

## ***Rapidly Developing Thunderstorms Convective Warning (RDT) Factsheet***

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## **Document Change Record**

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1	07/02/2019		Initial version
1A	19/06/2019		Change of title
1B	24/07/2019		Correction of copy-paste errors
2	03/11/2020		Update for NWC SAF GEO V2018

**\*DCR = Document Change Request**

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## **1 GEOSTATIONARY NOWCASTING PRODUCTS**

Nowcasting and very short-term weather forecasting require very timely satellite data. In addition to image data, satellite-derived cloud products play an essential role in the analysis of the current weather situation. To support these types of applications, EUMETSAT established a dedicated SAF in Support of Nowcasting and Very Short Term Forecasting (NWC SAF). This SAF produces application software packages to generate, among other things, cloud parameters, rain fall rates from convective clouds, and a Rapidly Developing Thunderstorms product from images of Meteosat satellites and the polar-orbiting satellites NOAA and Metop. The software packages are available to users for local implementation <http://www.nwcsaf.org>. For those who cannot or do not want to set up the software, EUMETSAT produces the basic cloud products and products for users with special interest in convective systems and disseminates these products via EUMETCast-Africa.

## **1 RAPIDLY DEVELOPING THUNDERSTORMS – CONVECTIVE WARNING PRODUCT**

The Rapidly Developing Thunderstorm – Convective Warning product provides short-range forecasting and nowcasting users with a large range of parameters about convection events and their predicted development. The status at the time of the satellite measurement and predicted status of the same convective systems 15, 30, 45, and 60 minutes after the measurement are given in separate data files. The files do only contain 1 classical satellite data map (see image 1). All other parameters are given in a bulletin-like form, describing the convection/cloud cells.

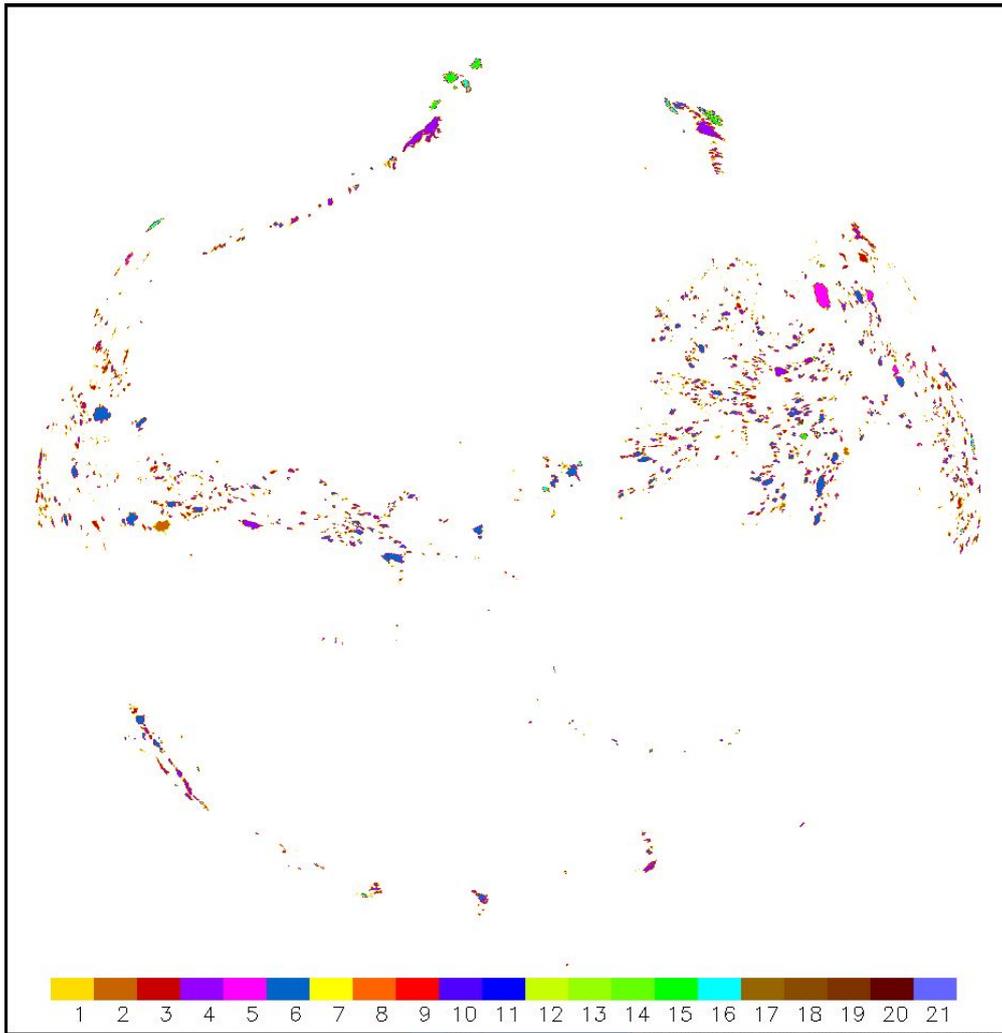
The content of the output in netCDF format is described in detail in the Data Output Format document ([RD.2]). Only a very brief summary is given here, taking into account that this mainly bulletin-like file lists a large number of variables/attributes, taking into account horizontal, vertical and temporal description of each cloud cells. The bulletin-like part of the product relies on several dimensions: number of cells, number of contour points for horizontal description, number of levels, slices and overshoots for vertical description, number of trajectory points for a temporal description. The actual parameter list can be separated in a number of parts, each containing various cloud cell parameters:

