TOOCAN Data Format

Update : 12/11/2019

version 2.06

[Filename]

TOOCAN-REGION-YYYY0MM0DD0-YYYY1MM1DD1,dat,gz

YYYY0 : yearStart
MM0 : monthStart
DD0 : dayStart
YYYY1 : yearEnd
MM1 : monthEnd
DD1 : dayEnd

ex : TOOCAN-AFRICA-20140601-20140630.dat.gz

[Reference]

Fiolleau T. and Roca R. 2013 : An Algorithm for the Detection and Tracking of Tropical Mesoscale Convective Systems Using Infrared Images From Geostationary Satellite. IEEE Transactions on Geoscience and Remote Sensing, v. 99, p. 1-14

[Contact]

Thomas Fiolleau
OMP/LEGOS
14, av. Edouard Belin
31400 TOULOUSE
thomas.fiolleau@legos.obs-mip.fr
tel : +33 561333082

Rémy Roca
OMP/LEGOS
14, av. Edouard Belin
31400 TOULOUSE
FRANCE
Remy.roca@legos.obs-mip.fr

1 Header

Global Attributes	Data type
##	a60
##	a60
TOOCAN Version	25x, a0
Institution	25x, a0
creator_name	25x, a0
contributor_name	25x, a0
Satellite	25x, a0
Region	25x, a0
time_coverage_start	25x, i0
time_coverage_end	25x, i0
Temporal resolution	25x, i0
Spatial resolution	25x, f0, a0
Lonmin - Lonmax	25x, i6, a3, i6
Latmin - Latmax	25x, i6, a3, i6
Nb columns	25x, i0
Nb lines	25x, i0
Population of MCS	25x, i0
##	a60
##	a60

Example :

```
############################################################
############################################################
# TOOCAN version       :            2.06
# institution          : CNRS/LEGOS/IPSL
# creator_name         : Thomas Fiolleau
# contributor_name     :       Remy Roca
# Satellite            :            MSG2
# Region               :          AFRICA
# time_coverage_start  :        20120401
# time_coverage_end    :        20120430
# temporal resolution  :          30 min
# Spatial resolution   :     0.04 degree
# Lonmin - Lonmax      :    -55 -     55
# Latmin - Latmax      :    -40 -     40
# Nb columns           :            2751
# Nb lines             :            2001
# Population of MCS    :           27483
############################################################
############################################################
```

2 Integrated MCS morphological parameters

Parameters	Description	Units	Data type
==>	Indication for a new MCS		3x
label	Label of the MCS in the segmented images		15d
qltyMCS	Quality flag indicating if the MCS initiates or dissipates due to missing images		8d
classif	Classification of the MCSs	1➔ MCS with a duration < 5hr 2➔ MCS with a duration ≥ 5hr and described by a uniq maximum of their cold surfaces along their life cycles 3➔ MCS with a duration ≥ 5hr and described by several maximums of their cold surfaces along their life cycles	8d
duration	Life time duration	number of frames	12d
UTimeInit	Universal Time of the MCS initiation	- Integer part: number of days since the 1st January - Decimal part: frame (1-48)	12.2lf
LTimeInit	Local time of the MCS initiation initiation	- Integer part: number of days since the 1st January - Decimal part: fraction of day	12.4lf
LonInit	Longitude of the MCS center of mass at its initiation	degrees	8.2lf
latInit	Latitude of the MCS center of mass at its initiation	degrees	8.2lf
UTimeEnd	Coordinated Universal Time of the MCS dissipation	- Integer part: number of days since the 1st January - Decimal part: frame (1-48)	12.2lf
LTimeEnd	Local time of the MCS dissipation	- Integer part: number of days since the 1st January - Decimal part: fraction of day	12.4lf
LonEnd	Longitude of the MCS center of mass at its dissipation	degrees	8.2lf
latEnd	Latitude of the MCS center of mass at its dissipation	degrees	8.2lf
velocity	Average velocity of the MCS from its initiation to its dissipation	m/s	12.2lf
distance	Distance covered by the MCS	km	12.2lf
lonMin	Minimum longitude of the MCS along its life cycle	degrees	8.2lf
latMin	Minimum latitude of the MCS along its life cycle	degrees	8.2lf
lonMax	Maximum longitude of the MCS along its life cycle	degrees	8.2lf
latMax	Maximum latitude of the MCS along its life cycle	degrees	8.2lf
TbMin	Minimum brightness temperature of the MCS along its life cycle	K	8d
maxSurf235K_pix	Maximum cold cloud surface reached by the MCS along its life cycle at 235K	number of pixels	17d

