General comments

- The abstract is simply (e.g. accessibly, well) written, which for a gas exchange paper is a real breath of fresh air! Sometimes they are obtusely complicated which makes them hard to access, well done
- I think I have a few points on the 'broader implications' statements at the start; I'd add some specificity or remove them altogether. They feel somewhat unnecessarily broad.
- In general, I'd suggest working to change the passive voice (e.g. line 150-153) to active voice throughout (e.g. line 150 = "We measured the change in CO2 concentration after injection by connecting an infrared CO2 gas analyzer to the inlet and outlet of the sealed Greenhouse Coffin." Another example, line 159: "We conducted a greenhouse experiment to test the accuracy and precision of the low-cost sensors, as well as the overall capability of the greenhouse coffins system in independent mode." Etc.
- I made some specific notes below, but I think the paper would be stronger if it had a more focused introductory narrative. The current organization sets up an unnecessary contrast between the greenhouse coffins and existing DIY chamber systems, rather than showing that this system builds upon recent developments in DIY chamber systems as a complement (not a direct comparison, especially given the difference in application and the same sensor used in many DIY chambers these days). I have given suggestions on reorganized narrative that the authors might consider.
- I think that a last pass for sentence fragments and overly-long sentences that could be made more efficient and readable by splitting in half is in order, as the authors write very well but in some spots in a verbose way!
- This is a really cool study that fits beautifully into the growing body of literature on DIY gas sensing devices, and I love that the authors show how it will work in the greenhouse space specifically for manipulative experiments that can be applied to real-world scenarios. The authors should pump up that part of their narrative as it is quite cool!

List of technical corrections, specific comments by location:

- Would suggest making the first sentence more efficient *and* more germane to the actual paper's take-home by combining with the second: "Agricultural systems are particularly vulnerable to the more frequent, less predictable extreme weather events (e.g. droughts, heat waves) wrought by climate change (refs)." This kind of phrasing elimates the super-wide "funnel" at the start of the paper which is perhaps too wide for this paper's scope; yes it's true that climate change is threatening ecosystem function, but for the purposes of this study, we all already know that are want to know why ag systems in particular are the focus. (section 40)
- Section 45: I think the authors would behoove themselves to reorganize a little here. I think the 'threat' in the paper is climate change, though what it really should be is 'agricultural systems being both a source and a sink for greenhouse gases in a climate-changed world'. I suggest the authors do some (very slight, truly!) massaging of the narrative arc in this first paragraph to refocus (see above, for example). E.g., proposed rearranged 'flow' of narrative in this paragraph:
    - Agricultural systems are threatened by the changing weather patterns associated with rampant climate change
    - What is more, ag systems have the potential to both contribute to (refs) and mitigate (refs) greenhouse gas emissions depending on the practices in place and the environmental contexts of the systems.

    - To best mitigate the harms of extreme weather (esp. drought, heat waves) and to characterize the potential for agricultural fields to decrease or even reverse GHG emissions, it is essential to better monitor (and thus understand) gas and water fluxes between those systems and the atmosphere.
- 52-55: "However, manual chambers require intensive labor to use at large scales and resolutions. In addition, commercial gas analyzers (not to mention the multiplexors and auto- or semi-automatic chambers associated with automatic systems) themselves are extremely expensive, presenting significant barriers to extensive chamber-based flux research, particularly in the relatively understudied global South."
- I think this needs rephrasing in light of the statements above. Perhaps:
    - "Mesocosm-scale experiments, performed in greenhouses or climate chambers, allow researchers to mimic the *in situ* environmental conditions of many different settings, and provide the opportunity to variably manipulate those conditions within a single study site. In this way, researchers can explore the impacts of precisely isolated environmental treatments, bridging the gap between lab-based studies of single plants and field-based studies and facilitating a more nuanced understanding of ecological dynamics."
    - I will also say that I think if this is the driving thrust of the argument, the introduction should be re-framed. Right now there is a lot of content on the difficulties of field-based gas flux work given the scope/scale of those studies, resulting in a lack of study on global South conditions. But then, we move to the utility of greenhouse/mesocosm experiments, which can bridge the gap between field and lab. Which is it? I think that the current setup should be adjusted to follow the structure I suggest above for P1, and be followed by, in P2:
        - However, it is challenging to study the effects of climate change on agricultural GHG dynamics given the difficulties inherent to field-based (high variability, environmental noise, the labor and cost associated with large-scale, high-resolution data collection and equipment) and lab-based (lack of environmental context, lack of replicability, the high cost of equipment) research on plant-soil systems.
        - Mesocosm-scale experiments located in greenhouses or climate controlled chambers therefore provide a middle ground, bridging the gap between lab and field studies by allowing for high replication, tightly controlled and isolated environmental treatments, and the ability to monitor plants within a context similar to that of their *in situ* environment.
    - Then, the next paragraph (P3) can go into the recent advances in DIY devices for GHG exchange research (without needing to discuss gap filling, which creates an artificial divide between your innovation and the current existing ones, esp. given that most of the those could easily be adapted to mesocosm experiments so it's not useful to suggest they can't. Your innovation measures something specific, the net GHG flux of a whole patch of soil/plants! This is different and thus not directly comparable as currently suggested in line 72.
        - E.g., "In recent years, researchers have been increasingly developing low-cost devices for chamber-based gas-exchange systems using a do-it-yourself (DIY) approach. These DIY systems reduce the generally high cost per device, allowing for higher replicability than has been previously possible using commercial systems. They leverage…such as the "Fluxbots".

To expand the application space of such DIY devices to the mesocosm scale, we have developed and validated the “Greenhouse Coffin”, a novel…”

- 80: highlighted words that can be deleted in green, here and throughout
- 80: spell out “relative humidity (RH)” here and use RH for the remainder
- 80: not sure what ‘based’ means here in the context, apologies! Highlighted to flag it for the authors to confirm
- 82-83: suggest rephrasing to, “Furthermore, we tested a DIY, low-cost multiplexer’s ability to link multiple greenhouse coffins to one commercial gas analyzer.” ← since you’re testing the multiplexor, not the system per se!
- 92: what does “Arduino Uno-like” mean? Isn’t the ATmega a kind of mcu that can be associated with an Arduino board? I would clarify what you mean here otherwise I think it’ll cause confusion.
- 107: “thus enabling *researchers* to chain each greenhouse coffin *together* to a single gas analyzer”
- 115: see note above on line 92 re: microcontroller specs; this is a little bit confusing!
- 166: in what way does the Bluetooth allow for easy data access? I’d love a few more details on how this works aka what format is the data in, how does it get transmitted over Bluetooth, etc.! it seems cool ☺
- Fig. 1: I think the labels on the two modes are incorrect; I think the left needs to be *independent* mode and the right needs to be *dependent*, right? the legend is correct if so, just the labels are off!
- 142: ha! This is awesome ☺
- 180 section: I suggest a table with the gas constants listed for easy access for readers looking to replicate your data processing method!
- 242: this wording is a little awkward and fumbly; I also think it’s probable that you’ll want to say “demonstrated” over “proved”. Maybe, “The validation experiment, performed continuously over five days using a single greenhouse coffin in independent mode, demonstrated that CO2 and ET fluxes can be measured reliably and accurately in a fully automated chamber using low-cost sensors.”
    - Remove highlighted sentence in 243-244
    - “…using low-cost sensors. Out of 223 automated measurements…”