# B51K-2383 - Testing and improving a UAV-based system designed for wetland methane source measurements

Friday, 13 December 2019
08:00 - 12:20
*Moscone South - Poster Hall*

## Swirl Topics

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## Abstract

Wetlands are the single highest emitting methane source category, but the magnitude of wetland fluxes remains difficult to fully characterize due to their large spatial extent and heterogeneity. Fluxes can vary with land surface conditions, vegetation type, and seasonal changes in environmental conditions. Unmanned aerial vehicles (UAVs) are an emerging platform to better characterize spatial variability in these natural ecosystems. While presenting some advantages over traditional techniques like towers and flux chambers, in that they are mobile vertically and horizontally, their use is still challenging, requiring continued improvement in sensor technology and field measurement approaches. In this work, we employ a small, fast response laser spectrometer on a Matrice 600 hexacopter. The system was previously deployed successfully for 40 flights conducted in a four-day period in 2018 near Fairbanks, Alaska. These flights revealed several potential areas for improvement, including: vertical positioning accuracy, the need for sensor health indicators, and approaches to deal with low wind speeds. An additional set of flights was conducted this year near Antioch in California. Flights were conducted several meters above ground up to 15-25 m in a curtain pattern. These curtains were flown both upwind and downwind of a tower site, allowing us to calculate a mass balance methane flux estimate that can be compared to eddy covariance fluxes from the tower. Testing will better characterize the extent to which altitude drifts in-flight and how GPS values compare with measurements from the onboard LIDAR, as well as the agreement between two-dimensional wind speed and direction on the ground versus measured onboard the UAV. Hardware improvements to the sensor and GPS are being considered to help reduce these sources of uncertainty. Results of this testing and how system performance relates to needs for quantifying wetland fluxes, will be presented.

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