



## **TECHNICAL NOTE for DESERT LOCUST product**



**Project partners:**    **vito** vision on technology 

**Contributing project:**  GEONETCast for and by  
Developing Countries  
**DevCoCast**

# PRODUCT TECHNICAL INFORMATION

## Format and compression:

The products are delivered as compressed zip files, each containing a single GeoTiff file.

There are 2 datasets provided: GreenArea and NDVI. The NDVI dataset GeoTiff files are internally compressed with Lempel-Ziv-Welch (LZW) data compression algorithm, due to its size being greater than 4 GBytes (for entire LocustArea region). All GreenArea dataset image files are provided internally uncompressed for users working with RAMSES or with ArcView 3.3 and more generally for users using software that is not compatible with the Lempel–Ziv–Welch (LZW) data compression algorithm.

## Filename convention:

**MCD\_<dataset>\_<date>\_<region>.zip**

The GeoTiff files follow the same naming convention, only with the appropriate .tif file name extension:

MCD\_<dataset>\_<date>\_<region>.tif

- MCD = typical acronym for the combination of the two MODIS instruments on board the NASA Aqua and Terra satellites
- dataset<sup>1</sup>
  - **GreenArea** : green vegetation dynamic maps
  - **NDVI** : normalized difference vegetation index values
- date = start of 10-day period (YYYYMMDD)
- region = name of country/geographic region (see list in Appendix)

## Spatial information:

Spatially all datasets are provided in Plate Carree projection with WGS84 spheroid using a pixel size of 0.0020833333333333 (a spatial resolution of approximately 250 meters). This information is coded into the GeoTiff files.

As listed in Appendix, there are 4 generic recession areas and 60 other areas (typically at country or sub-country level), each defined by

- an identifier code: useful for (semi-)automatic web downloads
- a suffix used in the file naming (see above), i.e. without spaces
- a lon/lat range in decimal degrees, with negatives for Western/Southern hemisphere
- And a description, some ending with “- Locust Area” to indicate that they do not cover the full country (as their name might otherwise suggest)

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<sup>1</sup> Other datasets (MeanReflectance bands and Valid band) are used internally in the processing data centre, and hence not part of this note.

The generic recession areas are (see Appendix for coordinates)

- Eastern locust area (E-LocustArea)
- Central locust area (C-LocustArea)
- Western locust area (W-LocustArea)
- Entire recession area (LocustArea), as commonly used by FAO DLIS

### Production and delivery frequency:

Products are produced and delivered three times per month, so at 10-day or dekad intervals, each time starting on the 1<sup>st</sup>, 11<sup>th</sup> or 21<sup>st</sup> of each month.

Dekads are defined as days 1-10, 11-20 and 21 – end of month.

The start date (1<sup>st</sup>, 11<sup>th</sup>, or 21<sup>st</sup>) are used in the file naming to distinguish the products.

Do note however that, in particular for GreenArea, the date in the file name, and the corresponding (production/delivery) dekad, is not representative of the time period covered by the data values (the “time meter”, as described below).

### Dataset values:

Please note that more thorough documentation on product interpretation is being prepared, and FAO DLIS has provided training on these products. This section is only to be seen as a short, technical summary.

Dataset	Data type	Data range	Flags	Scale	Offset
<b>GreenArea</b>	Byte	0 to 36	0 = no detection	1.0	0
<b>NDVI</b>	Float32	0.0 to 1.0		1.0	0

