

NOWCASTING PRODUCTS USING SATELLITE AND GLOBAL NWP DATA

Sateesh M^{1*}, Raghavendra Sreevathsa¹ and Prasad V. S.¹

1. NCMRWF, Noida, U.P., 201309.

sateeshm@ncmrwf.gov.in (corresponding author)

Abstract

Abstract: *The National Centre for Medium Range Weather Forecasting (NCMRWF) receiving the remote sensing observations and it is being used in the operational Data Assimilation system and further more. Apart from this, NCMRWF in collaboration with India Meteorological Department (IMD) also generating nowcasting products which are very useful in the nowcasting of weather using SAFNWC (CDOP3-V2018) software package. For the generation of nowcasting products, GFS T1534 model outputs has been utilized up to 9 hours of 00, 06, 12 and 18 hours run. The satellite irradiance data is taken from the METEOSAT8 (IODC) for its full coverage at 3km resolution at each 15 minute scan from EUMETCAST terrestrial service. And the output is stored for its full coverage at every 15 minutes interval in netcdf format. The lightning observation strikes are also using as an ancillary input for this model. And these model products are visualized on operational mode at IMD website (<http://foreignsat.imd.gov.in/>). This current work is further extended to the other geostationary satellites (FY-4A, HIMAWARI, KOMPSAT-2A) which has Indian Sub Continent coverage.*

1 Introduction

National Centre for Medium Range Weather Forecasting (NCMRWF) has a responsibility to produce the short range, medium range and extended range forecast using various numerical models. Satellite applications are very useful in the nowcasting of weather to a greater extent. The current abstracts express the real time processing of satellite images and GFS T1534 to make nowcasting products over the METEOSAT-8 (IODC) coverage area at 3 km resolution.

The METEOSAT-8 (IODC) compressed High Rate Information Transmission (HRIT) data receiving from EUMETCAST terrestrial service has been utilized along the GFS T1534 three hourly model forecast initiated at 00, 06, 12 and 18 hour cycle. Along with the lightning ground observations as a ground truth on real time. This work is carried out in collaboration with the India Meteorological Department (IMD).

2 Input data

NWCSAF (CDOP-3, V2018) software is utilized for making of experimental setup in collaboration with the IMD. The current model output contains Cloud Mask Analysis (CMA), Cloud Type (CT), Cloud Top Temperature and Height (CTTH), Cloud Microphysics (CMIC), Precipitating Clouds (PC), Convective Rainfall Rate (CRR), imaging Satellite Humidity And Instability product (iSHAI), High Resolution Winds (HRW),

Extrapolated Imagery products (EXIM), Automatic Satellite Image Interpretation (ASII), Convection Initiation (CI) and Rapidly Developing Thunderstorm (RDT). The detection of cloud system, tracking of cloud systems, forecasting of convective cloud systems and its representation are the major components.

2.1 NWP data

The list of model parameters which are utilized in the generation of products are listed in the table-1. The humidity profiles, temperature profile, surface temperatures, 2m relative humidity and wind velocities at various levels are remapped to the satellite data resolution.

2.2 Satellite data

The real time acquisition of METEOSAT-8 (IODC) is decompressed at all 11 channels and High Resolution Visible (HRV) are utilized to generate the nowcasting products on real time.

2.3 Lightning data

A real time monitoring of lightning data also supplied to the SAFNWC software at a cycle not exceeding to the 30 minutes for the satellite data scan [1].

3 Products

A complete set of products (listed in section 2) are generated on operational mode at MIHIR (CRAY, XC-40). Some of the products and discription is listed below:

3.1 Rapidly Developing Thunderstorm

The RDT or RDT-CW (Convection Warning) product has been developed by Meteo-France in the framework of the EUMETSAT SAF in support to nowcasting [1], [2]. This provides the clouds information related to the significant convective systems from 2 km to 20 km.

The objectives of RDT are:

- The identification, monitoring and tracking of intense convective system clouds.
- The detection of rapidly developing convective cells
- The forecast of the convective cells.

The figure 1 show the RDT product showing the Triggering, Triggering from split, Growing, mature and decaying cells on 20200102_1930 UTC.

