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.

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	Range	Res	Accuracy	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. Minimal temperature and humidity effects (Fig. 4C).	Figaro manual, Shah et al. (2023)
CO_2	Sensirion SCD40 (NDIR + T/RH sensor)	0–40,000 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 (Fig. 3B).	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%)	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 (Fig. 4A and S7).	Dynament manual

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.

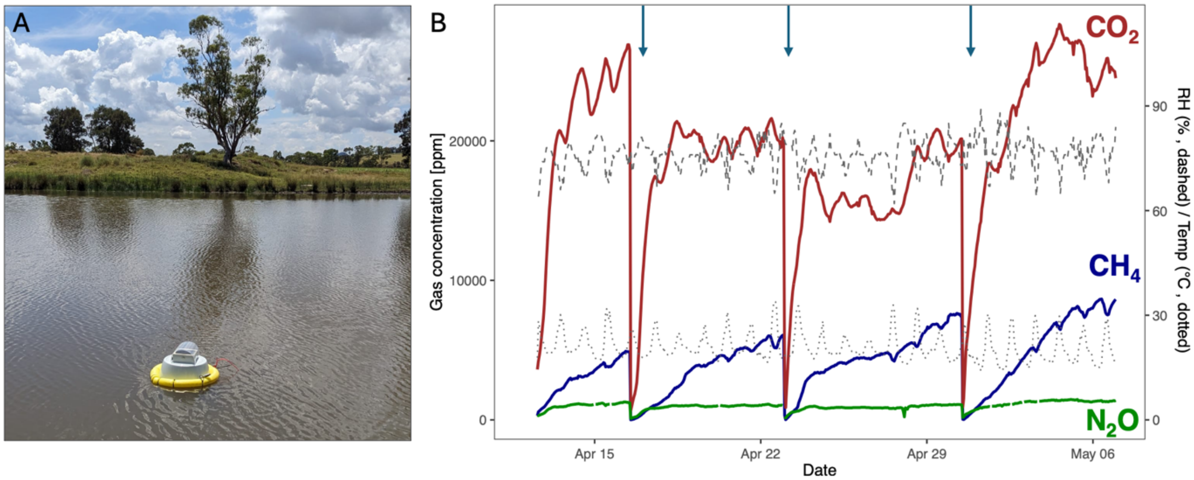

Figure 6: (A) *Pondi* in a farm dam. (B) Four weeks of hourly CO_2, CH_4, N_2O, relative humidity (RH), and temperature measurements inside the floating chamber of a *Pondi* in a farm dam. The arrows indicate the three venting events when the air pump diluted gas concentrations by injecting fresh air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

