

Interactive comment on “Validation of the METEOSAT storm detection and nowcasting system Cb-TRAM with lightning network data – Europe and South Africa” by T. Zinner et al.

T. Zinner et al.

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Dear Referee,

thanks for your comments. I knew before that my English is not perfect and we put much effort in improving the language. After my own revision along your and referee 1's comments, our South African co-author (second language experienced English speaker) and a native speaker here at our institute did a language check.

I hope it's more readable now.

Please find my answers ("—") to your comments below.

C778

Best Regards, Tobias Zinner

Editorial comments:

- Abstract: specify the acronym DLR — done. Removed "DLR" from abstract. Specified on first appearance in introduction.
- Abstract: approximately -> approximately — done. Sorry for not using a spell checker beforehand.
- 1271, line 3: specify the acronym SEVIRI — Was already done on page 1270, line 26.
- 1271, line 8: allows -> allow — A little Google check shows as many hits for "satellite data" with plural as "satellite data" with singular. As far as I know, there is no rule for using "data" with singular or plural. Anyway, we changed it to singular throughout the manuscript.
- 1271, line 23: Rapid Developing Thunderstorm Tool -> Rapid Developing Thunderstorm system — changed to "RDT product" as on the homepage of MeteoFrance/NWC SAF.
- 1271, line 23: specify the acronym SAF — done.
- 1272, line 28-29: (. . .) data source of choice for the presents analysis -> (. . .) data source for the presents analysis — No. I think, "source of choice" is a suited English term for what I want to say: It is the data best suited. My native speaker did not complain.
- 1273, line 11: The following expands(. . .) -> This study expands(. . .) — Changed to "The work presented here extends a previous study of ..."
- 1273, line 14: Why till now it is called Cb-TRAM and now Cb-TRAM METEOSAT?

C779

Use only one form for the whole manuscript. — done.

- 1273, line 15: Sect. or Section? Use only one form for the whole manuscript. — done.
- 1273, line 17: maybe is better to use “according” instead of “depending” — done.
- 1273, line 17: maybe is better to use “variation” instead of “spread” — done.
- 1274, line 1: Fig. or Figure? Use only one form for the whole manuscript. — done.
- 1274, line 4: (. . .), but also first(. . .) -> (. . .), and also for first (. . .) — done.
- 1275, line 1: Split into two sentences: The complete detected area is sub-divided into objects. An object is defined as a continuous groups of pixels. — done.
- 1275, line 3: (convective initiation, rapid growth, mature) -> this repetition is not necessary — removed.
- 1275, line 12-27: I would consider the possibility to move this description before, for example to the line 27 page 1273 — I moved this part to be the third paragraph in the section.
- 1279, line 20: contiguous -> contiguous — done.
- 1280, line 22: combined into -> combined with? In any case I do not understand in which manner they are combined. Please specify. — New sentence: "For the object-based analysis, all connected pixels (8-connectivity) with lightning activity above the threshold form a lightning cell."
- 1280, line 23: (. . .)areas in constitute(. . .) -> complete or correct — removed "in".
- 1281, line 3: allowed — done.
- 1282, line 11: I think is not necessary to write “i.e.” here. — done.
- 1285, line 19: (. . .) contain sl intense (. . .) -> what does sl mean? — It is a TEX

C780

fragment an should have been “\sl”. Corrected.

- 1286, line 7: (. . .) apart from any (. . .) -> (. . .)apart from any(. . .) — done.
- 1287, line 15: On the one hand (. . .) -> On one hand (. . .) — "On the one hand"/"on the other hand" is a correct phrase one finds in most dictionaries. "On one hand" seems to be the more colloquial version. Anyway, for better readability I changed it as suggested.
- 1287, line 15-18: sentence to long and complicated. Split in two sentences. — done.
- 1287, line 19: heavy -> severe — done.
- 1287, line 21: necessarily -> necessarily — done.
- 1287, line 27: Figures 6 show (. . .) -> Figure panel 6 shows (. . .) — done.
- 1288, line 2: (. . .) bottom of 6. -> (. . .) bottom of figure 6. — done.
- 1288, line 20: substitute “That means, e.g. . ..” This means, that . . .” — Changed to: "As a consequence, thunderstorms embedded in larger scale cloud systems or situations of broken cloud fields covering some area allow for better extrapolation results than small isolated convective cells."
- 1292, line 10-13: please revise the sentence. The expression “given the fact that the vast majority of all strong potentially harmful cells. . .” is very complicate! — done.
- 1292, line 19: “Although probably most. . .” -> Although probably the most. . .” — done.
- 1292, line 25-28: Revise and correct the sentences. For example, you can start the sentence with : “One of the reason for the slightly better. . .”
- 1293, line 1-4: simplify and split sentences — Changed to: "It has to be mentioned that the POD for thunderstorm objects becomes better if the “rapid development” detection of Cb-TRAM is included to the analysis. POD improves by about 10 to 15

C781

percentage points on average if either the “rapid development” or the “mature stage” detection is required.”

