

# ***Interactive comment on “Clouds over Hyytiälä, Finland: an algorithm to classify clouds based on solar radiation and cloud base height measurements” by Ilona Ylivinkka et al.***

## **Anonymous Referee #1**

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The classification and quantification of clouds from routine surface and remote-sense measurements remains essential information from studies that range from weather, atmospheric chemistry and the interaction between land and atmosphere. In this research, the authors present an algorithm that enables a cloud classification based on global radiation (observed with a pyranometer) and cloud base height (measured with a ceilometer). The algorithm is based on the calculation of three variables related to the cloud characteristics: transparency, patchiness and the measured CBH. By combining these metrics they are able to identify and classify low, middle and high clouds. To evaluate the performance of the algorithm they compare with an observed who use total sky images. The agreement is 70 %. The paper explained and discussed very interesting

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findings that can help the SMEAR II site -a referent site in the boreal ecosystem due to its completeness in measurements- and other sites. The article is very well written with a very complete introduction that stresses the relevance to have this sort of classification and quantification as a routine product for meteorological/atmospheric chemistry sites. The paper discussed interesting histograms of the cloud types monthly and daily averages, and as the authors mentioned in the conclusions, it will become a valuable tool to study the interactions between surface and the cloudy-boundary layer at boreal ecosystems. I agree with them. My comments to the article are the following:

1) For the completeness of the article, I would have appreciated a short section discussing the evaluation of the algorithm against satellite measurements. For instance the Meteosat Second Generation provides information on cloud classification. Please note that I am not asking a full comparison of the three years under analysis, but perhaps some case examples, for instance related to the diurnal variability or the more demanding and difficult to classify multi-layer clouds. Would it be possible to include this information?

2) Section 2.2 The length of the time interval (21 minutes) to calculate the transparency needs to be better justified. There is not a clear explanation on why it is used (only a reference to the work of Duchon and O'Malley (1999)). Is it related to a life time of clouds? More important, What is the sensitive of the algorithm to this value to the proposed classification? At the discussion, there is a short discussion on these values (lines 383-389), but it does not include the sensitivity to it.

3) Due to the completeness of the SMEAR II data set, I think it will be nice to attempt to connect the proposed metrics to other variables that are very relevant in the modelling of the clouds, but remain difficult to be measured. For example, Have the authors compared the transparency with an estimation of the cloud optical depth?

4) Equations (1) and (2). How do they model the clear sky radiation?