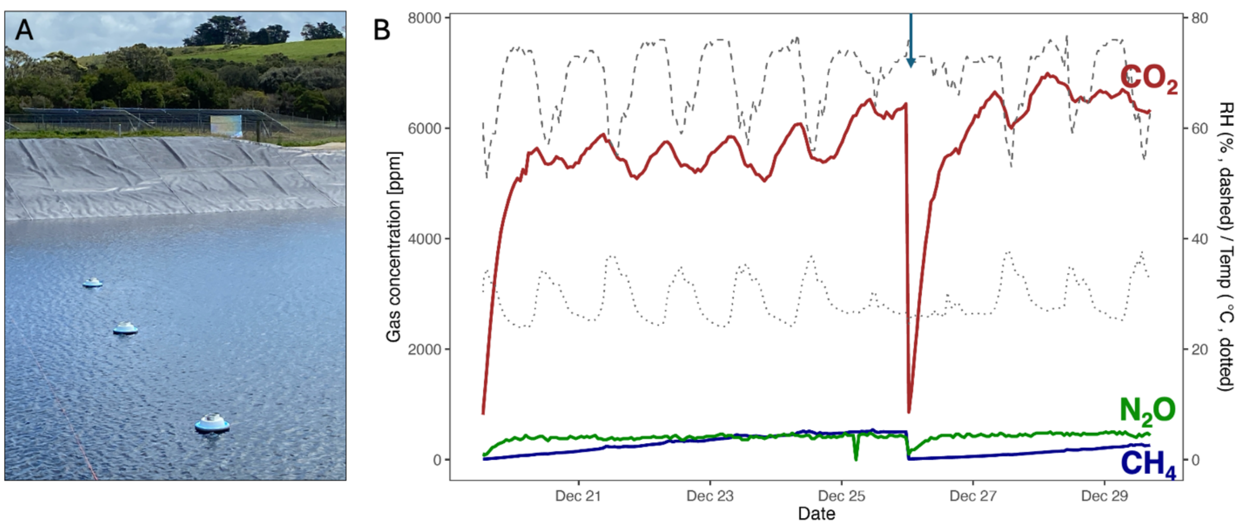

Figure 7: (A) Three *Pondi* in a wastewater lagoon. (B) Ten days of hourly CO_2, CH_4, N_2O, relative humidity (RH), and temperature measurements inside the floating chamber of a *Pondi* in a wastewater lagoon. The arrow indicates the venting event when the air pump diluted gas concentrations by injecting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

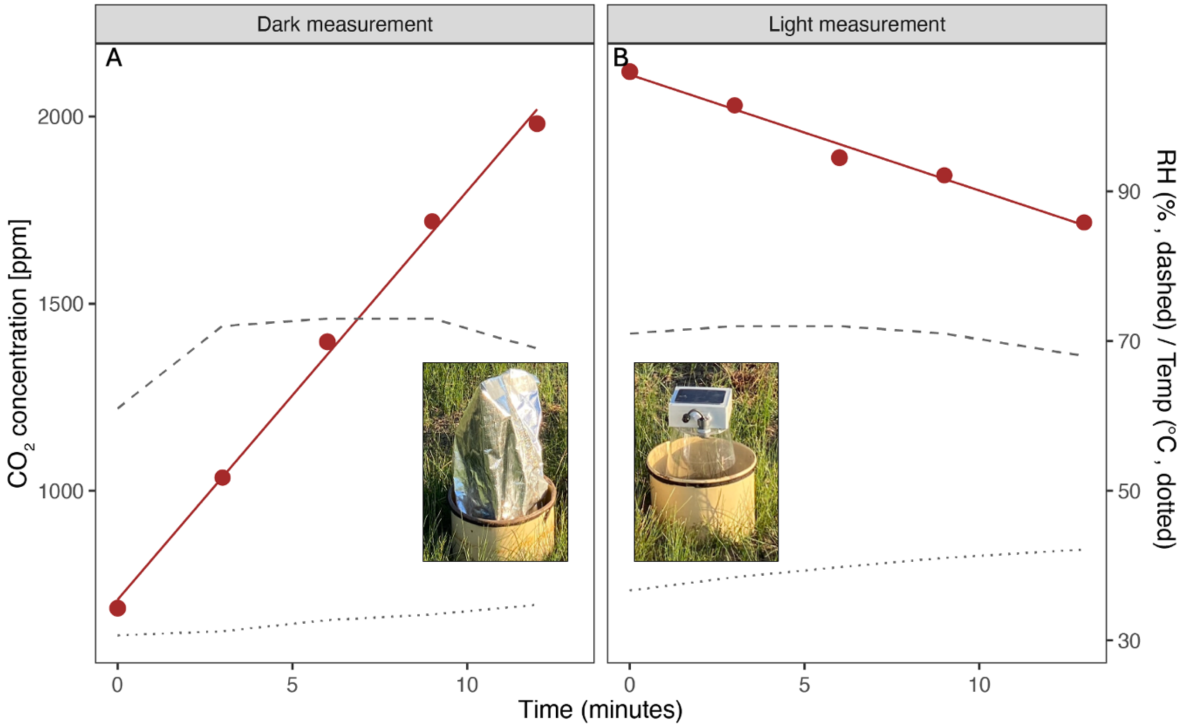

Figure 8: Monitoring CO_2 concentrations in vegetated terrestrial systems using *Pondi*. (A) *Pondi* recording dark respiration after the transparent chamber is covered with insulation material. (B) *Pondi* recording net primary production by allowing light through a transparent chamber. Coloured dots 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.

