



EGUsphere, referee comment RC1

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Comment on egusphere-2022-174

Håkan Pleijel (Referee)

Referee comment on "Seasonal variation of mercury concentration of ancient olive groves of Lebanon" by Nagham Tabaja et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-174-RC1>, 2022

This manuscript contains interesting new information, which should be of interest to the broader scientific audience. The Hg concentration of leaves, fruits, stems, litter of olive trees and soil (at different depths) in two geographically separated olive groves in Lebanon was investigated. Very little information on this is available in the scientific literature. Importantly the seasonal dynamics of the Hg concentrations of the different compartments were investigated. The relative importance of root uptake vs. uptake by leaves from the atmosphere is discussed.

I have two main concerns with the manuscript. Firstly, the language and clarity in several statements should be revised to improve the presentation. Please find below a number of suggestions of possible improvements. A native English speaker should check the entire manuscript. Secondly, the phenology of leaf dynamics in *Olea europaea* has been neglected in the interpretation of seasonal variation in leaf concentrations of Hg. According to literature a new flush of leaves emerges in spring in olive trees, while leaves are perennial and remain on the tree approximately 3 years. The new leaves that emerge and grow in spring and early summer have not been exposed to Hg to any large extent. Thus, they can be expected to start their development with very low concentrations of Hg – the Hg level increases rather monotonically with leaf age in many tree species (see Wohlegemuth et al 2021, Pleijel et al 2021). Thus, leaves sampled after the new flush of leaves has emerged and grown will typically have a lower Hg concentration than before the new leaves have emerged and become fully developed. Wouldn't such a "dilution" effect explain (at least part of) the seasonal dynamics in foliage Hg concentration presented in Figure 2 a and b? If so, it would also influence the interpretation of the seasonal dynamics in the Discussion. The influence of the leaf phenology dynamics on foliage Hg concentration needs to be discussed to improve the quality of the manuscript.

Detailed comments:

Lines 21-22: clearer like this: "... to investigate the seasonality of the mercury (Hg)

concentration of olive, an iconic tree ...".

Line 22: please change "was" to "were".

Line 27: maybe "low" rather than "lowest" since stems seem to have had equally low or lower concentration (line 24).

Line 30: "global"? Rather it is relevant for the kind of vegetation typical of the Mediterranean basin and similar climates, which is in itself important.

Line 38: "most important" or "most widely distributed" rather than "most common"?

Line 51: maybe simplify – "Forests are known to act ...".

Line 52: rather "leaf gas exchange" than "photosynthesis".

Line 54-55: maybe – "... or transferred to other plant organs ...".

Line 60: replace "is said" by "has been estimated"?

Line 64: "earth"? Do you mean "terrestrial"?

Line 68: is it really through "photo-respiration"? I think not. Please be more specific about the relevant "biological processes" referred to.

Line 69: "... Hg exchange between ...".

Line 72-73: The sentence starting "Differences ..." is not clear.

Line 94: maybe clearer to say "an air pollution emission area"?

Line 111: "outcomes and consumed"? Not clear.

Lines 114-115: then sentence starting "In addition ..." is not complete.

Line 117-119: the objectives would become more informative if they were further elaborated and detailed. The first one could include the information that leaves, fruits, stem, litter and soil were investigated (or this could be an additional, first objective – the comparison of the strongly contrasting Hg concentration levels between the different fractions is a very important aspect of the study). The second one is incomplete and should express that the significance of soil uptake is assessed in relation to uptake by the leaves of Hg from the atmosphere. The sites are locally uncontaminated but considering the scale of the Hg problem a certain degree of contamination occurs over wide areas.

Line 142: it does not become clear if Chekka town is a source of Hg emission or only of other pollutants.

Line 143: "monoxide" should be "carbon monoxide"? "particulate matter".

Line 224: the sentence is not well phrased.

Line 247-249: why is not the concentrations of fruits included in these comparisons?

Line 266-267: the sentence starting "Seasonal effect ..." is not complete.

Line 282 and section 3.3: it does not become completely clear what is compared. Variation among trees in different parts of the investigated areas? The presentation needs improvement in this section.

Line 298: if the p-value is 0.013 it is <0.05 and can thus be considered significant, contrary to what is said in the text!? Why is only one p-value provided if both foliage and stems are tested vs temperature?

Line 343: it could be discussed further why litter typically has higher concentrations than leaves. It should be mentioned here that the leaves shed as litter are likely to mostly be

the oldest leaves, which have accumulated Hg during the longest period of time and thus have higher Hg concentrations than the remaining leaves have on average since they consist of both younger and older leaves. It should also be kept in mind that litterfall could have lost organic carbon, thereby concentrating Hg (e.g., Pokharel and Obrist, 2011).

Line 353: rather than "photosynthetic activity and stomatal conductance" it would be more accurate to say "accumulation in leaves after stomatal uptake"?

Line 440: since the distribution of Hg pollution is by nature geographically very widespread, long-distance contamination occurs and it may be better to say "In sites without local contamination" instead of "In uncontaminated sites". Similarly on line 452 it would be appropriate to say "locally uncontaminated" rather than "non-contaminated".

Line 459: "but it can also be due to the physiology" – what aspects of physiology? Photosynthetic activity and stomatal conductance already mentioned on line 458 are physiological processes! What other physiological processes do the authors refer to?

Line 467: "... between Hg soil due ..."? Difficult to understand.

Why are some references in capitals, e.g., lines 512-513, lines 521-523, lines 712-715. Pleijel et al and Wohlgemuth et al are no longer preprints.

Font size in figures should be increased to improve readability.

In general, the results are interesting and important. They should be published, but as already mentioned the Hg concentration of foliage in relations to phenological dynamics of olive tree leaves needs to be considered in the discussion of the results.

Reference:

Pokharel, A. K. and Obrist, D.: Fate of mercury in tree litter during decomposition, *Biogeosciences*, 8, 2507–2521, <https://doi.org/10.5194/bg-8-2507-2011>, 2011.