Technical / Scientific comments: - 1271, line 18: you can mention the *official* definition of convection initiation: “CI=first occurrence of a 35-dBZ (S-band weather radar) echo from a new convective cloud.” -> Reference: Mecikalski et al, 2010. — It seems somewhat out of context to introduce specifics of CI here. Apart from the fact that I don’t like this definition too much, as 35 dBZ is heavy rain (including most likely lightning) and not “initiation”, in my opinion.

- 1271, line 25-26: Mention that thunderstorm detection and nowcasting is important also for applications outside the aviation. Think about the effect of hailstorms, flash floods, severe wind gusts. As a matter of fact, on line 3, page 1272, you speak about “other users”. — Added: “Similarly, warnings of heavy precipitation, hailstorms, flash floods or severe wind gusts are important for public authorities, for example fire departments, organisers of open-air activities as well as the general public.”

- 1273, line 25: specify here the criteria for using HRV. You mention this on page 1277, line 6 but it is too late. — I moved the short description of the 3 stages and a comment on HRV up to the front of the section.

- 1273, line 27: the “convection initiation” and “mature stage” are considered stages of convective cells. The “rapid growth” cannot be considered a stage, since it is a particular feature of some convective cells (not all!). See also the sentence on page 1293, line 11 where you write that rapid development is not supposed to be a reliable sign of intense convection. Have a look at the reference of the ESSL EUMETSAT Convection working Group: http://www.essl.org/cwg/res/pdf/BP-EUMETSAT_20120730.pdf — I agree. Cb-TRAM detection stages should not be confused with the real physical successive stages of convective development. I changed the paragraph: “Cb-TRAM ... detect ... three different stages of thunderstorms: convection initiation, rapid growth, and mature stage. Not necessarily all stages appear in nature in this order or are

C782

detectable from a satellite perspective. Nonetheless they mark an ascending risk of severe thunderstorm impact.

- 1274, line 1: Nowcasts are provided up to one hour -> Since you are not using the Rapid Scan Mode, I think that these nowcasts are provided / refreshed every 15 min for the next 15, 30, 45, and 60 minutes? Is that right? Please specify. — Clarified.

- 1274, line 14-29: could you add a reference for this procedure? — done. It is the same Zinner et al. 2008 paper as before.

- 1274, line 21: extrapolation: persistence is assumed (Lagrange)? Please specify a bit more. — Clarification. New paragraph: “First of all, an extrapolation is used in the tracking scheme to facilitate the association of cloud objects identified at one time with its future manifestation at the next time step. I.e., detected object positions at a time t are extrapolated to forecasted positions at time $t+1$. These forecasted positions are compared to new detections at time $t+1$ (via overlap analysis) in order to construct the track of specific objects. Specifically the tracking over long periods of time and/or the tracking of small objects is improved by this method.”

- 1275, line 5: parallax correction: how do you transform CTT in CTH / which kind of data you use (NWP, standard atmosphere, MPEF CTH, SAFNWC CTH, or others?) Please specify. — Added “by numerical weather prediction (here forecasts of the ECMWF, European Center for Medium Range Weather Forecast)”

- 1278, line 14-15: IC strokes can be subdivided into intra-cloud and inter-cloud strokes. I think you should mention both. — done. “... the measurement of cloud-to-ground (CG) and inter- and intra-cloud strokes (IC, not separated here) ...”

- 1280, line 19: “10 flash reports within a Meteosat pixel and a 15 min time period” -> how do you calculate this value? — Clarified: There was an error in my argumentation which probably confused you. From “5 flash reports with 3 km radius and 5 min” one can derive “0.035 flash reports per square km and minute”. This translates to

C783

"approximately ... 10 per Meteosat pixel and 15 min".

- 1281, line 21: "European thunderstorm activity is often connected to fronts." -> Insert a reference if possible. — Added the general reference Doswell (2001), a text book. South Africa lies at latitudes too low to experience many frontal systems (mid-lat cyclones). SA Domain: around 30° South, EU Domain: around 50° North. New sentence: "Most of the thunderstorms in South Africa can be expected to be multi-cell storms or mesoscale convective complexes which usually are not connected to frontal zones. European thunderstorm activity is often connected to fronts due to its location in the mid-latitude westerlies (Doswell,2001)."

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 1269, 2013.