Poster #1-70

Side-by-side Evaluation of Eddy Covariance Gas Analyzers for the AmeriFlux Network: Effects of Analyzer Type and Spectral Corrections on Turbulent Fluxes

P. Polonik[1*], W.S. Chan[1], S. Dengel[1], D.P. Billesbach[2], G. Burba[3], J. Li, A. Nottrott[4], I. Bogoev[5], B. Conrad[5], and S.C. Biraud[1]

[1]Lawrence Berkeley National Laboratory, Berkeley, CA
[2]University of Nebraska, Lincoln, Lincoln, NE
[3]LI-COR Biosciences Inc., Lincoln, NE
[4]Picarro Inc., Santa Clara, CA
[5]Campbell Scientific Inc., Logan UT

Contact: ppolonik@lbl.gov

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The eddy covariance (EC) technique is used at hundreds of field sites worldwide to measure trace gas exchange between the surface and the atmosphere. Data quality and correction methods for EC have been studied empirically and theoretically. Recent development of new gas analyzers for CO_2 and H_2Ohas led to an increase in options for EC practitioners. Gas analyzers can be categorized based on their sample and inlet configuration as open-path, closed-path, or enclosed-path sensors. We evaluated the comparability of fluxes calculated from five different gas analyzers including two open-path (LI-7500A, IRGASON), two enclosed-path (EC200, LI-7200), and one closed-path (Picarro) analyzers, which were all located on a single tower in an irrigated alfalfa field managed by University of California, Davis. To effectively compare sensors with different inlet characteristics, the use of corrections to account for signal loss was required. Therefore, we applied two spectral corrections (Massman and Fratini methods) and a purely empirical approach using the integrals of sensible heat and gas cospectra. We found that all fluxes calculated from the gas analyzers were comparable if appropriately corrected. However, the comparability strongly depended on the gas species (CO_2 or H_2O) and the correction method chosen. Differences were below 5% on average for CO_2 fluxes using any correction method, but for H_2O, the average differences were between 4% and 13% for the different correction methods. The magnitude of corrections also varied strongly, especially for water vapor fluxes. This study does not identify a best sensor, but considers the benefits and difficulties of each sensor and sensor type. This information should be considered by investigators when choosing a sensor for a site or when analyzing EC measurements from multiple sites.