

An automated trapping system for improved estimates of N₂O and CO₂ efflux from soil

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Project Summary: Agricultural soils are the greatest source of human derived greenhouse gases to the atmosphere. Because of this a number of efforts are underway to minimize the emissions of greenhouse gases from soils that include use of organic fertilizers and no-till practices. Such mitigation practices, however, require verification particularly at national and international levels where carbon credits can be bought and sold. For this reason, we propose the development of an autonomous soil gas flux chamber that, once deployed, automatically traps greenhouse gases (CO₂ and N₂O) being released from soils to the atmosphere for months at a time (an Automated Trace Gas-Trapping System or ATGTS). The ATGTS consists of a flux chamber to collect gas evolving from soils, chemical or molecular sieve traps to remove water and trap CO₂ and N₂O, a pumping system that periodically turns on and off to move gases through the chemical traps, a system for collecting and distributing rain-water within the flux chamber, and a power system consisting of a solar panel and 24 V battery (Figure 1). We have previously demonstrated that a prototype system is capable of quantitatively trapping CO₂ and N₂O gases evolving from soils and now seek to (1) design an independent electronic control system and (2) finalize the mechanical design for an autonomous system. We envision a final ATGTS system that could be sent to farmers and educators across the country as a basis for them to participate in greenhouse gas accounting programs.