maxSurf235K_km2	Maximum cold cloud surface reached by the MCS along its life cycle at 235K	km²	17.2lf
maxSurf220K_km2	Maximum cold cloud surface reached by the MCS along its life cycle at 220K	km²	17.2lf
maxSurf210K_km2	Maximum cold cloud surface reached by the MCS along its life cycle at 210K	km²	17.2lf
maxSurf200K_km2	Maximum cold cloud surface reached by the MCS along its life cycle at 200K	km²	17.2lf
coldCloudi	MCS Cold Cloudiness at 235K from its initiation to its dissipation	km²	17.2lf

qltyMCS :

first digit = MCS Initiation error

- 1: OK
- 2: MCS initiation explained by a recovery of the tracking due to a minimum of 5 successive missing GEO images
- 3: MCS initiation explained by the transition from a GEO global mode to a rapid scan mode.

second digit = MCS Dissipation error

- 1: OK
- 2: MCS dissipation explained by a recovery of the tracking due to a minimum of 5 successive missing GEO images
- 3: MCS dissipation explained by the transition from a GEO global mode to a rapid scan mode.

third digit = MCS Edge error

- 1: OK
- 2: MCS impacted by the GEO image boundaries along its life cycle
- 3: MCS impacted by the GEO image boundaries in a rapid scan mode along its life cycle.
- 4: MCS impacted by missing/bad pixels

two last digits = number of images interpolated along the MCS life cycle

Example:

qltyMCS = 11100

First digit =1 ➔ MCS initiation OK

Second digit = 1 ➔ MCS dissipation OK

Third digit = 1 ➔ MCS not impacted by the image boundaries

Two last digit = 00 ➔ No interpolated GEO images during the MCS tracking

qltyMCS = 11108

First digit =1 ➔ MCS initiation OK

Second digit = 1 ➔ MCS dissipation OK

Third digit = 1 ➔ MCS not impacted by the image boundaries

Two last digit = 08 ➔ 8 interpolated GEO images during the MCS tracking

qltyMCS = 11200

First digit =1 ➔ MCS initiation OK

Second digit = 1 ➔ MCS dissipation OK

Third digit = 2 ➔ MCS impacted by the image boundaries

Two last digit = 00 ➔ No interpolated GEO images during the MCS tracking

qltyMCS = 11300

First digit =1 ➔ MCS initiation OK

Second digit = 1 ➔ MCS dissipation OK

Third digit = 3 ➔ MCS impacted by the image boundaries in a rapid scan mode (GOES-13 and GOES-15)

Two last digit = 00 ➔ No interpolated GEO images during the MCS tracking

qltyMCS = 13100

First digit =1 ➔ MCS initiation OK

Second digit = 3 ➔ MCS dissipation due to the transition from a GEO global mode to a rapid scan mode

Third digit = 1 ➔ MCS not impacted by the image boundaries

Two last digit = 00 ➔ No interpolated GEO images during the MCS tracking

qltyMCS = 21100

First digit =2	➔ MCS initiation explained by a recovery of the tracking due to a minimum of 5 successive missing GEO images.
Second digit = 1	➔ MCS dissipation OK
Third digit = 1	➔ MCS not impacted by the image boundaries
Two last digit = 00	➔ No interpolated GEO images during the MCS tracking

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Classif:

Classification of the MCSs

1➔ MCS with a duration < 5hr
2➔ MCS with a duration ≥ 5hr and described by a uniq maximum of their cold surfaces along their life cycles
3➔ MCS with a duration ≥ 5hr and described by several maximums of their cold surfaces along their life cycles