We thank A/Prof Gerard Rocher-Ros for the thoughtful and constructive comments, and we are grateful for the insightful feedback provided. Below, we respond to each point raised by the reviewer (quotes in grey) and describe how we will revise the manuscript accordingly.

The article by Malerba and others present a new chamber to measure GHG fluxes from ecosystems, in a very refined design, with telemetry, being one of the most advanced chambers available. The authors also test and present key details on the performance of the equipment, even though some details are missing that I list below.

Thank you for the positive comments.

The only bigger issue I have is a bit more details on the items and estimated cost of a Pondi. Other studies presenting similar chambers (e.g. So et al, 2024; reference below), do a great job with a table of all the main items, sources and rough cost. This would allow a better comparison to other chambers available as well as commercial options, given that the study highlights "low cost" in several places. The same paper provides a repository with more detailed documentation, which could also be necessary to do for this technical note.

Great point. We have now added a new table (Table S1) listing all hardware components and sub-components of the Pondi. We also specified that the approximate cost of the components for a Pondi is USD 750 (or AUD 1,166) and requires around six hours of specialised labour to assemble. This allows for a transparent comparison with other chambers, including the work by So et al. (2024), which we now cite.

Table S1: List of the primary components used in the construction of the Pondi. It includes both core and optional parts. Component: Major subsystem or category of parts (e.g., Enclosure, Solar, Sensors). Description: A brief explanation of the role of each component within the system. Sub-Component: Specific item within the component group. Units per Device: Number of units of that item required for the construction of one Pondi unit. Manufacturer: The company or brand providing the component. Generic items indicate cases where the brand is unimportant. Custom-designed parts (e.g., 3D-printed sensor mounts) were produced by Leading Edge Engineering Solutions (LEES). Items marked as optional (e.g., N_2O sensor, external solar panel) can be omitted to reduce cost or power demand, depending on deployment context.

Component	Description	Sub-Component	Units per Device	Manufacturer
Enclosure & Mounting	Protects the internal electronics and	Enclosure	1.0	Hammond Manufacturing, 1555RGY

	sensors from environmental exposure. Provides a secure housing and mechanical structure for field deployment, including mounting points for floating or terrestrial use.	Vent	1.0	Amphenol LTW, VENT-PS1YGY-O8001
		Chamber	1.0	Ezy Storage, 16L Round tbasin
		Pool Noodle	1.0	Generic item
		Zip ties	7.0	Generic item
		Label - waterproof sticker	1.0	Generic item
		Foam seal - Enclosure to PCB (internal)	1.0	LEES custom design
		Foam seal - Enclosure to chamber (External)	1.0	LEES custom design
		USB-C panel mount waterproof socket & cap	1.0	Waterproof IP68 Type C Female to Male PFC Flat Cable 10cm
Solar	Onboard solar module that recharges the system's battery, enabling long-term autonomous operation without the need for external power sources.	Panel	1.0	First Solar, 5V 150mA
		Panel adhesive sealant	1.0	Generic item
		Micro-Fit 2 Pin Plug	1.0	Molex, 0436450200
Solar - External (optional)	An optional, larger solar panel for use in shaded environments or when higher energy capacity is needed (e.g., powering active ventilation or telemetry in low-light areas).	External Panel	1.0	Voltaic Systems P126
		External Panel - USB C plug	1.0	LEES custom design
		External Panel - Bracket, 1mm aluminium	1.0	LEES custom design
		External Panel - Double-sided tape	1.0	LEES custom design
		External Panel - 6mm heat shrink double wall	1.0	LEES custom design
PCBs & Components	Core electronics, including custom-assembled circuit boards,	PCB - Main	1.0	LEES custom design
		PCB - Breakout	1.0	LEES custom design

