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Measuring Very Small Soil Fluxes of N₂O & CH₄ using a New OF-CEAS Technology

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Abstract Text:

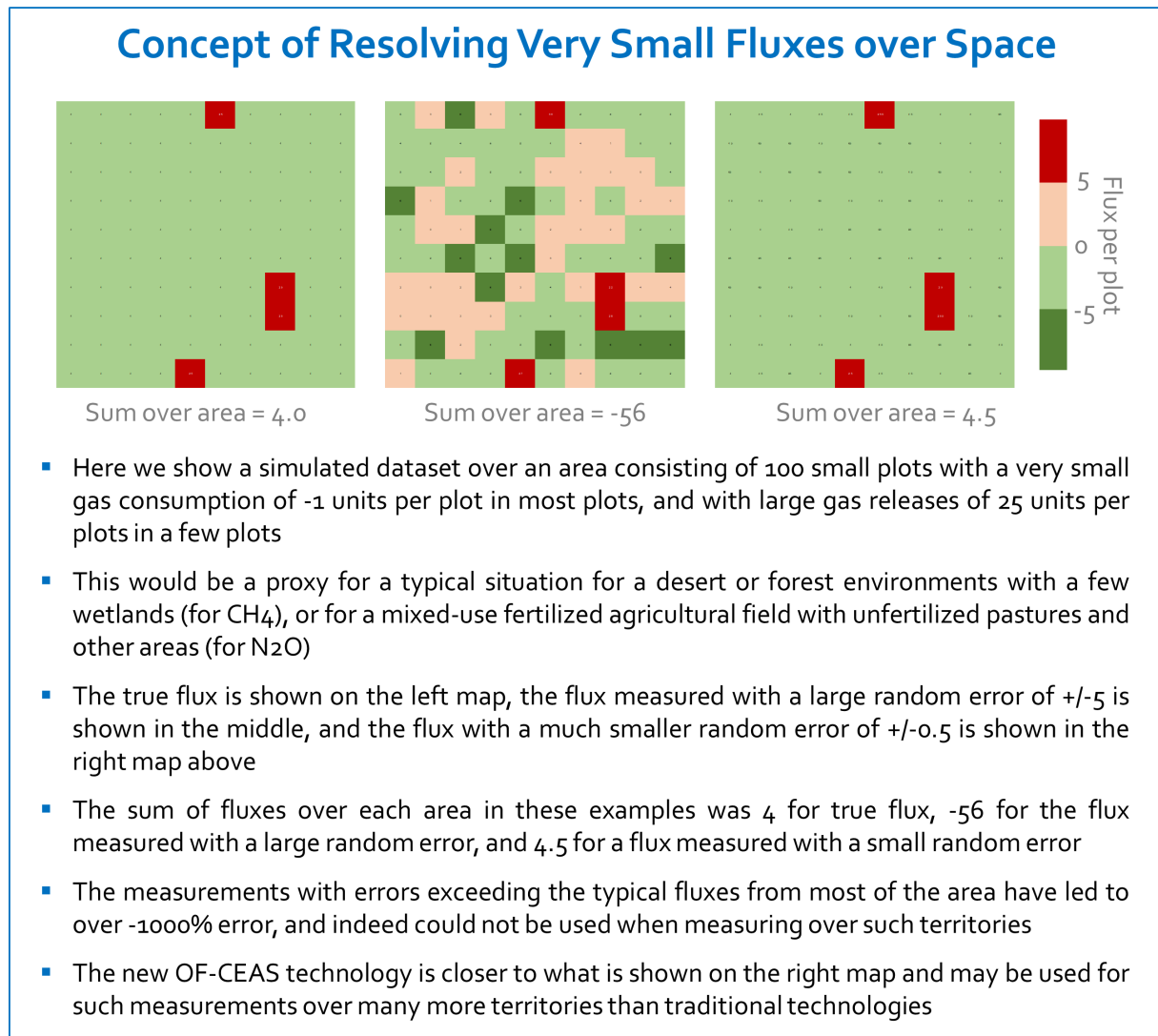
N₂O and CH₄ soil flux studies traditionally consider certain time periods and certain ecosystems to be of low importance due to very small or negligible expected flux rates. Periods of such “negligible” fluxes are rarely reported because small fluxes are hard to resolve, measurements are costly, time-consuming, and often take a lot of power. “Negligible” flux sites are also rarely studied because small fluxes are hard to resolve, measurements are time-consuming and costly, and it is hard to get funding to measure something when the error bars cross zero.

However, such fluxes may not be negligible in time when multiplied by long time duration, for example, 340 out of 365 days per year. Similarly, these may not be negligible in space when multiplied by a large area. When GHG budgets are of interest, very small fluxes multiplied by hundreds of days or square kilometers, or both, could easily exceed large fluxes multiplied by few days or square kilometers.

The new OF-CAES technology [1-7] has very low minimum detectable flux which may help make more of such measurements valuable and valid in both time and space. The presentation will demonstrate the field data on the N₂O and CH₄ soil flux performance of this new technology. Conceptual simulations will demonstrate the significant advantages of using the technology when measuring small N₂O and CH₄ fluxes over time and space.

References:

- [1] Burba, 2021. Eddy Covariance Method for Scientific, Regulatory, and Commercial Applications. *LI-COR Biosciences*, 660 pp (*under review*)
- [2] Burba, 2021. Atmospheric Flux Measurements. In *Advances in Spectroscopic Monitoring of the Atmosphere*. *Elsevier Science*, 618 pp
- [3] Koulikov and Kachanov, 2014. Laser-based cavity-enhanced optical absorption gas analyzer with laser feedback optimization. *US Patent 8659758*
- [4] Leggett et al, 2019. Development of Trace CH₄ and CO₂ Analyzers: Performance Evaluation Studies, GCWerks Integration, and Field Results. *AGUFM*
- [5] Minish et al, 2019. New High-Precision Low-Power CO₂ and CH₄ Analyzers for Multiple Applications. *Geophysical Research Abstracts*, Vol. 21
- [6] Romanini et al, 2014. Introduction to cavity-enhanced absorption spectroscopy. In *Cavity-Enhanced Spectroscopy and Sensing*. *Springer*, 546 pp



Session Selection:

B036. Geoclimatic Drivers of Nitrous Oxide (N₂O) and Nitric Oxide (NO) Emissions: From Microscale Variability to Global Influences

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