Geophysical Research Abstracts
Vol. 18, EGU2016-17594, 2016
EGU General Assembly 2016

A Bayesian model to estimate the 3-D shadowing correction in sonic anemometers

John Frank (1,2), William Massman (1), and Brent Ewers (2)
(1) U.S. Forest Service, Fort Collins, CO, United States, (2) University of Wyoming, Laramie, WY, United States

Sonic anemometers are the principal instruments in micrometeorological studies of turbulence and ecosystem fluxes. Recent studies have shown that common designs underestimate vertical wind measurements because they lack a correction for transducer shadowing, with no consensus describing a true correction. We introduce a novel Bayesian analysis with the potential to resolve the three-dimensional (3-D) correction by optimizing differences between anemometers mounted simultaneously vertical and horizontal. We reanalyze data from field experiments featuring multiple CSAT3 sonic anemometers. The resulting posterior correction revealed both self- and cross-shadowing of transducers. This resulted in ≈10% increase in the standard deviation of vertical wind velocity, where despite the uncertainty in the posterior, the 95% posterior credible interval was significantly higher than a common correction proposed in the literature. Applying the posterior correction to fast-response data at various sites across North America increased LE + H by an average of 8-12% with 95% credible intervals averaging between 6-14%.