**Table 1.** Contrasting features between Systems 1 and 2

|  |  |  |
| --- | --- | --- |
| **Feature** | **System 1** | **System 2** |
| Objective | Feasibility of probe-TILDAS integration | Versatility of soil gas probe sampling |
| Location | Biosphere 2, University of Arizona, Tucson, AZ | Aerodyne Research Inc., Billerica, MA |
| Analyzer 1 | Dual-laser TILDAS for H2O and CO2 isotopes | Novel dual-laser TILDAS for N2O and CH4 isotopes |
| Analyzer 2 | Mini TILDAS for OCS, CO, CO2, and H2O | Vocus PTR-T  OF-MS for VOCs |
| Control Gas (bulk) | Ultra-Zero Air | Ultra-Zero Air; Ultra-High Purity N2 |
| Control Gas (trace) | 5% CO2in air | 49.1 ppm N2O in air; 54.6 ppm CH4 in air |
| Flow Control | 0.6 to 1 SLPM per column | 0.65 SLPM per column |
| Matrix | Silica | Silica, Soil |

**Table 2.** Experiments under controlled conditions using Systems 1 and 2

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Experiment** | **Type of soil** | **Columns** | **Probe Pore Size (μm)** | **Total flow (sccm); Probe Flow (sccm); Dilution (%)** | **Control gas (ppm)** | **System** | **Figures** |
| 1. Effect of probe sampling (silica)a | Silica | 1 | P8  (8 um) | total (10-600); probe (5-300); dilution (50%) | CO2 1000 | 1 | Figure 4 |
| 2. Flow and dilutiona | Silica | 1 | P8  (8 um) | total (50:50:300); probe (0-300); dilution (90:15:0%) | CO2 1000 | 1, 2 | Figure 6, 7, 8 |
| 3. Multi-probe evaluationa | Silica | 1 | P8  (8 um) | total (20-400); probe (5-100); dilution (75%) | CO2 2000 | 1 | Figure 10 |
| Silica | 2 | P10  (10 um) |
| Silica | 3 | P5  (5 um) |
| Silica | 4 | P8  (8 um) | total (250);  probe (25); dilution (90%) | N2O 3ppm  CH4 7 ppm | 2 | Figure 9 |
| 4. Soil vs. silica: multi-probe flow rate dependence | Soil 1 | 4 | P8  (8 um) | total (235); probe (60); dilution (74%) | N2O 3 ppm; CH4 7 ppm | Field moisture | Figure 11 |
| Silica | 5 | P10  (10 um) | Dry |
| Silica | 6 | P25  (25 um) | Dry |
| 5. Soil wettinga | Soil 1 | 4 | P8  (8 um) | total (50-100); probe (25); dilution (50-75%) | Dry to wet | Figure 12 |
| 6. Soil redox: anaerobic (N2) to aerobic (UZA)ab | Soil 3 | 5 | P10  (10 um) | total (185); probe (53); dilution (71%) |  | Wet | Figure 13 |