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Important submission on an understudied region

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Referee comment on "First insights into northern Africa high-altitude background aerosol chemical composition and source influences" by Nabil Deabji et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-106-RC1>, 2021

Deabji et al. present initial (five-month) PM₁₀ and chemical composition results from a new monitoring station at a remote elevated site in Northern Africa. Given the lack of data from this region, this is an important contribution that will lead to greater understanding of aerosol sources in Northern Africa.

Unfortunately, the manuscript as presented is hard to read and could benefit from restructuring/reorganization. Some of the conditions and comparisons seem arbitrary. For example, they report PM₁₀ concentrations during "background" periods were up to 20 µg/m³ - but that is because the authors set 20 µg/m³ as the upper limit defining "background" periods. They also excluded local pollution from "background" and then present results saying these were dominated by local dust - this again is a result of excluding other local sources. A better approach might be to pick the lowest fifth (5th) or tenth (10th) percentile of PM₁₀ mass concentrations and describe that as background condition. Similarly, the comparisons with Delhi and Kathmandu seem out of place, as pollution in urban centers especially these locations is very complex and unlike AM5. Since the focus of this manuscript is on AM5, even comparing Moroccan cities (from other published literature, not this work) to Delhi is out of place in this manuscript.

I also had a hard time following the paper, and it could benefit from a more organized structure. For example,

- in the site intercomparison above, the authors compare AM5 with Izana (Moroccan coastal site), then with India/Tibet/Kathmandu, then back to Cape Verde (off the coast of North Africa), then to an unnamed background site in the Mediterranean. This discussion would be more cohesive if AM5 is compared first with all remote sites, then (if at all) with urban sites rather than switching back and forth.

- when discussing daily and monthly variations, they first discuss August/summer. In the

next paragraph, they discuss Oct-Nov-Dec, but midway again discuss August and Saharan influence, then again present winter (Nov-Dec?) results.

- Even the winter discussion is inconsistent, as they first say a change in wind direction leads to lower PM_{10} (which seems unlikely since the populated centers are to the west and wind speeds are high), but then attribute the lower PM to increased precipitation (which is more logical).

Skimming the rest of the paper showed continued repetition and disorganized presentation of results - for example, line 822 has the "first insight into aerosol chemical composition..." midway through a paragraph, and then next paragraph also starts with "first high altitude aerosol characterization study..." I also don't know why sulfate concentration of $1.4 \mu\text{g}/\text{m}^3$ is presented as high when average concentrations at AM5 are $\sim 30 \mu\text{g}/\text{m}^3$ - is that because that sulfate level is high relative to average sulfate at the site? It might help to separate these two results, then.

The next few sections were lengthy, somewhat repetitive descriptions of chemical composition results. The manuscript may be more readable if the monthly variation and chemical composition results are replaced and reorganized by air mass as winds from different directions seem to hit the site in each month. Maybe the authors could shorten and reorganize the paper as NAO+MCE (as they are similar); ACE; SD; and local remote/background - these are perhaps more interesting for atmospheric research and future campaign planning than monthly data.

After restructuring the manuscript to improve readability and logical flow (and some light copy-editing*) the paper can be re-reviewed and considered suitable for publication.

*Some examples:

Lines 160-161: please use either km/h or m/s, but not both especially when comparing two values. It is unclear why low wind speeds indicate Saharan dust reaches AM5 via this path. Also the authors say summer is dominated by southwestern winds, but only describe westerly and southeasterly winds. The last sentence of this section then says summer is dominated by southern winds, so this section is also confusingly structured/worded.

Line 260: Either delete "while" or replace it with "However" or combine this sentence with the previous sentence - separating the two as "mineral dust, while...".

Line 293: replace "accordingly" with "for example,"

Line 294: says PM₁₀ peaked at 143 µg/m³ but line 307 says the peak was 145 µg/m³.

Line 336: delete "In contrast" (and in any case, probably don't compare AM5 to a complex urban site outside Morocco as mentioned earlier.)

Lines 348-349: I assume they mean the urban sites in Morocco are twice or thrice (not trice; also, "two or three times" is better) the AM5 values, but the sentence is unclear. The first two sentences of this paragraph could be easily rephrased as "Urban sites show PM10 values two to three times that observed at AM5 (Table 3)." However, I just noticed only one other site in Morocco listed in Table 3 - Tetouan, which has very similar PM₁₀ to AM5.