Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2020-388-RC1, 2020

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Chemical composition and source apportionment of atmospheric aerosols on the Namibian coast" *by* Danitza Klopper et al.

Anonymous Referee #1

Received and published: 11 June 2020

The manuscript reports the first data on two years aerosol chemical composition at the Namibian site of Henties Bay Aerosol Observatory (HBAO). The site face the Atlantic Ocean, it present particular characteristic, a coastal desert which meteorology is affected by the upwelling of cold water of Benguela upwelling system and it deserve great interest. Besides, data on aerosol composition in this particular area are scarce, therefore the topic is relevant in the atmospheric scientific community and the paper deserve the publication on ACP. However, some implementation are necessary before the publication.

Specific comments

Line 148. The correlation SO4/S have to take into account the other species containing S (i.e. MSA) even if MSA presents lower concentration than SO4. It seems more correct report the correlation (MSA+SO4)/S, molar ratio will be more correct than weight ratio, even if MSA/S and SO4/S have only slightly different mass ratios.

Line 200. The Ca/Na w/w ratio in bulk seawater is 0.04 as correctly reported in table 2 and it is not 0.021.

Table 1. Looking at the values reported in this table I have few considerations:

There are surprising the very high maximum values for few species: Na, Cl and especially F. The STD DEV is not so high; therefore, these high values are occasional. Can be these anomalous high values due to contamination? Is it possible that something go wrong during the sampling? Only considering Na and Cl at their maximum, the sum is 129 ug/m3 that is really a huge PM10 mass value even for a marine windy environment.

It is still surprising 25 ug/m3 of fluoride, it is a huge values, it is difficult to have in open environment such as high concentration of F, this values is more similar to those found in the framework of health in dusty workplace. There are some other anomaly in the sample with the highest values of F, could be a problem of sampling or contamination? I do not believe these high values are reliable so please revise the sentence regarding these high values in the abstract and section 4.2.4.

In general, I suggest to e check the data for the sampling showing these se anomalous high values. Could these anomalous high values affect the PMF results?

There is another interesting feature of this data set: authors define this area desert-coastal, but looking at mean (but also maximum) values of crustal marker the concentration are quite low. For instance, Al present average value of only 478 ng/m3 and its maximum is only 4739 ng/m3. Therefore, the influence of sea spray aerosol is dominant respect to crustal aerosol, the author explain this by the wind intensity and

prevalent direction, that is correct, but this is surprising for this desert and arid region. I think this topic deserve a discussion.

Lines 366 and 370. Please check the year of these references.

Lines 452-458. About the seasonal cycle of MSA, figure 5 shows maxima in austral summer in 2017 (Oct-Nov-Dec) confirming the pattern already find in previous work, but in 2016 the maximum is in autumn (Mar-Apr), the author have an explanation for this maxima? Is this pattern anomalous or it is common to have a late phytoplanktonic bloom? In any case, they have to discuss the pattern that seems anomalous respect to previous results.

Equation 1b. As the authors have all the crustal element concentration, they can calculate the crustal content by the sum of the contributions of all the main crustal element oxides (SiO2, Al2O3, Fe2O3, CaO, MgO, K2O, TiO2), following the approach reported in the literature by several authors (e.g. Marcazzan et al., 2001; Nava et al., 2012; Marconi et al., 2014) replacing CaO whit CaCO3 basing on the Ca mineral content in the area. This approach can be more reliable than the use of the only Al and the averaged content of Al in the upper continental crust.

PMF

Here my main criticism to the paper. The PMF as it is do not add any new finding respect to the simply aerosol component analysis. Besides PMF is not able to distinguish the source of each metals, that are gathered in one factor called heavy metal. In my opinion, the PMF analysis is useless at this level. In the PMF, the author use the following not-independent variable: ss components (K, Ca and SO4) and PM10 mass the latter obtained by the sum of the other aerosol component.

For this reason the ratio between sea spray components and the percentage of sea spray aerosol to the total mass are the same with or without PMF analysis. The sentence at lines 505-511 are obvious. In this context PMF do not add nothing new.

Line 526. Regarding the presence of As in this factor it has to be noticed that As concentration are really high to arise from marine biogenic activity, besides this factor is characterized by secondary species and As, because of it is a metal it is not secondary. Could be As is emitted by smelting activity and transported together with biogenic compounds? May air mass backward trajectory analysis for days with high As concentration clear this process?

Secondary product

This factor can be called NH4 neutralization, as it contain acidic species not necessary arising by the same source, but they are neutralized by ammonia (the latter find in aerosol phase as NH4+ counterbalancing HSO4-, MS-, Formate, oxalate etc.).

Heavy metals

Unfortunately, metals are gathered in only one factor, preventing the individuation of their source. There are several mining activity in Namibia (as reported in figure 1), therefore the analysis of backward trajectory for days with high concentration of each metals (or particular ratios between them) could be more useful than PMF in constrain metal sources.

Lines 627-631. This sentence is too general, I think in this upwelling area, nutrient in the ocean arise from sea bed by upwelling of water masses more than deposited from the atmosphere, I can be wrong but these sentence has to be better supported by literature.

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Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2020-388, 2020.