OPERA : Maximum Reflectivity Composite

Configuration of CIRRUS relative to ODYSSEY

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Composite domain

CIRRUS composite is defined over the same domain as ODYSSEY composite, but at double the pixel resolution i.e., 1km by 1km (CIRRUS) instead of 2kmx2km (ODYSSEY).

Update cycle

CIRRUS composite is refreshed every 5 minutes, i.e. three times more frequently than ODYSSEY-produced equivalent composite (which is refreshed every 15 minutes).

Composite availability

CIRRUS composite is available by NT+5min, i.e. 5 minutes after nominal time (NT) of the composite while ODYSSEY-produced equivalent composite is available by NT+13min, at the latest.

Reference period

CIRRUS composite is based on the radar reflectivity datasets that has been observed within a period of 10 minutes prior to the nominal time of composite (NT) that is (NT-10min, NT] while the ODYSSEY-produced composite is based on the 15-minute scanning interval [NT-10min, NT+5min].

Radar database

CIRRUS composite is controlled using the relational database of the metadata about all C-band and S-band radars and their data volumes as exchanged within OPERA. A current CIRRUS' database is a revised and updated version of the ODYSSEY's database (Table 1).

Data availability

The incoming reflectivity data from Spanish radars are available at 10-minute frequency. Hence in CIRRUS they are subject to the extrapolation forward in time (using the Optical Flow method from the PySteps library).

Production software

Both maximum reflectivity composites delivered by CIRRUS and ODYSSEY, are produced on the operational production platform at Météo France. The main technical aspects of the production are presented in the Table 3.

Compositing method

The same maximum-value compositing method is applied to ODYSSEY and CIRRUS, to produce 2D datasets of maximum reflectivity with associated quality index using the incoming volume radar data. For each composite pixel in the cartesian coordinates, a search for all contributing radar pixels in polar coordinates is performed. If successful, a maximum reflectivity as well as associated quality index are then assigned to a given cartesian pixel (for more details, see Saltikoff et al., 2019).

Table 1. Differences between two metadata databases (DB), CIRRUS and ODYSSEY, in terms of radars included (√) in their maximum reflectivity composites (status as of the June 25th, 2023). Note that ODYSSEY production line has not been updated since December 2022.

Radars CCCC_ii	CIRRUS	ODYSSEY	Comment
BIRK_42 (Iceland)	√	x	New radar, new site
I**BIRK_45** (Iceland)	√	x	New radar, new site
BIRK_41 (Iceland)	x	√	Radar is removed as replaced by BIRK_45
SOWR_41 (Poland)	√	x	New radar, old site but corrected */where* attribute
SOWR_42 (Poland)	√	x	New radar, old site but corrected */where* attribute
SOWR_43 (Poland)	√	x	New radar, old site but corrected */where* attribute
SOWR_45 (Poland)	√	x	New radar, old site but corrected */where* attribute
SOWR_49 (Poland)	√	x	New radar, new site
LYBM_43 Serbia	x	√	Old operational radar but files are not exchanged

Table 2. The lists of Spanish radars (country code: LEMM) for which incoming reflectivity data DBZH is being extrapolated forward in time every 10 minutes starting hh05 (for more details, see the Product sheet).

Minute part of NT	Radar identifier CCCC_ii
05, 15, 25, 35, 45 & 55 :	LEMM_41, LEMM_42, LEMM_43, LEMM_44, LEMM_45, LEMM_46, LEMM_47, LEMM_48, LEMM_49, LEMM_50, LEMM_51, LEMM_52, LEMM_53, LEMM_54 & LEMM_60

Table 3. Differences in terms of criteria, software and resources used to run operationally CIRRUS and ODYSSEY production lines on the production platform of Météo France. NT stands for nominal time of corresponding composite.

	CIRRUS	**ODYSSEY**
Launch of production	NT+2min	NT+9min
Selection criterion for scanning interval of data	From NT-10min to NT	From NT-9min to NT+9min
Preprocessing of selected incoming data by toolbox	BALTRAD version 2022 en Python 3 (rave, bropo and beamb) and satellite filter version 2023	BALTRAD version 2013 (rave, bropo and beamb) and satellite filter version 2018
Compositing software	ODYSSEY compositing algorithm in C++11 and use of PROJ.6	ODYSSEY compositing algorithm in C++98 and use of PROJ.4
Production environment	Rocky Linux 8.5	CentOS 6.5
Computing resources	2 computing servers dedicated to CIRRUS, each with 36 CPU	2 computing servers dedicated to ODYSSEY, each with 32 CPU

References

Saltikoff, E.; Haase, G.; Delobbe, L.; Gaussiat, N.; Martet, M.; Idziorek, D.; Leijnse, H.; Novák, P.; Lukach, M.; Stephan, K., 2019: OPERA the Radar Project. Atmosphere, 10, 320. https://doi.org/10.3390/atmos10060320.