3.2 Cloud Type

The cloud type product gives the information about the various type of clouds on real time [3], [4]. The forecaster can understand the various stages from time to time. The figure 2 shows the various cloud time on the 20200102_1930 UTC.

The forecast fields of the following parameters, remapped onto satellite images, are used as input:

- Surface temperatures
- Air temperature at 950/925 hPa (for low level inversion), 850, 700, 500 and at tropopause level.
- Total water vapour content of the atmosphere.
- Surface geopotential height from the NWP model.

Table 1. List of channels dependencies on PGE.

SEVIRI channel	PGE												
	01 CMa	02 CT	03 CTTH	04 PC	05 CRR	09 HRW	10 ASH	11 RDT	12 AMA	13 SPbR			
HRVIS	✓+	✓				✓+							
VIS0.6	✓+	✓		✓	✓	✓+							
VIS0.8	✓					✓+							
IR1.6	✓			✓									
IR3.9	✓	✓		✓									
WV6.2			✓	✓	✓	✓+	✓+	✓	✓	✓	✓	✓	
WV7.3	✓	✓	✓	✓		✓+		✓	✓	✓	✓	✓	
IR8.7	✓+	✓						✓		✓	✓	✓	
IR9.7													
IR10.8	✓+	✓	✓	✓	✓+	✓+	✓+	✓+				✓	
IR12.0	✓+	✓	✓	✓		✓+	✓	✓				✓	
IR13.4	✓	✓	✓								✓	✓	

The list of ancillary data required to remapping onto satellite images are:

- Land/sea atlas
- Elevation atlas
- Monthly minimum SST climatology
- Monthly mean 0.6 μm atmospheric corrected reflectance climatology (land).
- Monthly integrated atmospheric water vapor content climatology
- Monthly climatology of mean air temperature at 1000hPa, 850hPa, 700hPa and 500hPa as a supporting files.

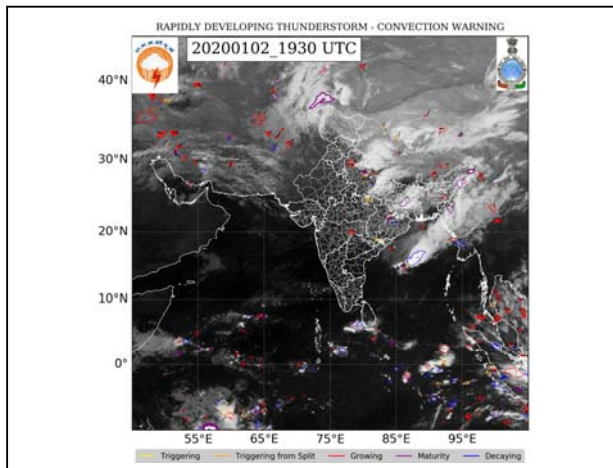


Figure 1. Rapidly developing thunder storm product shows a triggering of thunderstorm is located over north east of Andhra Pradesh dated on 20200102_1930UTC.

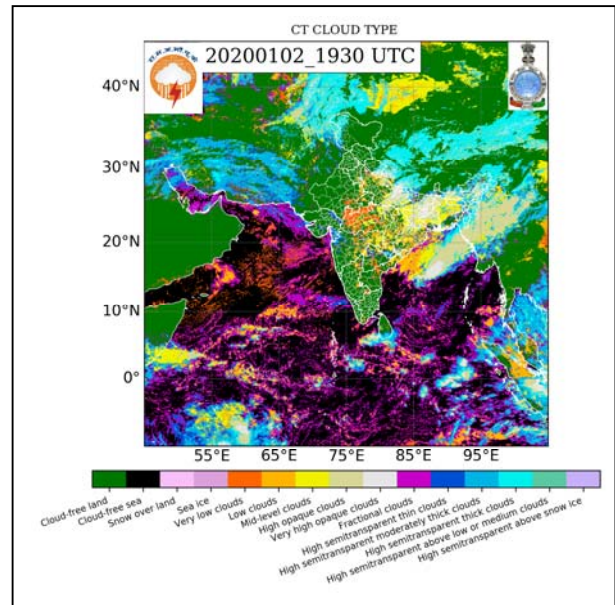


Figure 2. Cloud type product shows very high level opaque clouds during the thunderstorm period over north east of Andhra Pradesh on 20200102_1930UTC.

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