### Green vegetation dynamic map (GreenArea):

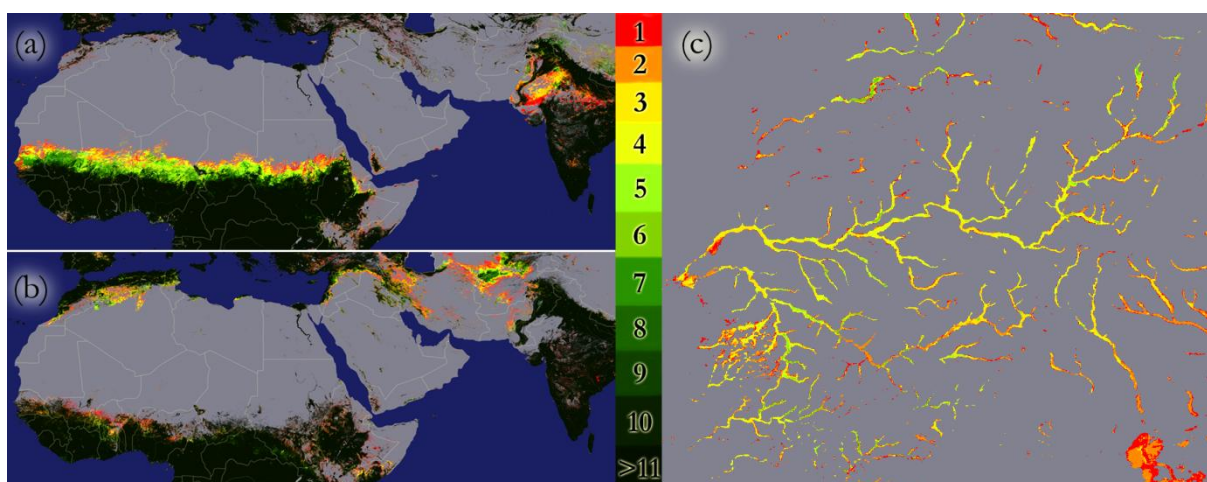


Fig. 1. The green vegetation dynamic map from (a) 2008/09/01 and (b) 2009/03/21 with the legend on the right (number of dekades passed since the vegetation onset). (c) Zoom (18 °N, 1 °E) in Mali on 2008/09/01.

The detections are provided as a time meter, i.e. the pixel value corresponds to the number of dekades since vegetation onset. The user can thus follow the spatio-temporal dynamic of green vegetation, and identify (i) ephemeral vegetation occurring after one isolated rainfall event, (ii) seasonal vegetation areas, and (iii) evergreen vegetation, e.g. palm grove.

A colour table is used to inform the user on the vegetation stage, i.e. vegetation at the onset (in red), close to the onset (in orange) or far from the onset (in yellow-green to dark green after 11 dekades of vegetation detections). Figure 1(c) shows the progressive vegetation development in the Wadi, i.e. riverbed that contains water only during heavy rain periods, taking advantage of the soils that are still humid after a rainy event.

A few examples:

A value of 0 represents No Vegetation detected, a value of 1 indicates new Vegetation detected, a value of 12 presents that Vegetation was detected 4 months (12 dekads) ago for the first time.

The meter is incremented every dekad if a green pixel is detected, is reset to zero if “no vegetation” pixel is detected. In case of no valid data, the meter keeps the last value until the next observation. The meter is calculated on a sliding window of the last 36 dekads, hence the maximum value of Green vegetation dynamic map is 36.

For more details about the methodology used, see:

“Development and Application of Multi-Temporal Colorimetric Transformation to Monitor Vegetation in the Desert Locust Habitat”, Pekel, JF., Ceccato, P., Vancutsem, C., Cressman, K., Vanbogaert, E., Defourny, P. *IEEE Journal of Selected Topics in Earth Observations and Remote Sensing*. (in press)

### **Normalized Difference Vegetation Index (NDVI)**

The NDVI value is computed  $(NIR-RED/NIR+RED)$  based on the integrated mean reflectance composite values of both TERRA and AQUA MODIS sensor data. The compositing method was designed to use a colorimetric approach, in order to lower the sensitivity to soil background, which is particularly needed for arid areas.

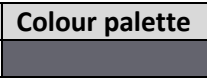










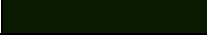
For more details about the compositing method used, see:

“Mean Compositing, an alternative strategy for producing temporal syntheses. Concepts and performance assessment for SPOT VEGETATION time series”, C. Vancutsem; J. -F. Pekel ; P. Bogaert a; P. Defourny - *International Journal of Remote Sensing*, Vol. 28, No. 22, 20 November 2007, 5123–5141

## Colour coding convention:

All datasets except for the green vegetation dynamic maps (GreenArea), are provided in grey scale, without embedding colour table in the GeoTiff files.

