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Hydrology and Earth System Sciences
Discussions

Interactive comment on "A statistical approach for rain class evaluation using Meteosat Second Generation-Spinning Enhanced Visible and InfraRed Imager observations" *by* E. Ricciardelli et al.

Anonymous Referee #3

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The paper "A statistical approach for rain class evaluation using Meteosat Second Generation-Spinning Enhanced Visible and InfraRed Imager observations" by Ricciardelli et al., proposes a statistical technique to infer precipitation classes from SEVIRI radiances and radiance spatial and temporal features. The calibration of the technique is carried out by using AMSU derived estimates and it is validated against radar rain fields. The subject of the paper is of some interest for this journal, but is poorly written, with a number of serious weaknesses that I do not believe could be addressed through a standard major revision. I suggest to reject the paper for a number of reasons: I

listed below the most relevant ones (page numbers refer to the discussion paper, from 1 to 36).

The aim of the paper seems to provide a tool to benefit short term hydrology and long term climate studies (lines 1-3 on page 3): the author should explain the usefulness of a technique that gives as output only two precipitation levels.

In the introduction, there is no need to mention early works on satellite precipitation estimation in the '80s and '90s, since they used very different approaches and instruments. On the other side, many works on SEVIRI data use for precipitation are missing (the mentioned Kidd and Levizzani reports on them). The correct reference for Mamoudou and Gruber is Ba and Gruber (page 4 and reference list).

Section 2. The history and launch schedule of Meteosat spacecrafts are not necessary for the aim of this paper. Please, add a reference for the Italian radar network, and report on the quality of the data used. Since the radar data are used here to validate satellite product, it is mandatory a more detailed description of the radar network and its reliability.

Section 3. Section 3.1 roughly describes the cloud classification algorithm. Is table 1 related to this section? How is accuracy defined for cloud classes? Are clear sky pixels included in the accuracy calculation? What are the outliers mentioned in line 13 on page 9? Are they damaged pixels, noise, or what? Only two images out of the nine used to validate the classification are during nighttime: are there enough pixels to verify correct classification of all cloud classes? I think that the validation dataset should be much larger.

In section 3.2.1 there are a number of sentences that have to be canceled (my suggestion) or discussed with much more detail. I report here few examples, but the entire section should be rewritten or canceled. How can SEVIRI observation "individuate precipitation processes" (lines 16-17 on page 11) ? especially in convective clouds? Which processes can be individuated (coalescence, riming, breakup, melting)? The ra-

diance measured in the SEVIRI channels comes from the very top layers of the cloud. Few lines below it is said that “features related to radiances acquired at 3.9 and 1.6 μm bear on the cloud drop size distribution”: as a matter of fact, “cloud drop size distribution”, unfortunately, cannot be derived by any feature related to SEVIRI channels. The temperature of WV channels are related with tropospheric moisture content over clear sky areas, but in case of mid- and high- level clouds the contribution to the radiance measured by satellite sensor has a dominant contribution from the cloud top. How can the temperature differences mentioned on lines 3-4 on page 12 “characterize convective as well as stratiform precipitation” ?

Section 3.2.2. Probably Table 3 means Table 2 (line 25 on page 13). On line 26-28 (page 13) is described the matching between SEVIRI and AMSU rain product. It seems that the rain value estimated over an area ranging between 200 km2 (at nadir) and 1000 km2 (on the edge of the swath) is assigned to a SEVIRI pixel of around 25 km2 in the considered area. This implies a number of assumptions on the rainfall spatial and temporal structure that are not usually verified in real rain. Table 6 has to be better introduced and discussed in the text, and the caption should be rewritten accordingly.

Section 4. A good validation practice requires that the datasets used for calibration and validation are independent. In the work reported in this paper, it seems this condition is not satisfied for all the considered cases. Comparing table 2 and table 6, for 4 out of 11 cases (29/09/09, 23/06/10, 04/08/10 and 10/10/10) the satellite overpasses used for validation are very close to the slot used for the calibration, and this should be avoided. I suggest to remove the mentioned cases from the validation, and to add more slots of the other cases. In table 7 the last column title is “satellite overpass time”, but the number reported in the column are probably the nominal time of delivery of the SEVIRI slot. Since the SEVIRI starts scanning the earth from the South, the Mediterranean region is scanned few minutes before the end of the scan, at 12, 27, 42 and 57 minutes every hour. In this table should be reported the real scan time of the Mediterranean

region. The accuracy indicator is of a very limited meaning in evaluating the technique performances, since it includes the number of correct negatives, which is always very high, and can be arbitrarily increased by enlarging the considered area. See as an example table 8 and figures 2, 3 and 4.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 13671, 2013.