Responses to Reviewer 2

Review of "Drivers of Droplet Formation in East Mediterranean Orographic Clouds" by Foskinis et al. Summary: "*The manuscript deals with …* The manuscript is generally well written; however, Section 3.4 deserves more focus as it contains some obscure arguments.

Reply: We thank the reviewer for their enthusiam of this work, as well as for all the comments that have lead to an improved manuscript. We have addressed each point raised and have also reread the manuscript to correct for any stray grammatical errors.

Specific comments:

- Section 2.3.1: When determining the hygroscopicity kappa value starting from the chemical composition, what factor has been applied to the organic mass fraction?

Reply: The hygroscopicity value of *eBC* was considered equal to 0.2 based on Ding et al. (2021)

- "we identified three prevailing wind directions, that correspond to the local transport patterns (Figure S2f) from 90°, 180° and 320° N, where the NTotal obtains its maximum values (~3300 cm-3)". It is not clear whether the maximum values for NTotal are found only at the 320° direction or all the three selected wind directions.

Reply: We apologize for the lack of clarity. We have now updated Figure S2f including the boxplots of the N_{Total} related to the wind direction and discussed in the manuscript.

Line 306: It is not really clear in Figure S2 what are the wind directions tracing an air flow passing over mountain peaks. In addition, with wind directions from 330 – 360°, the PBL height is large and vertical velocity as well (Fig S2b) which is the other way around with respect to what stated in the text.

Reply: Actually, here the reviewer is mentioning the same thing with what is shown in the manuscript. When airflow originates from 330 – 360°, in principle, the airmass passes over mountain peaks, increasing PBLH values. In contrast, when the wind blows from SW or NE directions, where there are no mountain peaks among the trail, the PBL tends to shrink. Thus, both of us claim the same thing, so no change is needed.

- Lines 308 – 310: the references to the panels in Fig. S2 (panels b, c, d) in the text do not match with what shown in Fig. S2 in the supplementary. Are the Authors referring to Fig S3 instead?

Reply: This point has been mentioned by Reviewer 1, now it is corrected properly.

- Fig. 2. Panel b: the PBL / FTL mask is not clear; for instance, on days 11-14 Nov the PBLH is lower than the (HAC)2 elevation but this period is classified green (PBL); the same occurs on 20 – 23 Nov.

Reply: The reviewer is right, and we apologize for this oersight. The graph is now correct.

- Panel c: In the wind direction plot, please use a palette with colours changing with continuity between 360° and 0°.

Done

- Fig. 3a: the y axis of the figure on the left cannot report simply concentrations in cm-3 but must be in dN/dlogDp units. The specific period of the campaign providing this subset of data should be reported. Same for Fig. 5.

Reply: The figure corresponds to the whole period of the campaign as mentioned above, while we changed Figures 3 and 5 as requested.

- About the “virtual cutoff”. Clearly, a (physical) PM10 cutoff … exceeding the threshold of 13.5 µm” (lines 431 - 433). However, with Deff < 13.5 µm, the interstitial dataset should be contaminated from the concentrations of droplet residuals. Please, explain.

Reply: We apologize for this misunderstanding, there was a typo in the text. We meant to write that " where the D_{eff} was **not** exceeding the threshold of 13.5 µm". Everything is now corrected.

- Section 3.4: if clouds are observed only at the (HAC)2 site and not at VL, why the values in the y axes differ between the two graphs in Fig. 6? Most noticeably, in the FTL conditions, Deff is larger than 13.5 µm and the PM10 inlet at (HAC)2 site should sample interstitial aerosols free of cloud residuals, so why the closure is worse in this case? Please, clarify.

Reply: In the case of FTL, where as correctly mentioned the sampled aerosols correspond only to the interstitials, there is a loss of aerosols (those which have activated into cloud droplets), that are not accounted for by the parameterization calcualtions. Thus, the predicted droplet number is much smaller than the observed.