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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Distribution and sources of bioaccumulative air pollutants at Mezquital Valley, Mexico, as reflected by the atmospheric plant *Tillandsia recurvata* L." *by* A. Zambrano García et al.

**Anonymous Referee #3**

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The subject manuscript addresses the accumulation of atmospheric relevant pollutants by a plant that obtains nutrients and water directly from the atmosphere as a metric of atmospheric pollutant monitoring. The manuscript is novel in the use of this plant as biomonitor of toxic metals and PAH and would be interest to the atmospheric chemistry and physics community and the readership of ACP. The major weakness of the paper is that the measurements cannot be readily integrated or interpreted into the context of air pollution and the impacts of air pollution. Nonetheless, the quality of the measurements and the novelty of the measurements warrant publication after addressing the

comments below:

General Comments

1) The measurements are very difficult to connect to air pollution concentrations and air pollution impacts due to the complexity and of the transfer function between the atmosphere and bioaccumulation on the plant. Although the derivation or measurement of the transfer function is clearly beyond the scope of the current paper, the authors should offer some recommendation of future work that is needed to allow such measurements to better address atmospheric pollutant concentrations or the impacts of atmospheric pollutants. 2) Given the importance of dust in the accumulation of metals on or within the plant, the authors need to be address the assumption that the accumulation of pollutants is bioaccumulation and not just surface deposition. Would similar results for metals or PAH have been obtain for the crustal material if an inert object shaped as the plant was deployed in the location of the plant? 3) It is not clear from me from the paper if the uptake of C and N are dominated from the uptake of carbon dioxide and nitrogen fixation, which is suggested in the text but not necessarily supported by the data. If this is the case for either of these components, than the enrichment of the C and N isotopes are not really of interest to the air pollution community and are more relevant to the global biogechemical cycle. This issue needs further clarification. 4) What quality control was done to assure that the observed bioaccumulation was not due to natural differences in the plants, which correlated with spatial location, or natural ecosystem differences. In terms of the soil, it appears that some of the soil accumulation is associated with local dust that could be independent of air pollution. This issue needs to be better discussed as the implication that all difference were due to local pollution seems inappropriate. 5) The use of factor analysis to help understand sources of the metals need to re-evaluated to assure that the interpretation of the results is appropriate. The use physical mechanisms of deposition (both wet and dry) are very complex processes that are dependent on particle size. To this end, the factors may not necessarily reflect sources and may reflect factors impacting deposition with



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or without source differentiation.

Specific Comments

1) Page 5815 – What QA/QC was done to demonstrate that the extraction and ICP-OES analysis method was accurate for V, Ba, Pb, Sr, Ni, Ca, Cr, Sb, Mo, and Cd. The text indicates that QA/QC was checked for other light elements that Optical ICP is well suited but some of these other elements are more difficult by ICP. In addition, what was done for blank subtraction to address field and laboratory contamination? Were any QA/QC checks performed? What was done to validate that the extraction quantitatively extracted these metals? 2) Page 5817 – What QA/QC was done for the PAH analysis. Were any QA/QC checks performed? What was done to validate that the extraction quantitatively extracted these PAH? 3) Page 5825 – The connection of the high Ca and the limestone areas is not clear. Are the authors suggestion that the Ca is from the mines or that the soil in these areas are just different and high in Ca. If the authors are suggesting that the high Ca is from the mines, how is this determined? 4) Page 5827 – The interpretation of factor 3 is confusing. Are these elements lumped together because they are from the same source or because the deposition process that led to their accumulation on or in the plant are similar? Do the authors believe that these are all from cement facilities, multiple sources in the near proximity of the cement faculties, and atmospheric parameters that lead to higher uptake of the pollutants from a atmospheric mix that is from a wide range of sources. 5) The use of isotope ratios is confusing in the factor analysis. Is this a reflection of location that is represented by isotopic ratios?

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 5809, 2009.