- The overview part of the output lists some characteristics of cloud cell population.
- The cell part details the spatial and temporal description of the cloud system.
- The main description part lists for each cloud system identity characteristics, date type and other characteristics (type, movement, cooling rate, severity ...) which concern the whole cloud system.
- The level and contour description part lists for each cloud system and each “bottom” and “top” threshold level the localization parameters (contour and gravity centre), satellite characteristics, morphological characteristics and data fusion parameters (e.g. precursor products like cloud top temperature).
- The vertical surface description part lists for each cloud system pairs of threshold brightness temperature / surface allowing vertical morphological description,
- The historical description part lists for each cloud system a limited set of characteristics of its recent past (maximum 12 time steps corresponding to satellite refresh rate): localization of gravity centre, satellite and morphology characteristics, movement and trends.
- The overshooting top description part lists all detected overshoots, their localization, characteristics and reference to the corresponding cloud system.

Forecast products are only bulletin-like product, without map container. Moreover, the set of variables/attributes is more restricted: only main and bottom level description.

There is one Forecast products for each given lead range. Forecast products are available each 15min. So here are 5 output files produced, one for the analysis, and 4 for +15, +30, +45 and +60min lead ranges.

In order to display the bulletin-like parts of the data specific tools are required. The Product Users Manual [RD.2] shows in section 3.5 some examples of RDT-CW visualisation.



*Figure 1: RDT-CW map of type and phase of cloud cells, 2019/01/18, 13:15 UTC.*

<i>Colour No.</i>	<i>Phase and type of cloud cell</i>	<i>Colour No.</i>	<i>Phase and type of cloud cell</i>
<i>1</i>	<i>Convective_triggering</i>	<i>12</i>	<i>HighRainRate_triggering</i>
<i>2</i>	<i>Convective_triggering_from_split</i>	<i>13</i>	<i>HighRainRate_triggering_from_split</i>
<i>3</i>	<i>Convective_growing</i>	<i>14</i>	<i>HighRainRate_growing</i>
<i>4</i>	<i>Convective_mature</i>	<i>15</i>	<i>HighRainRate_mature</i>
<i>5</i>	<i>OvershootingTop_mature</i>	<i>16</i>	<i>HighRainRate_decaying</i>
<i>6</i>	<i>Convective_decaying</i>	<i>17</i>	<i>HighSeverity_triggering</i>
<i>7</i>	<i>Electric_triggering</i>	<i>18</i>	<i>HighSeverity_triggering_from_split</i>
<i>8</i>	<i>Electric_triggering_from_split</i>	<i>19</i>	<i>HighSeverity_growing</i>
<i>9</i>	<i>Electric_growing</i>	<i>20</i>	<i>HighSeverity_mature</i>
<i>10</i>	<i>Electric_mature</i>	<i>21</i>	<i>HighSeverity_decaying</i>
<i>11</i>	<i>Electric_decaying</i>		

## 2 RETRIEVAL ALGORITHMS

The RDT-CW product has been developed by Météo-France in the framework of the EUMETSAT NWC SAF. Using mainly geostationary satellite data, it provides information on clouds related to significant convective systems, from meso scale (200 to 2000 km) down to smaller scales (tens of km).