	microcontrollers, data storage, and power management systems that run Pondi's operations, read sensors, and handle logging or telemetry.	PCB - Antenna	1.0	LEES custom design
		u.Fl cable	2.0	TE Connectivity AMP Connectors, 2410329-2
		Battery holders 18650	2.0	Generic item
		Battery cells	4.0	INR18650B
		BG96 mPCI-e	1.0	Quectel, BG96
		mPCie Standoffs	2.0	Wurth Elektronik, 9774015151R
		SIM card (cost of each card before data charges)	1.0	Generic item
		Micro-Fit 2 Pin Socket	1.0	Generic item
		6-pin sensor cable to breakout PCB	1.0	INR18650B
Other Sensors	Sensors to measure CO_2, CH_4, temperature, and humidity, critical for calculating gas fluxes.	Methane (CH4)	1.0	Figaro TGS2611-E00
		Carbon Dioxide (CO2)	1.0	Sensirion AG, SCD40-D-R2
Fastners	Includes bolts, nuts, and screws required to assemble the chamber, secure electronics, and mount components within the enclosure.	M2.5x4 (mPCIe)	2.0	Generic item
		M3x6	4.0	Generic item
		M3x12	2.0	Generic item
Printed Parts	3D-printed or custom-fabricated parts used to hold sensors, guide airflow, or support other mechanical and structural elements of the system.	Stem	1.0	LEES custom design
		nut	1.0	LEES custom design
		Battery holders	2.0	LEES custom design
		Antenna mount	1.0	LEES custom design
Other Consumables	Miscellaneous materials needed for assembly and	Micro-Fit Pins		Generic item
		Filament - ABS (kg)		Generic item

	maintenance, such as adhesives, sealants, tubing, or cable ties, that ensure secure, leak-proof operation.	Conformal coating		Generic item
N2O (optional)	Optional N_2O sensor and associated components for measuring nitrous oxide fluxes. May be excluded to reduce cost or power demand if only CH_4 and CO_2 are of interest.	N2O Sensor	1.0	Dynament Platinum P/N2OP/NC/4/P
		N2O - PCB	1.0	Dynament
		N2O - Panel mount	1.0	Dynament
		N2O - Cable	1.0	4-core flexible cable
		N2O - 4pin molex plug	1.0	Molex, 0430250400
		N2O - Gland	1.0	12mm cable gland
		N2O - Silicon mix	1.0	MG Chemicals Black Flexible Epoxy
		N2O - Petrolium jelly		Generic item
		Printed mold	2.0	LEES custom design
Active Venting (optional)	An add-on module that includes a small pump and microcontroller for periodically flushing the chamber with ambient air to reset internal gas concentrations between measurements.	Pump	1.0	Adafruit Industries LLC, 4700
		Solenoid	1.0	DFRobot, DFR0866
		Control PCB	1.0	LEES custom design
		Printed frame	1.0	LEES custom design
		Tubing	1.0	Generic item
		Gland	1.0	12mm cable gland
		Vent	1.0	12mm mesh vent
		Vent O-ring	1.0	Generic item

Finally, the paper mentioned above, are able to separate diffusive from ebullitive fluxes of methane, which is something this study could also explore. Maybe no need to do a new analysis, but mentioning this capacity could be relevant.

Thank you for highlighting this. While the Pondi was designed to capture total net gas fluxes (ebullition + diffusion), the high-frequency sampling capabilities and venting mechanism offer the potential to distinguish between diffusive and ebullitive events based on temporal discontinuities in CH_4 concentration data. Although we have not yet conducted a systematic analysis to separate these flux types, there are published methodologies to do so. We added a statement in the discussion to highlight this potential and suggest it as a priority for future methodological development.

L50: The first paragraph on the different gasses is too broad on the global sources, it could already be narrowed down to the key ecosystems that this study targets. Particularly relevant would be for methane, as half of global emissions are from aquatic ecosystems (Global Methane Budget, Saunois et al 2025, ESSD). The "UN Environment programme, 2023" has a type and is maybe not the best reference.

