

## ***Interactive comment on “Source apportionment of atmospheric aerosol in a marine dusty environment by Ionic/composition Mass Balance (IMB)” by João Cardoso et al.***

### **Anonymous Referee #3**

Received and published: 28 March 2018

This paper analyzed elemental and some ion data in PM<sub>10</sub> acquired from Cape Verde, an island west of the African Continent, with the attempt to determine the contributions from Saharan dust, sea salt, and their derivatives due to atmospheric transformation. Their approach is mainly based on ion balance, assuming known crustal and sea water chemical composition and the sequence of cation/anion neutralization. The mass and ion closure result from the approach generally make sense, especially when accounting for the residual water content. However, uncertainties were not provided for each contribution estimate, as PMF and other receptor models usually did. In many cases, the authors picked a middle value from a range of possible ratios, such as the water/soluble dust ratio, Fe/Na<sup>+</sup> ratio, Mg<sub>2+ss</sub>/Na<sub>+</sub> ratio, etc. to carry out their cal-

Printer-friendly version

Discussion paper



ulation. Is it possible to propagate uncertainties in these assumptions throughout the calculation and give an overall uncertainty estimate in Table 3? The uncertainties should be compared with those from PMF based on the bootstrapping or DISP methods. In fact, the dust Fe/Na<sup>+</sup> ratio (3.7) determined from the edge line (Figure 2) is based on only 3 points and the ratio falls at the low end of possible range of Fe/Na ratio for Sahara dust. It is nearly impossible to find a period with zero sea salt contribution at the island, and therefore using the edge line to determine the dust Na<sup>+</sup> fraction is risky. At the very least, uncertainty in this method should be given and propagated into all subsequent calculations.

When the authors compare IMB and PMF source contribution, they only compare the average contributions for the three periods. It is also meaningful to compare: 1) correlation of respective source contributions determined by the two methods across individual samples and 2) chemical composition of corresponding sources/classes, particularly the sea salt and dust sources, to examine whether the authors' assumptions in IMB, such as the aforementioned Fe/Na<sup>+</sup> ratio, are consistent with PMF. These comparisons should be presented and discussed explicitly.

Additional comments:

Page 10, Line 16. What is the range of this F factor? Can this be propagated into the uncertainty estimate?

Page 10, Line 33. Does K<sup>+</sup> (and perhaps Cl<sup>-</sup>) generated from biomass burning need to be considered in the IMB for the region?

Page 13, Line 12-19. How does the assumption of average inorganic and organic water growth factor influence the mass closure, and the contribution of each source to PM10? Can the range be estimated?

---

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-10>, 2018.