Eboigbe et al. Response to reviewers:

We note our responses are in blue and we use the notations RxCx to define a specifically numbered comment (C) relating to a specifically numbered reviewer (R). RxARx refers to a specifically numbered Author Response (AR) that relates to a reviewer comment.

REVIEWER 3 (R3):

R3C1: The manuscript entitled "Mercury contamination in staple crops impacted by Artisanal Small-scale Gold Mining (ASGM): Stable Hg isotopes demonstrate dominance of atmospheric uptake pathway for Hg in crops" by Eboigbe et al. examines the biogeochemical cycling of mercury and uptake mechanisms in selected crops in areas contaminated with mercury due to ASGM. In light of the fact that ASGM represents the largest anthropogenic source of Hg today, and that due to the illegal nature of the ASGM activities, such areas are understudied, this contribution is very welcome and provides new valuable insights for scientific community.

Overall, the manuscript is very well and clearly written and logically structured. Appropriate complementary analytical methods are used, and the data are appropriately and adequately interpreted and evaluated in light of previous related studies. Therefore, I consider the article suitable for publication in the journal Biogeosciences. Regarding the content, I have only one general suggestion, namely that a section on the limitations of the studies be added to the discussion, where the aforementioned restrictions during sampling are critically evaluated and, on this basis, appropriate recommendations for future studies are made.

R3AR1: First we thank the reviewer for their very positive assessment of the manuscript. With respect to the limitations/recommendations, we have attempted to incorporate these into the text as each part of the study is address. However, we will add a Section 3.6 “Limitations and future work” to the manuscript that includes the following statement:

“As noted in Section 2.1, the scope of our sampling was limited by the social and geopolitical complexity of the ASGM issue. While it would have been optimal to assess larger crop sampling sizes at each site, we had to respect the wishes of the site operators, the community, and the farmers for whom these crops are their livelihood. Despite the lower-than-optimal sampling sizes, we achieved robustness through a thorough experimental design that captured samples from all the critical environmental compartments (and different plant tissues) and multi-method analyses. With that, we are confident in our data and the findings made with those data. Future studies should expand upon this work by adding dissected crop tissues (i.e., roots, edible parts) to improve the assessment of uptake pathways, internal cycling of Hg by plants, and translocation into edible tissues. Hg stable isotope analyses should remain a key part of future studies of this nature. Other studies have determined more elevated concentrations of Hg in edible parts of crops near ASGM areas (i.e., Adjorololo-Gasokpoh et al., 2012; Addai-Arhin et al., 2023); hence, if it is feasible, similar structured studies to our own should attempt to assess ASGM sites of differing (larger) scales and/or the proximity of farms to these sites.

This site was chosen due to existing partnerships that were built through discourse and trust. As described in Moreno-Brush et al. (2020), these partnerships between the communities, miners, local researchers, and international collaborators are critical to the success of Hg biogeochemical assays in ASGM areas. Security and research safety are considerable issues of research conducted in ASGM areas. While this should highlight the need for strong local

partnerships, we stress that flexibility and adaption are vital components of such work, work which becomes increasingly important as ASGM continues to expand in the Global South."

Here we stress the very real challenges of doing work in active ASGM areas. Many of these locations around the world are unsafe for researchers and are simply unfeasible. Therefore we highlight the importance of international collaborations and local partnerships in this section.