The objectives of RDT-CW are:

- The identification, monitoring and tracking of intense convective system clouds
- The detection of rapidly developing convective cells, where IR sensor allows for
- The forecast of the convective cells

A detailed description of the algorithms can be found in the Algorithm Theoretical Basis Documents (ATBD) [RD 1] and the Product User Manual (PUM) [RD 2] of the Convection products of the NWC SAF GEO Software package. See the list of references below.

The data are provided in the [netCDF](#) data format.

### 3 PRODUCT GENERATION

The product generation of the geostationary nowcasting RDT product takes place at EUMETSAT Headquarter, using the standard user setup of the NWC SAF GEO processing package. Therefore all standard specifications of the Product User Manual (PUM) of this software packages are applicable. The following local configurations are applied for the processing:

- Products are derived for the full disk of the operational 0° geostationary MSG-satellite.
- Original MSG pixel resolution is used.
- Products are available for each repeat-cycle—every 15 minutes.
- In the case of a swap of the operational satellite (e.g. Meteosat-11 to Meteosat-9), the product generation is automatically switched as well to the new operational satellite.
- 5 files per product and repeat cycle are generated.
- As additional input to the processing, forecast data from the ECMWF operational model are used. The 6-hour, 12-hour, 18-hour, and 24-hour forecasts from the midday and midnight forecasts are made available for the processing.
- The RDT-CW processing is also using Cloud mask (CMA), Cloud Top Height and Temperature (CTTH), Cloud Microphysics (CMIC), and Convective Rain rate (CRR) products which are generated prior to the RDT generation.
- No lightning data are used for the product generation.
- Production is based on Version 2018.1 of the NWC SAF GEO processing package.

#### 3.1 Limited List of References Documents

All documents are on the EUMETSAT Technical Documents Page:

<http://www.eumetsat.int/website/home/Data/TechnicalDocuments/index.html>

**Note:** Documentation on the NWC SAF webpage could be referring to a newer version of the NWC SAF software package than the one which was used to generate the Global Nowcasting RDT Products. Always use the applicable versions of the documentation on the EUMETSAT Technical Documents Page, as specified in the table below.

RD 1	Algorithm Theoretical Basis Document for the Convection Product Processors of the NWC/GEO	SAF/ NWC/CDOP2/GEO/MFT/ SCI/ATBD/ Convection	Version 2.1
RD 2	User Manual for the Convection Product Processors of the NWC/GEO	NWC/CDOP3/GEO/MF- PI/SCI/UM/Convection	Version 1.0
RD 3	Data Output Format for the NWC/GEO	NWC/CDOP3/GEO/AEM ET/SW/DOF	Version 1.0

#### 4 PRODUCT SPECIFICATIONS

<b><i>What data is available?</i></b>	EUMETSAT has generated Geostationary Nowcasting RDT Products since January 2019. Data are not archived.
<b><i>Allocation:</i></b>	Near-real time full disk products are available 10-25 minutes after sensing time finishes.
<b><i>Product available:</i></b>	Geostationary Nowcasting RDT Products in netCDF can be received in near-real time–10-15 minutes after the end of the image acquisition by the MSG satellite–via the EUMETSAT <a href="#">EUMETCast-Africa</a> system. For details on <i>data provision, filenaming, and file sizes</i> , please access the <a href="#">Product Navigator page</a> and search for Geostationary Nowcasting.
<b><i>Product Support:</i></b>	The EUMETSAT help desk ( <a href="mailto:ops@eumetsat.int">ops@eumetsat.int</a> ) will answer any of your questions about the Geostationary Nowcasting Cloud Products.
<b><i>Future Developments</i></b>	N/A