We thank Dr Guillem Domènech-Gil for the thoughtful and constructive comments, and we are grateful for the positive feedback on the engineering quality and user-friendliness of the *Pondi*. Below, we respond point by point and outline the changes made to the manuscript accordingly. We will wait to upload the revised manuscript until we get the second reviewer's comments.

About calibration and validation

In section 2.1, you mention the possibility to continuously refine and update the total flux equation as calibration data changes over time while, in section 2.4, you describe one-time calibration (2-point for N2O, 1-point for CH4, and factory pre-calibration for CO2 sensors). This calibration-update feature seems very useful, but if only one-time calibration is needed, which is its purpose?

We agree this point deserved clarification. The "one-time" calibration presented in section 2.4 refers to the initial calibration performed prior to deployment. However, the system architecture allows users to update calibration parameters at any time by uploading new values via the cloud interface. This feature is particularly useful for long-term deployments where sensor drift is expected or if a user performs re-calibration after retrieval. We will clarify this functionality in the revised section 2.1 and add a note in section 2.4 to connect both explanations.

More information on how humidity was controlled during the validation measurements and why the chosen RH and temperature, and CO2, CH4, and N2O concentrations are relevant for the later field measurements would be scientifically valuable and increase future usability of Pondi.

We now provide additional information in the methods (section 2.5). We regulated humidity and temperature during calibration and validation tests by placing three Pondi loggers first into a heated room, and after inside a refrigerator. This approach created two scenarios: hot and humid conditions (36°C, 75%) and cold and dry conditions (15°C, 50%). These conditions cover most of the variability in temperature and humidity typical to mid-latitude field conditions. However, we will also clarify that further validation across more extreme humidity and temperature regimes is planned for future work, especially for tropical or arid applications.

About interferences, accuracy, and system validation

The commercial gas sensors used present interferences. While some of these cross-sensitivities are addressed, others remain. In this sense, it would be very interesting for future uses of Pondi to know certain system specifications. The error linked to temperature and humidity, together with the quantified error via MAPE, represents a measurement inaccuracy, different for each sensor and measurement range. Could you clarify the accuracy of Pondi for each sensor and concentration/measurement range? Is it possible to provide MAPE values for the field measurement range?

Great suggestion. In the revised manuscript, we will include a new summary table with:

- Measurement ranges for each sensor
- Resolution
- Accuracy (with references)
- Known cross-sensitivities
- Calculated MAPE values across the most common field measurement ranges (based on our calibration dataset)
- Notes on how we addressed the cross-sensitivities
- Reference for the information provided

The table will look like the one below and we will refer to this in sections 2.4, 2.5, and 2.6

Gas	Sensor Model	Measurement Range	Resolution	Accuracy	Known Cross-Sensitivities	MAPE	Notes	Ref
CH_4	Figaro TGS2611-E00 (MOx)	0–10,000 ppm	~0.1 ppm	± 1.7 ppm at 28 ppm (ca. 6%)	Humidity and temperature.	8.93% (3–10,000 ppm)	Temperature correction applied using NTC thermistor. Operating RH usually >50%, minimizing humidity effects.	Figaro, manual Shah et al. (2023)
CO_2	Sensirion SCD40 (NDIR + T/RH sensor)	400–40,000 ppm (validated up to 10,000 ppm)	1 ppm	± 40 ppm at 5,000 ppm (ca. 5%)	Minimal due to NDIR design.	19.9% (400–10,000 ppm)	Integrated temperature and RH compensation. Sensor underpredicts above 5,000 ppm.	Sensirion manual
N_2O	Dynament P/N2OP/NC/4/P (NDIR)	0–1,000 ppm	~0.1 ppm	± 50 ppm at 1,000 ppm (5%)	Cross-sensitive to CO_2 (~0.05 ppm N_2O per ppm CO_2).	4.96% (0–1,000 ppm)	CO_2 correction factor applied. Sensor robust to temperature and RH variation.	Dynament manual

References

Figaro TGS2611-E00 manual: https://www.figarosensor.com/product/docs/tgs2611-e00_product%20infomation(fusa)_rev01.pdf

Shah, A., Laurent, O., Lienhardt, L., Broquet, G., Rivera Martinez, R., Allegrini, E., Ciais, P., 2023. Characterising the methane gas and environmental response of the Figaro Taguchi Gas Sensor (TGS) 2611-E00. Atmospheric Measurement Techniques 16, 3391-3419, 10.5194/amt-16-3391-2023.

