Reviewer's comments:

Comment #1:
I am satisfied with the replies to my previous comments. The authors obviously worked hard to do extra experiments and analysis which makes the manuscript in a much better shape now. However, some minor mistakes still exist and are outlined below. The paper could be published after properly correcting the mistakes.

Answer #1:
The authors would like to sincerely thank the efforts and constructive comments and from the reviewer to improve the quality of this manuscript.

Comment #2:
Table 2: In line "IDef", the "Smoldering fraction" is said to be "yes" which makes no sense. Do the authors mean it is the same as FWrp? If so, please explicitly denote it in the table like the line "IWrp".

Answer #2:
Thanks for pointing out. The smoldering fraction used in IDef is indeed being developed through the WRAP algorithm. It has been updated to "FWrp" instead of "yes".

Comment #3:
Line 340: Probably because I did not make myself clear enough and therefore the authors made a mistake here. Dryer environmental air once entrained into the plume will decrease its water vapor content and also the latent heat released during updraft. So, dry stratification favors weak pyro-convection and therefore low injection height. Then, it is better to say "where the atmospheric stratification damps the pyro-convection through entrainment" rather than "has no control". "has no control" would confuse readers to believe dry stratification could strengthen pyro-convection. Freitas et al. (2007) is recommended if the authors still find it hard to understand.

Answer #3:
Thanks for identifying the unclear statement. The paper is very helpful to understand the different effect of dry and wet stratification on pyro-convection. The sentence is now corrected.

Revision #3:
From this study, it is seen that the prescribed heights in the offline method have overestimated the plume rise height under the dry weather condition where the atmospheric stratification damps the pyro-convection through entrainment.

Comment #4:
Line 427: "the dust can be lifted and transported downwind to react with the BB aerosols". I am not sure whether dust aerosols could have chemical reactions with BB aerosols. The authors might want to say the two kinds of aerosol react with NOx, O3 and SO2 gases.

Answer #4:
Agree with the reviewer's concern. There is still no finding suggesting the reaction of both aerosols, the sentence is revised for clarity.

Revision #4:
Under favourable upwind weather condition, the dust can be lifted and transported downwind and concurrently present with the BB aerosols.

Comment #5:
Line 429: "NOx, and SO42- aerosols over western Taiwan in 2006 (Dong et al., 2018)". Please check Dong et al., 2018 again to make sure SO42- aerosols are discussed in this paper.

Answer #5:
Thanks for identifying the typo. It is SO_2 instead of SO_4^{2-}.