The Green vegetation dynamic map dataset embeds the following colour table within the GeoTiff file:

Value	R,G,B value	Colour palette
0	100,100,110	
1	255,0,0	
2	255,106,0	
3	255,169,0	
4	169,243,12	
5	116,223,19	
6	100,152,0	
7	33,109,0	
8	23,77,0	
9	15,51,0	
10	8,26,0	
11-36	4,13,0	

All values above 36 should not be present in a GreenArea dataset, if so however they are mapped on the same RGB (colour) value as the value range from 11 to 36.

Note that a user can always override the provided colour coding with his own colour convention.

## Distribution Systems

The Desert Locust products are distributed by VITO in two ways:

- Through web downloads on the DevCoCast project website (<http://www.devcocast.eu>)
- Through the EUMETCast satellite broadcast system (as a pilot service, initially towards three countries – Sudan, Eritrea, Mali – but at this moment only to Mali).

### **Web download**

The web downloads require registration with VITO, by simple e-mail to the DevCoCast help desk, <mailto://info@devcocast.eu>. Upon registration, users receive an e-mail with login/password. A number of users (points of contact) at the national locust centres have been registered automatically on request from FAO-DLIS.

After login, the “Desert Locust Products” link in the Download menu of the web site, or the direct link <http://www.devcocast.eu/user/images/dl/Form.do> will present users with a search form to query for available products.

Note that registered users in Africa, e.g. national locust control centres, could also get (free) access to SPOT-VEGETATION data on the same website.

For support with the downloading (i.e. how to automate it), or any questions/clarifications, please send e-mail to DevCoCast help desk at the above e-mail address.

### ***Pilot satellite broadcast service***

The fast, low cost and highly reliable EUMETCast satellite broadcast can be received, after registration, in Europe, Africa and the Americas. Registration with EUMETSAT can be done via <http://registration.eumetsat.int/>.

At present, this is only a (limited scope) pilot service, that tries to assess if there is added value to this access through satellite. Hence, it is recommended to try the web downloads first.

If you are interested, the DevCoCast project partners can provide more information on practical requirements, step-by-step guidance and so on. They can be contacted through the help desk <mailto://info@devcocast.eu>.

## APPENDIX Desert Locust Products - Geographic Areas

Identifier	File name suffix	Lon min	Lon max	Lat min	Lat max	Region description
900	LocustArea	-26.1	104.4	40	0	Locust Area
902	E-LocustArea	45	77	33	25	Locust Area - East
903	C-LocustArea	22	60	33	3	Locust Area - Central
904	W-LocustArea	-18	25	36	11	Locust Area - West
910	Locust_E-Algeria	0	10	30	25	Algeria - East
911	Locust_N-Algeria	-6	10	33	30	Algeria - North
912	Locust_S-Algeria	0	12	25	19	Algeria - South
913	Locust_W-Algeria	-9	0	30	25	Algeria - West
914	Locust_C-Chad	17	20	18	13	Chad - Central
915	Locust_E-Chad	20	23	18	13	Chad - East
916	Locust_N-Chad	17	23	20	18	Chad - North
917	Locust_W-Chad	14	17	16	13	Chad - West
918	Locust_Egypt	25	36	32	22	Egypt - Locust Area
919	Locust_E-Egypt	30	36	27	22	Egypt - East
920	Locust_W-Egypt	25	30	30	22	Egypt - West
921	Locust_Eritrea	36	44	18	12	Eritrea - Locust Area
922	Locust_N-Eritrea	36	40	18	15	Eritrea - North
923	Locust_S-Eritrea	40	44	15	12	Eritrea - South
924	Locust_E-Ethiopia	40	45	12	8	Ethiopia - East
925	Locust_N-Ethiopia	35	40	15	11	Ethiopia - North
926	Locust_Ogaden	42	48	9	5	Ethiopia - Ogaden
927	Locust_India	69	75	29	24	India - Locust Area
928	Locust_Iran	55	65	30	25	Iran - Locust Area
929	Locust_NE-Libya	17	25	30	25	Libya - NorthEast
930	Locust_NW-Libya	9	17	33	28	Libya - NorthWest
931	Locust_SE-Libya	17	25	25	20	Libya - SouthEast
932	Locust_SW-Libya	9	17	28	23	Libya - SouthWest
933	Locust_Mauritania	-17	-5	27	15	Mauritania - Locust Area
934	Locust_NW-Mauritania	-17	-11	22	18	Mauritania - NorthWest
935	Locust_N-Mauritania	-13	-6	27	20	Mauritania - North
936	Locust_E-Mauritania	-10	-5	20	15	Mauritania - East
937	Locust_W-Mauritania	-17	-10	20	15	Mauritania - West
938	Locust_Mali	-12	5	25	14	Mali - Locust Area
939	Locust_NW-Mali	-7	0	25	17	Mali - NorthWest
940	Locust_N-Mali	-1	5	21	18	Mali - North
941	Locust_S-Mali	-1	5	18	15	Mali - South

