affected areas. MODIS TERRA satellite data of 16<sup>th</sup> October 2018 (1800 hrs) was analyzed. (Refer Table-1).

**Table-1 Satellite Data acquired over Flood Affected Area**

S No	Date	Satellite / Sensor	Status
1	22-07-18 (1800 Hours IST) & 23-07-18 (1800 hours IST)	Sentinel-1 & RADARSAT-2 SAR	Analysed and 1 flood map was sent.
2	25-07-18 (1800 hours IST)	RADARSAT-2 SAR	Analysed and 1 flood map was sent.
3	30-08-18	Sentinel-1A SAR	Analysed and 1 flood map is was sent.
4	09-09-18	MODIS TERRA	Analysed and 2 flood maps were sent
5	11-09-18	Sentinel-1A SAR	Analysed and 1 flood map was sent.
6	23-09-18 (0600 hrs IST)	Sentinel-1A SAR	Analysed and 1 flood map was sent
7	23-09-18 (1800 hrs IST)	RADARSAT-2 SAR	Analysed and 1 flood map was sent
8	23-09-18 (1800 hrs IST)	RADARSAT-2 SAR	Analysed and 1 flood map was sent
9	25-09-18 (0600 hrs IST)	RADARSAT-2 SAR	Analysed and 1 flood map was sent
10	12-10-18 (0600 hrs IST)	RADARSAT-2 SAR	Analysed and 1 flood map was sent
11	13-10-18 (1030Hrs IST)	Resourcesat-2 AWiFS	Analysed and 1 flood map was sent
12	13-10-18 (1800 Hrs IST)	RADARSAT-2 SAR	Analysed and 1 flood map was sent
13	14-10-18 (1800 Hrs IST)	Sentinel-1A SAR	Analysed and 1 flood map is being sent

14	12-10-18 (0600 hrs IST) 13-10-18 (1030Hrs IST) 13-10-18 (1800 Hrs IST) 14-10-18 (1800 Hrs IST)	RADARSAT-2 SAR , Sentinel-1A SAR & Resourcesat-2 AWiFS	Analysed and 1 flood map was sent
15	16-10-18 (1100 Hrs IST)	MODIS TERRA	Analysed and 1 flood map is being sent

### 3.0 Data Analysis

Satellite data is rectified and inundation layer is extracted. The inundation layer is integrated with district boundary layer, for extracting district-wise inundation statistics which are shown in the Table-2.

### 4.0 Observations

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

- Satellite data covers part of Odisha state.
- Major inundation was observed in Puri, Jagatsinghpur, Jajapur, Bhadrak, Kendrapada, Baleshwar, Khordha, Ganjam and Cuttack districts.
- Observed inundation may include wet areas/ rain water accumulation / water in low lying areas

**Table-2: District-wise inundated area statistics**

SI.NO	District	Flood Inundated Area (ha)
1	Puri	15172
2	Jagatsinghpur	10662
3	Jajapur	9315
4	Bhadrak	6705
5	Kendrapara	6442
6	Baleshwar	5447
7	Khordha	5057
8	Ganjam	4573
9	Cuttack	2897
	Total	<b>66269</b>

Note:

- Flood inundation may include rain water accumulation / flood water in low lying areas.
- Districts with inundation less than 1000 ha are not included in the statistics.

**Distribution List:**

1	MHA	<ol style="list-style-type: none"><li>1. Joint Secretary, NDM, Ministry of Home Affairs, North Block, New Delhi - 110 001. (Through e-mail).</li><li>2. NDM control Room, Ministry of Home Affairs, North Block, New Delhi - 110 001 (Through e-mail).</li></ol>
2	NODAL MINISTRIES	<ol style="list-style-type: none"><li>1. Chairman, Central Water Commission, Sewa Bhavan, R K PURAM, New Delhi-110066</li><li>2. ADGM (H &amp; A), India Meteorological Department, Mausam Bhavan, New Delhi -110003</li></ol>
3	STATE	<ol style="list-style-type: none"><li>1. Additional Chief Secretary and Managing Director, Odisha State Disaster Management Authority (OSDMA), Bhubaneswar</li><li>2. Relief Commissioner, Govt. of Odisha, Bhubaneswar. (Through email and hard copy of the map through ORSAC also)</li><li>3. Chief Executive, Odisha Remote Sensing Application Centre (ORSAC), Dept Of S&amp;T, Govt. of Odisha, 2nd Floor, Surya kiran building complex, Saheed Nagar, Bhubaneswar – 751 007. (with a request to disseminate the information to the concerned user depts.)</li></ol>
4	ISRO/DOS	<ol style="list-style-type: none"><li>1. Director, EDPO, ISRO Head Quarters, Antariksha Bhavan, New BEL Road, Bangalore-560094. (e-mail)</li><li>2. Programme Director, EDPO, ISRO Head Quarters, Antariksha Bhavan, New BEL Road, Bangalore-560094. (e-mail)</li><li>3. Associate Director, EDPO, ISRO Head Quarters, Antariksha Bhavan, New BEL Road, Bangalore-560094. (e-mail)</li></ol>
5	NRSC	<ol style="list-style-type: none"><li>1. Director, NRSC</li><li>2. Associate Director, NRSC</li><li>3. Deputy Director (RSA) &amp; PD, DSC</li></ol>

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