Sensirion SCD40 manual: https://sensirion.com/media/documents/E0F04247/631EF271/CD_DS_SCD40_SCD41_Datasheet_D1.pdf?utm_source=chatgpt.com

Dynament P/N2OP/NC/4/P (NDIR) manual: https://www.processsensing.com/docs/dynament/tds0132_1.1Platinum-Dual-Range-Non-Certified-Nitrous-Oxide-Sensor-Data-Sheet.pdf

Section 2.6 provides interesting and important insights, but a relevant question might obfuscate them. Was the CO2 sensor tested against interferences? If CO2 sensor does not present interferences, the CO2 contribution from the NO2 signal can be compensated but otherwise the issue becomes more complex.

We clarify that the CO_2 sensor is a nondispersive infrared (NDIR) unit, which is inherently less prone to cross-sensitivities compared to electrochemical sensors. According to manufacturer data and our tests, NO_2 does not interfere with CO_2 detection in the NDIR configuration used. We have updated section 2.6 to make this clear and provide a citation to the sensor datasheet confirming this.

The field measurements and observations are relevant to validating Pondi, while missing data may induce thoughts of hidden information. To remove this residual possibility, could you include temperature and humidity data in Figures 6, 7, and 8? Do you have long-term terrestrial flux measurements including the different used sensors? Did you notice long-term drift in any of the sensors used? Could saturation values vary over time as seems to happen in Figure 6 and 7?

We have now added temperature and humidity data as additional panels in Figures 6, 7, and 8 to aid interpretation (see below).

While long-term drift is an important consideration, our typical deployment periods thus far have been around one month (see Fig. 6). Although this period is too short to assess long-term drift conclusively, we observed no significant signal decay or instability in any of the sensors during this timeframe. Also, we recommend monthly maintenance visits to clean the sensors and chamber surfaces due to algal buildup and biofouling, especially in aquatic settings. These visits provide a natural opportunity to perform routine recalibration, which helps minimise any long-term drift that might otherwise accumulate.

Regarding long-term terrestrial flux data, we encountered biological constraints when enclosing vegetation in the chamber for extended durations. Specifically, plants showed signs of heat stress, especially when sunlight was allowed to penetrate the transparent chamber to facilitate light-dependent photosynthesis. The heat buildup inside the sealed chamber appeared to compromise their physiological functions and introduce inaccuracies in gas exchange measurements. To mitigate this, we limited the duration of terrestrial flux measurements to short intervals (typically <30 minutes), ensuring that plant metabolism remained stable (i.e., linear trends in CO_2 concentrations) and avoiding potential artefacts in the data. Active temperature regulation or intermittent venting might extend the measurement duration in future studies while minimising heat accumulation and maintaining plant health.

