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Atmospheric Chemistry and Physics Discussions

Interactive comment on "An EARLINET Early Warning System for atmospheric aerosol aviation hazards" *by* Nikolaos Papagiannopoulos et al.

Anonymous Referee #1

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[General comments]

This study well describes the development of early warning system using polarization lidars for aviation operations. Because elastic lidar data are used in the algorithm, the method can be applied not only for EARLINET lidars but also for aerosol lidars in the world. The method uses reasonable mass-to-extinction conversion factor and lidar ratios determined from plenty of references, and therefore the resulted threshold backscatters would be reliable. This study shows a good way of lidar data application and has a possibility to be a standard model of the warning system for decision making. I think this study satisfies the ACP publication level, but minor revisions should be needed because some points are still not clear as the following specific comments.

[Specific comments]

1. In Figure 5(d), there are mis-alerting points above 5 km. This would be caused by the low signal-to-noise ratio. The authors should discuss about this issue in the manuscript and please consider screening the mis-alerting points, for example, by using a threshold for signal-to-noise ratios. Signal averaging would also be helpful to decrease the false detection. Although the processed data can be available every hour (or possibly 30 minutes), the time resolution seems unnecessarily too high (I could not find the resolution used in your results). The authors should explain why such high resolution compared to the updating time (every hour) is needed without improving the signal-to-noise ratio by averaging.

2. In the second case of your results (observations at Antikythera), the authors mentioned that "few pixels within the same aerosol layer are wrongly classified as clouds". In Figure 6(d), are the cloudy pixels excluded from the aviation alert? Please clarify it because, if the cloudy pixels are not excluded, your system can easily misclassify cirrus clouds as dust.

3. In the last paragraph of the section 4.2, the authors mentioned that "In synthesis, both observations and model simulations advocate for the co-existence of volcanic dust and aged desert dust particles in the aerosol scene", but I could not understand this sentence, because, in the simulation results, volcanic ash dust did not appear below 2 km and desert dust particles are few above 2 km. Therefore, I supposed the volcanic ash dust and desert dust are not "co-existence" in the same layer. I believe these events happened at the same time, but the word "co-existence" may be misleading.

4. In Table 2, I understand that EWS was not available for the stations indicated by (*) because they could not provide depolarization channel during the exercise, but why it was not available for the other stations, for example Belgrade (SRB), even though the measurement performed percent was 100 %. The authors should mention the reason.

5. In Figure 9, the time domain is not same as Figure 6, so that comparison with the observation was not easy. Please consider changing the time domain or indicating

observation time domain by e.g., dashed lines.

[Technical corrections]

Page 3 line 23, “The latter and can be expressed as”: “and” should be removed? Please confirm it.

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