

Response to Reviewer 1

We thank the reviewer for this 2nd review, which helped us to further improve and clarify the manuscript.

Reply to comments:

Regarding my general comment #1, the authors gave a convincing explanation about how the six cases (especially the three without dusty cirrus) are selected. I think it is worthwhile to mention in the manuscript that the three non-dusty cirrus cases were selected because they have similar dust intensity and height to the three dusty cirrus cases.

We have included this at the beginning of section 3 and also in the Supplement.

Regarding my general comment #2, I understand adding more non-dusty cirrus cases is not quite doable due to the limited number of available relevant cases, and I agree the current six cases are enough for this study. However, I still think the statistical evaluation in Section 3.4 does depend on how many non-dusty cirrus cases are included, since the new parameterization performs not as well for the non-dusty cirrus cases as for the dusty cirrus cases (Figures S5, S6, and S8). The improvements by ACI-dusty shown in Figures 19c and 20 may not be as evident with more non-dusty cirrus cases included. I would recommend the authors to add more discussion about this issue.

We have included some note of caution about the robustness of the results in section 3.4.

Regarding my specific comment #9, I understand that the statement is weakened by saying “This suggests ...”. But my previous concern lies in the usage of “dominant” in the sentence. I agree with the authors that this study has proved the existence of dusty cirrus and the simple parameterization they proposed did an impressive job in simulating this phenomenon. However, as the authors mentioned in their responses to my general comment #2, this study is not statistically representative for the full climatology of European mineral dust events. Without examining the full climatology of dust events, I do not think it is safe to conclude (even with the word “suggest”) that dusty cirrus is the dominant effect. I think Figure 20 only suggests that the dusty cirrus formation dominates over the other ACI interactions in these selected cases, when dusty cirrus presents and/or when the dust events are intensive and reach high altitude.

We have changed the formulation to ‘.. for the six Saharan dust episodes investigated in the

current study ...' to avoid any generalization.

Line 173: It seems Sections 3-8 in the previous supplement were deleted in the revised supplement. So, I am not sure which part in the supplement is this sentence referring to.

Has been deleted.

Line 341: “A detailed analysis of those individual events is given in the Supplement”. Please give the figure numbers you are referring to.

Has been deleted.

We have again checked all references to the supplement and corrected some mistakes, which occurred during the revision of the manuscript.