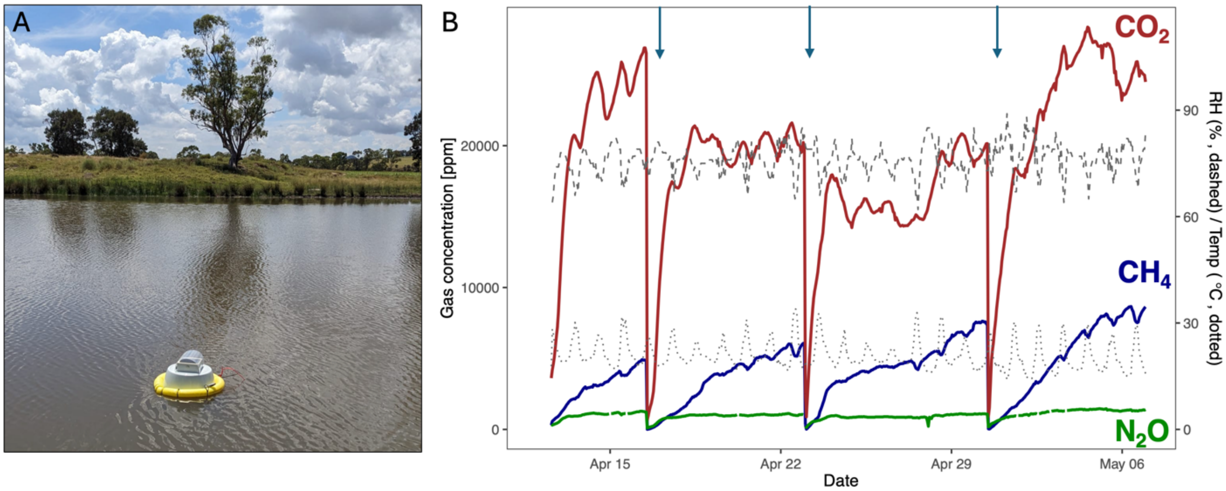

Figure 6: (A) *Pondi* in a farm dam. (B) Four weeks of hourly CO_2, CH_4, N_2O, relative humidity (RH), and temperature measurements inside the floating chamber of a *Pondi* in a farm dam. The arrows indicate the three venting events when the air pump diluted gas concentrations by injecting fresh air into the chamber.

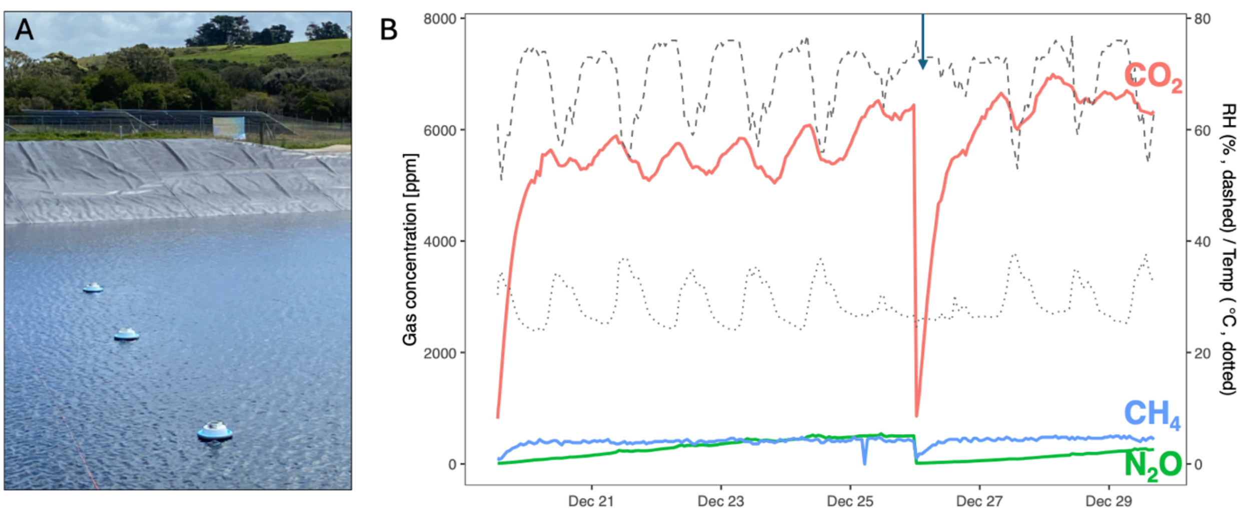

Figure 7: (A) Three *Pondi* in a wastewater lagoon. (B) Ten days of hourly CO_2, CH_4, N_2O, relative humidity (RH), and temperature measurements inside the floating chamber of a *Pondi* in a wastewater lagoon. The arrow indicates the venting event when the air pump diluted gas concentrations by injecting fresh air into the chamber.

