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Interactive comment on "Correction of CCI cloud data over the Swiss Alps using ground-based radiation measurements" *by* Fanny Jeanneret et al.

Anonymous Referee #1

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General comments:

The article is a study looking at the issue of false cloud detection over high altitude regions likely due to the presence of snow for the MODIS- and AVHRR-derived CLOUD_cci products. A cloud mask is generated using surface longwave and shortwave observations and compared against SYNOP and satellite masks. This data is used to create a decision-tree model with the intent of identifying false cloud detections in the satellite products. This is an important issue and the basic approach seems sound. The manuscript is understandable but there are several places where the phrasing is awkward or grammatical errors are present.

Directly comparing satellite observations with surface observations is difficult to do, and can result in large uncertainties. I think some more detail about how the comparison is being done and what the expected uncertainties are warranted. For example, are the authors using only near-nadir satellite measurements or are some of these comparisons occurring at the edge-of-scan? Is a satellite cloud shadow mask being used? Are there measurement times available from the SYNOP stations, or are they just assumed to be at 12 UTC?

The authors assess cloudiness as a function of altitude and season, but state that these relationships are likely caused by the well-known issue of detecting clouds over cold, bright surfaces (i.e. snow). I'm wondering why these comparisons don't include the use of a snow mask? Are there other factors being proposed as reasons for the false detections other than snow? Including a snow product might also give some insight as to how much of the issue is due to the satellite over-detection despite the known presence of snow versus the inadequacy of a coarse snow mask over the relatively fine spatial structure of mountainous regions.

I had difficulty assessing the skill of the model given the results shown. One issue was how the percentages were presented. For example in Page 20, Line 1: "In the Swiss Alps area, the use of the decision tree model as a quality filter permitted the rejection of 62 % of the false cloud detections in the satellite cloud property dataset, with the limitation of causing the removal of 7 % of real clouds in the process." – I believe in this sentence the 62% refers to a percentage of a percentage, while the 7% is an absolute cloud amount. This is a somewhat confusing way to present the results. This result refers to the last line of page 30: "Globally, 62 ± 13 % of the cloud mask overestimations are detected, reducing the systematic false positive error from 14.4 ± 15.5 to 4.3 ± 2.8 % but increasing the missed clouds from 8.7 ± 3.5 to 15.6 ± 2.1 %." – So the model reduces false positives by ~10% and increases missed cloud by ~7%, correct? If so I think this could be presented more clearly.

Specific comments:

The last line of the abstract says the systematic error is reduced to 4.3% with an increase of 7% missed clouds. Does this mean a 4.3% high bias after offsets from missed cloud and false detections?

Page 3, Line 11: NOAA-16 only used 1.6 during the day for a short part of its lifetime

P2, L5: the Heidinger reference is for PATMOS-x, which is not a Cloud_cci product

Figure 10. This is a nice graphic but it doesn't add much to the understanding of the model. It could probably be left out or changed to give more information.

Figure 11 shows much larger adjustments to pre-2002 AVHRR than MODIS. Drift seems to be a factor but the differences seem large even in the early part of the satellite record. Have you looked at the satellite-viewing angle over the Alps over the course of the record?

Table 2 seems to show that many of the false positives detections occur for optically thick, low clouds (e.g. Groups G and I), but these groups have some of the lowest False positives identified. I think the author's allude to this in the discussion on page 15, but it could be made clearer.

Technical correction

Abstract: Line 2: 'among others' should refer to something. 1st line in Intro is awkward Page 2, Line 17: This sentence is a run-on Page 2, Line 25: Is "uses as labels: a typo? Not sure what it means.