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UTimeinit / UTimeEnd:

UTimeinit = 16256.25
UTC Day = 16256 since the 1st January 1970
frame = 25
UTC Hour = (Slot-1) × (60 / temporal_resolution) = 12 hr
UTC Minute = (60 / temporal_resolution) × ((Slot-1) modulo (60 / temporal_resolution))

LTimeInit / LTimeEnd:

LTimeinit = 16256.3386
Local day = 16256 since the 1st January 1970
Local hour = 0.3386 × 24 hr = 8.1264 hr

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duration = number of images

duration [hr] = duration [slot] × (60 / temporal_resolution)

3 MCS morphological parameters along their life cycles

Parameters	Description	Units	Data type
qltyGEO	Flag Indicating the IR missing image	0 ➔ missing of the IR image and interpolation of the TOOCAN segmented image 1 ➔ presence of the IR image	8d
Tbmin	Minimum brightness temperature	K	8d
Tbavg	Average brightness temperature	K	8d
UTime	Coordinated Universal Time of the MCS in number of days since the 1st January 1970 plus the slot	- Integer part: number of days since the 1st January - Decimal part: frame (1-48)	12.2lf
LTime	Local time of the MCS in number of days since the 1st January 1970 plus the fraction of the day	- Integer part: number of days since the 1st January - Decimal part: fraction of day	12.4lf
lon	Longitude of the center of mass	degrees	8.2lf
lat	Latitude of the center of mass	degrees	8.2lf
jcm	Column of the center of mass in the image	Indices of the column	8d
icm	Line of the center of mass in the image	Indices of the line	8d
velocity	Instantaneous velocity	m/s	12.2lf
sminor_220K	Semi-minor axis of the ellipse at a 220K threshold	km	12.2lf
smajor_220K	Semi-major axis of the ellipse at a 220K threshold	Km	12.2lf
e_220K	Eccentricity of the ellipse for a 220K threshold	$\frac{Sminor\_220K}{Smajor\_220K}$	12.2lf
angle_220K	Orientation of the ellipse at a 220K threshold	degrees	12.2lf
sminor_235K	Semi-minor axis of the ellipse at a 235K threshold	km	12.2lf
smajor_235K	Semi-major axis of the ellipse at a 235K threshold	Km	12.2lf
e_235K	Eccentricity of the ellipse at a 235K threshold	$\frac{Sminor\_235K}{Smajor\_235K}$	12.2lf
angle_235K	Orientation of the ellipse at a 235K threshold	degrees	12.2lf
surf235K_pix	Cold cloud surface of the convective cluster for a 235K threshold	number of pixels	15d
surf210K_pix	Cold cloud surface of the convective cluster for a 210K threshold	number of pixels	15d
surf235K_km2	Cold cloud surface of the convective cluster for a 235k threshold	km²	15.2lf
surf220K_km2	Cold cloud surface of the convective cluster for a 220k threshold	km²	15.2lf
surf210K_km2	Cold cloud surface of the convective cluster for a 210k threshold	km²	15.2lf
surf200K_km2	Cold cloud surface of the convective cluster for a 200k threshold	km²	15.2lf

qltyGEO = Flag Indicating the IR missing image

0 ➔ missing of the IR image at this time and interpolation of the TOOCAN segmented image
1 ➔ presence of the IR image

UTime

UTime = 16256.25

- UTC_{Day} = 16256 since the 1st January 1970
- Slot = 25
- $UTC_{Hour} = \left((slot - 1) \times \left(\frac{60}{temporal\_resolution} \right) \right)$
- $UTC_{Minute} = \left(\frac{60}{temporal\_resolution} \right) \times \left((slot - 1)\ modulo\ \left(\frac{60}{temporal\_resolution} \right) \right)$

LTime

LTime = 16256.3386

- $Local_{Day}$ = 16256 since the 1st January 1970
- $Local_{Hour}$ = 0.3386 × 24 hr = 8.1264 hr