We agree this section could be more targeted. We revised the paragraph to narrow the scope toward the types of systems targeted by Pondi—namely, small artificial and semi-natural aquatic systems such as farm dams, reservoirs, wastewater lagoons, and vegetated soils. We now cite Saunois et al. (2025, Earth System Science Data) from the Global Methane Budget to better contextualise the importance of aquatic ecosystems in global CH_4 emissions. We also replaced the UN Environment Programme citation with Saunois et al. (2025, Earth System Science Data) and Shukla et al. (2022, IPCC).

L74: If spelling out companies like this, would it be needed to provide references for them?

We added info on the specific products by these companies:

- Picarro (e.g., G2508 and G2509 Gas Concentration Analyzer)
- Los Gatos Research (e.g., Ultraportable Greenhouse Gas Analyzer)
- Li-COR (e.g., LI-7810 and LI-7815)

L93: A key reference missing here would be So et al, 2024

We added So et al., (2024, Biogeosciences) in the text.

L198: Some details on the external unit with the air pump are missing: What is the specific design here, which type of fan?

We expanded the relevant methods section to include a description of the external venting unit. It consists of a weatherproof housing that encloses a 5V miniature air pump (4700 Adafruit Industries), controlled by a control PCB to activate the pump for one hour at user-defined intervals (e.g., weekly). The air is filtered and injected into the chamber through a 6 mm silicone tube connected to a dedicated port.

L426: Cannot see arrows in the figure, which are mentioned in the caption.

Thank you for spotting this typo. We have revised the figure to add the arrows indicating the venting events (see below).

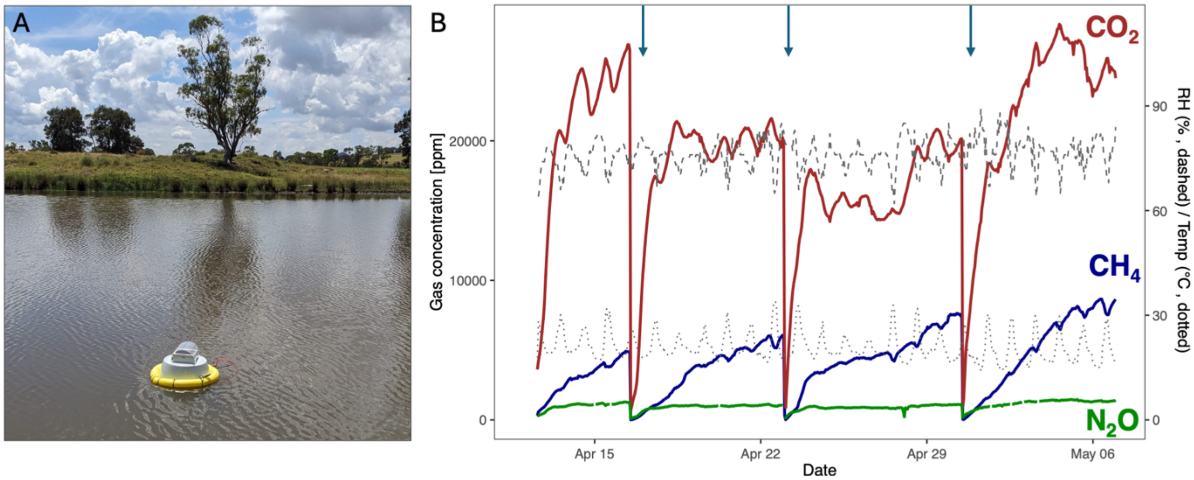

Figure 6: (A) *Pondi* in a farm dam. (B) Four weeks of hourly CO_2, CH_4, N_2O, relative humidity (RH), and temperature measurements inside the floating chamber of a *Pondi* in a farm dam. The arrows indicate the three venting events when the air pump diluted gas concentrations by injecting fresh air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