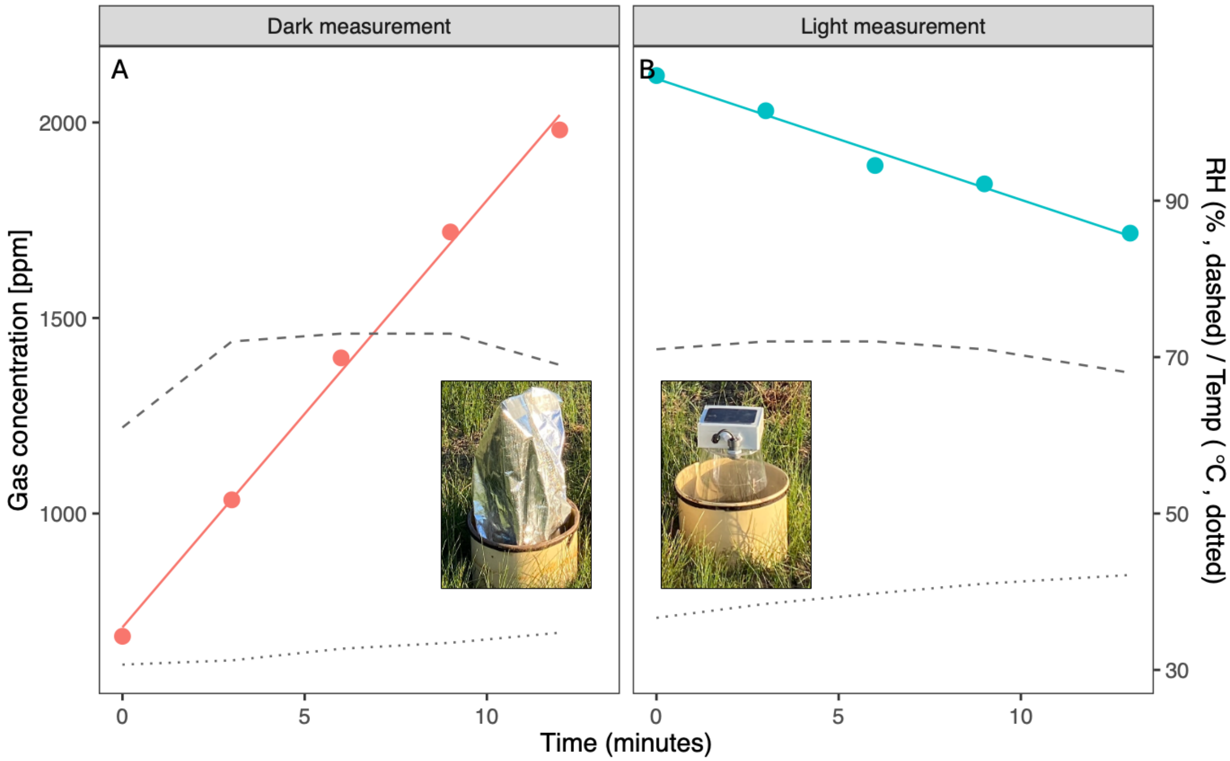

Figure 8: Monitoring CO_2 concentrations in vegetated terrestrial systems using *Pondi*. (A) *Pondi* recording dark respiration after the transparent chamber is covered with insulation material. (B) *Pondi* recording net primary production by allowing light through a transparent chamber. Coloured dots are measurements from a *Pondi*. Continuous coloured lines are linear models to estimate emission rates (dark measurement; red) and sequestration (light measurement; green). Dashed and dotted lines are relative humidity (RH) and temperature measurements inside the chamber of the *Pondi*, respectively.