942	Locust_W-Mali	-5	-1	20	16	Mali - West
943	Locust_NE-Morocco	-5	-1	33	31	Morocco - NorthEast
944	Locust_SE-Morocco	-8	-3	31	29	Morocco - SouthEast
945	Locust_SW-Morocco	-13	-8	31	28	Morocco - SouthWest
946	Locust_S-Niger	8	14	16	13	Niger - South
947	Locust_Tamesna-Air	4	10	20	15	Niger - Tamesna Air
948	Locust_Tenere	10	15	20	15	Niger - Tenere
949	Locust_N-Oman	55	60	26	20	Oman - North
950	Locust_S-Oman	52	58	20	16	Oman - South
951	Locust_SW-Pakistan	61	68	30	25	Pakistan - SouthWest
952	Locust_E-Pakistan	68	73	30	24	Pakistan - East
953	Locust_C-SaudiArabia	35	46	28	23	Saudi Arabia - Central
954	Locust_E-SaudiArabia	46	51	28	18	Saudi Arabia - East
955	Locust_N-SaudiArabia	35	45	32	28	Saudi Arabia - North
956	Locust_SW-SaudiArabia	39	46	23	16	Saudi Arabia - SouthWest
957	Locust_N-Senegal	-15	-12	17	15	Senegal - North
958	Locust_N-Somalia	42	51	12	9	Somalia - North
959	Locust_N-Sudan	22	39	22	12	Sudan - North
960	Locust_NE-Sudan	30	39	22	17	Sudan - NorthEast
961	Locust_NW-Sudan	24	30	22	17	Sudan - NorthWest
962	Locust_SE-Sudan	30	37	17	12	Sudan - SouthEast
963	Locust_SW-Sudan	22	30	17	12	Sudan - SouthWest
964	Locust_Tunisia	7	12	37	30	Tunisia - Locust Area
965	Locust_UAEmirates	51	55	25	18	United Arab Emirates - Locust Area
966	Locust_N-WSahara	-15	-8	28	25	Western Sahara - North
967	Locust_S-WSahara	-17	-12	25	21	Western Sahara - South
968	Locust_E-Yemen	47	53	19	13	Yemen - East
969	Locust_W-Yemen	42	47	18	12	Yemen - West

The above table has the following columns:

- Identifier: a code (number), useful for automatic web downloads
- File name suffix: indication of the geographic area, as coded into the product (zip file) and GeoTiff file names.
- Lon/Lat min/max: range of geographic coordinates, in decimal degrees, with negative values for Southern/Western hemisphere
- Region description: a more descriptive name of the region. “- Locust Area” is added to distinguish with pre-defined regions that fully cover the country.