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Atmospheric Measurement Techniques Discussions

Interactive comment on "Two-dimensional and multi-channel feature detection algorithm for the CALIPSO lidar measurements" *by* Thibault Vaillant de Guélis et al.

Anonymous Referee #2

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In this paper a 2D feature algorithm (2D-McDA) based on the two 532 and 1064nm channels from the CALIOP lidar onboard the CALIPSO satellite. This work clearly shows the advantages of using horizontal and vertical coherence between pixels for detection of features. The 2D-McDA uses approaches taken from the field of image processing algorithm that examines full resolution lidar signals and can therefore identify finer details than can be retrieved by more standard multi-resolution averaging schemes. The use of the depol. channel and 1064nm channel introduce many new possibilities, like the detection of smoke and thin cirrus as described in the paper.

The paper is well written and easy to follow. The algorithm and all its details are well

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explained and shown in corresponding images for each of the individual steps.Looking at the successful implementation, this work will very likely lead to the use of similar approaches in the future for similar type of signals.

There are a few minor comments which have to be addressed before publication.

- Figure 2: Caption, please mention here that the jumps in the red line shows the change in vertical resolution. This is mentioned in the text (line 92-93), but it would help people browsing through the paper.

- Page 5, line 98: 'For practical reasons, the layer detection scheme uses ..'. Explain practical reasons: most likely what you mean is that the dynamical range of the signal is smaller and linear instead of the exponential backscatter range.

- Page 6, line 130: Remove 'refer to'

- Page 9, line 172-174: 'This detection procedure ... very extended ones.' Are we talking here about the three options per channel in the table? Please describe this more specific.

- Page 10, line 202: 'We then average the remaining signal (here the attenuated scattering ratios) using an edge-preserving Gaussian sliding window that extends over 5 km (15 profiles) horizontally and a single range bin vertically (a in Table 1). 'Have you filled in the area's which had features with noise or are you assuming 0 in those area's? In the latter case you may loose connections between features due to adding no signals.

- Page 10, line 205: 'faint layers is mainly in the horizontal direction'. Please elaborate! Can you specify this more, i.e. aerosol and thin cirrus regions have a long horizontal scale, for aerosols this can go up to 50-100 km. Also the horizontal window allows for the detection of thin layers close to each other vertically

- Page 12 line 241: 'yellow and white colors do not discriminate aerosol from cloud, as in the VFM, but instead simply differentiate weak from strong features based on

whether the feature detection required data averaging (yellow) or not (white).' This is actually a very important feature of these kind of masks and it is mentioned here for the first time explicitly. You need to mention this separation on strong and weak instead of cloud & aerosol in the abstract, introduction and conclusion as it is conceptually very different from the standard methods that you only look for non-molecular and not the type.

- Page 13 line 283-286 : 'While .... algorithms'. You are very correct with the future outlook that you would like a 2D feature typing in the end, however there are lower hanging fruits to pick first. The detected features will improve and guide the smoothing strategies of the data. This will already show large improvements in the retrievals, i.e. strong and weak features are separately smoothed to calculate the local profile and provide you with the best possible lidar, color and depol. ratio's to enable a better typing and aerosol sub-typing. I think a somewhat broader discussion on how your product can be used is needed here.

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